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Silver Springs Underground Gas Storage Facility

Environmental Noise Assessment

Prepared For

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GLOSSARY

A weighting	Frequency adjustment representing the response of the human ear
Background noise level	Noise level in the absence of intermittent noise sources
Background creep	The gradual increase in background noise levels in an area as a result of successive developments generating constant noise levels at a particular location.
CONCAWE	The oil companies' international study group for conservation of clean air and water – Europe "The propagation of noise from petrochemical complexes to neighbouring communities"
dB(A)	A weighted noise level measured in decibels
Equivalent noise level	Energy averaged noise level
L_{A10}	A weighted noise level exceeded 10% of the time, representing the typical upper noise level
L_{A90}	A weighted noise level exceeded 90% of the time, representing the background noise level
L_{Aeq}	A weighted equivalent noise level measured in decibels
$L_{Aeq,\ 1\ hr}$	A weighted equivalent noise level measured in decibels over a period of 1 hour
$L_{Aeq,\ adj,\ 1\ hr}$	A weighted equivalent noise level measured in decibels over a period of 1 hour and adjusted for tonality
$L_{pA,LF}$	Indoor low frequency A weighted noise level
RBL	Rating Background Level
Sensitive receptor	A location in the vicinity of the proposed development, where noise may affect the amenity of the land use. For the proposed development, sensitive receptors are generally dwellings.
Sound power level	A measure of the sound energy emitted from a source of noise.
WHO	World Health Organisation
Worst Case	Conditions resulting in the highest noise level at or inside dwellings. Worst case meteorological conditions can be characterised as no cloud at night with wind from the project site to dwellings. Worst case building construction refers to a façade constructed from light weight materials providing the lowest noise reduction across it.

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1 INTRODUCTION

AGL has recently acquired the Silver Springs gas facility and is proposing to construct an Underground Gas Storage facility to be known as the Silver Springs Underground Gas Storage facility (SSUGS). The major noise source associated with the proposed facility is the existing and new gas compression units.

Sonus has been engaged to make an assessment of the environmental noise from the construction and operation of the proposed SSUGS facility at the closest noise sensitive receptors. The assessment has consisted of:

- a survey of the existing acoustic environment and equipment on site;
- measurements of the noise from the existing compressors and generators;
- a prediction of the noise from the construction and operation of the new compressor on site at the closest sensitive receptor;
- a comparison of the predicted levels with the relevant environmental noise criteria, and;
- recommendations for acoustic treatment measures.

The new gas compression unit will comprise a compressor and the associated drive equipment. The gas compression unit has the potential to operate continuously.

2 DESCRIPTION OF EXISTING ENVIRONMENT AND FACILITY

The SSUGS facility is located at Silver Springs / Renlim Gas fields, which have an acoustic environment characterised by natural sounds such as birds and wind in trees, other than in close proximity to the existing gas field plant. The closest sensitive receptor to the site is Boxleigh, which is located approximately 2.9 km to the south of the site and is considered as the most critical sensitive receptor in this assessment. Appendix A provides the coordinates and approximate locations of the sensitive receptors considered in this assessment.

The topography between the site and the sensitive receptors is relatively flat and it is expected that the topography will have negligible influence on the noise predicted at the closest sensitive receptor.

Background noise levels (L_{A90}) and ambient noise levels (L_{Aeq}) were measured at Noona, which is a sensitive receptor in the vicinity of the facility. These continuous unattended measurements were made between the 20^{th} and the 28^{th} of September, 2010, in accordance with the Queensland Department of Environment and Resource Management's (DERM) "Noise Measurement Manual" (the DERM Noise Measurement Manual). The approximate noise measurement location is indicated on the Figure A.1 in Appendix A. The monitored location did not appear to be significantly influenced by noise other than natural sounds, predominantly wind in trees.

Using the measurement data obtained, the Rating Background Levels (RBL) were calculated in accordance with the "Planning for Noise Control" Guideline released by DERM. The calculated RBLs are summarised in Table 2.1.

Table 2.1: Calculated Rated Background Levels.

RBL dB(A)		
Day	**Evening**	**Night**
29	33	28

The calculated RBLs are considered to be representative of all sensitive receptors which are located in an environment dominated by noise from wind in trees, birds and other natural sound.

Currently, there are four existing compressors, of which only three operate at any one time, with one used as a standby. There are also two generators which are main noise sources at the facility. The existing compressors are of the following make:

- one Ajax DPC-600;
- two Ajax DPC-360-H-1, and;
- one Ariel J-GD5R.

At any one time, one of the Ajax DPC-360-H-1 compressor or the Ariel-JG5R compressor will be on standby.

Noise from the above existing equipment at the facility was measured in the vicinity of the site on the 20th of September, 2010. These measurements were used to estimate the noise contribution from the existing equipment to the Rated Background Level at the sensitive receptors in the vicinity of the site. At the time of the measurements, all three Ajax compressors and the two generators were operating.

The noise contribution from the existing equipment estimated under mild upwind weather conditions is shown in Table 2.2. Mild upwind conditions are used as these best replicate the conditions that would influence the measured Rated Background Levels.

Table 2.2: Estimated Contribution to RBL from Existing Equipment

Sensitive Receptor	Estimated Noise Level (dB(A))
Boxleigh	24
Noona	19
Glenmore	< 18
Glenearn	< 18
Cooma	< 18
Wanganui	< 18
Glen Fosslyn	< 18
Doonba	< 18
Beechwood	< 18
Billinbah	< 18

3 METEOROLOGICAL CONDITIONS AND ATMOSPHERIC EFFECTS

The CONCAWE noise propagation model is used around the world and is widely accepted as an appropriate model for predicting noise over significant distances.

The CONCAWE system divides the range of possible meteorological conditions into six separate “weather categories”, from Category 1 to Category 6. Weather Category 1 provides “best-case” (i.e. lowest noise level) weather conditions for the propagation of noise, whilst weather Category 6 provides “worst-case” (i.e. highest noise level) conditions, when considering wind speed, wind direction, time of day, and level of cloud cover. Weather Category 4 provides “neutral” weather conditions for noise propagation.

For the purposes of comparison, Categories 1, 2 and 3 weather conditions are generally characterised by wind blowing from the receptor to the noise source during the daytime with little or no cloud cover. Category 4 conditions can be characterised by no wind and an overcast day, whilst no wind and a clear night sky represent Category 5 conditions. Category 6 conditions can be characterised by a clear night sky and wind blowing from the noise source to the receptor.

In the particular circumstances of this development, it is noted that the noise levels experienced at sensitive receptors in the vicinity of the facility will be significantly affected by the weather category. For example, higher noise levels would be expected at sensitive receptors with wind blowing from the site to the sensitive receptor (i.e. Category 5 or 6 conditions) than with wind blowing from the sensitive receptor to the site (i.e. Category 1, 2, or 3 conditions).

Twelve months of historical meteorological data for Silver Springs were processed to determine the likelihood of each meteorological category. The times during which the wind speed is greater than 5m/s have been listed separately and excluded from each category, as it is anticipated that ambient noise levels (from wind in trees) would mask the noise from the site at these times.

Tables 3.1 to 3.6 summarise the percentage of time in each meteorological category for the closest sensitive receptor located to the south of the site (most critical sensitive receptor), and for sensitive receptors located to the southwest, northwest, north, northeast and east of site.

Table 3.1: Distribution of meteorological categories for sensitive receptor located to the south of the site.

Meteorological Category	Total Percentage of Time in Each Category	Percentage of Time in Each Category during Night-time Only
Wind Speed > 5m/s	8%	1%
Category 1	1%	0%
Category 2	8%	1%
Category 3	14%	3%
Category 4	31%	38%
Category 5	19%	22%
Category 6	19%	35%

Table 3.2: Distribution of meteorological categories for sensitive receptor located to the southwest of the site.

Meteorological Category	Total Percentage of Time in Each Category	Percentage of Time in Each Category during Night-time Only
Wind Speed > 5m/s	8%	1%
Category 1	1%	0%
Category 2	8%	1%
Category 3	9%	1%
Category 4	25%	27%
Category 5	22%	19%
Category 6	27%	51%

Table 3.3: Distribution of meteorological categories for sensitive receptor located to the northwest of the site.

Meteorological Category	Total Percentage of Time in Each Category	Percentage of Time in Each Category during Night-time Only
Wind Speed > 5m/s	8%	1%
Category 1	1%	0%
Category 2	7%	1%
Category 3	12%	6%
Category 4	22%	22%
Category 5	23%	25%
Category 6	26%	46%

Table 3.4: Distribution of meteorological categories for sensitive receptor located to the north of the site.

Meteorological Category	Total Percentage of Time in Each Category	Percentage of Time in Each Category during Night-time Only
Wind Speed > 5m/s	8%	1%
Category 1	1%	0%
Category 2	11%	5%
Category 3	13%	5%
Category 4	25%	32%
Category 5	20%	21%
Category 6	22%	36%

Table 3.5: Distribution of meteorological categories for sensitive receptors located to the northeast of the site.

Meteorological Category	Total Percentage of Time in Each Category	Percentage of Time in Each Category during Night-time Only
Wind Speed > 5m/s	8%	1%
Category 1	2%	0%
Category 2	13%	5%
Category 3	16%	7%
Category 4	30%	45%
Category 5	14%	13%
Category 6	18%	28%

Table 3.6: Distribution of meteorological categories for sensitive receptors located to the east of the site.

Meteorological Category	Total Percentage of Time in Each Category	Percentage of Time in Each Category during Night-time Only
Wind Speed > 5m/s	8%	1%
Category 1	2%	0%
Category 2	14%	4%
Category 3	15%	7%
Category 4	33%	51%
Category 5	16%	16%
Category 6	13%	21%

For compliance testing, the DERM Noise Measurement Manual requires that the noise measurement be conducted during fine weather conditions with calm to light winds. Measurement during conditions conductive to sound propagation should only be conducted if the conditions are a true representation of the normal situation in the area. When conducting a noise prediction, it is therefore considered appropriate that the prediction is also made for fine weather conditions, unless conditions conducive to sound propagation are representative of the normal conditions in the area.

To objectively determine whether the meteorological conditions conducive to sound propagation are a representation of the normal conditions of an area, reference is made to the *Planning for Noise Control Guideline*.

The *Planning for Noise Control Guideline* states that the meteorological conditions conducive to sound propagation, such as temperature inversions (Categories 5 and 6) and downwind conditions will be a significant feature of the area if they occur for 30% of the time. Therefore based on Tables 3.1 to 3.6, Categories 5 and 6 weather conditions are considered to be a feature of the area for all sensitive receptors located in the vicinity of the facility site.

Consequently, it is proposed that the assessment of noise at all sensitive receptors in the vicinity of the facility be made under worst-case (CONCAWE Category 6) meteorological conditions.

4 CRITERIA

The Environmental Protection (Noise) Policy 2008 has been used as the primary method of objectively assessing the noise from the proposal. However, reference is also made to the World Health Organisation (WHO) Guidelines, the DERM "Planning for Noise Control" Guideline and the DERM "Assessment of Low Frequency Noise" Draft Guideline.

Separate noise criteria are proposed for the construction stage of the proposal, given the short term, transient nature of construction noise in comparison to operational noise.

4.1 Operational Noise

4.1.1 <u>Environmental Protection (Noise) Policy 2008</u>

The *Environmental Protection (Noise) Policy 2008* (the Policy) provides the management intent to control background noise creep as well as achieve acoustic quality objectives for sensitive receptors.

A traditional approach to environmental noise has been to measure existing background noise levels prior to a development and to set environmental noise criteria at a certain level above the existing background noise level. Where this methodology is used, background noise levels are measured over a period of time to incorporate a range of meteorological conditions. The background noise level used is at the lower end of the range of measured levels.

One of the concerns about this methodology is that each development may increase the background noise level allowing more relaxed criteria for future developments. This theoretical phenomenon of the degradation of the acoustic environment with successive developments is known as background creep. For this development to contribute to background creep, successive developments would need to rely on background noise levels, which have been elevated by previous projects, to set less stringent criteria.

To control background creep, the Policy includes:

To the extent that it is reasonable to do so, noise from an activity must not be –

(a) For noise that is continuous noise measured by $L_{A90,T}$ - more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$; or

(b) For noise that varies over time measured by $L_{Aeq,adj,T}$ - more than 5 dB(A) greater than the existing acoustic environment measured by L_{A90T}.

As the noise from the proposal is expected to be continuous, it is part (a) that applies. Based on the measured background noise levels, the criteria associated with controlling background creep are shown in Table 4.1.

Table 4.1: Criteria to control background creep.

$L_{A90,T}$ dB(A)		
Day	**Evening**	**Night**
29	33	28

Since the development of the WHO Guidelines, it has become more common for regulatory authorities to base environmental noise criteria on avoiding health and wellbeing impacts rather than comparison with background noise levels. The Policy includes acoustic quality objectives based on the WHO Guidelines. These are described in Table 4.2.

Table 4.2: The Environmental Protection (Noise) Policy acoustic quality objectives.

Sensitive Receptor	**Time of Day**	**Acoustic Quality Objectives (dB(A))***			**Environmental Value**
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
dwelling (for outdoors)	daytime[1] and evening[2]	50	55	65	health and wellbeing
dwelling (for indoors[4])	daytime and evening	35	40	45	health and wellbeing
	night-time[3]	30	35	40	health and wellbeing in relation to the ability to sleep

Note: * Measured at the sensitive receptor.
[1] Daytime is defined by the Policy as "the period after 7am on a day to 6pm on the day".
[2] Evening is defined by the Policy as "the period after 6pm on a day to 10pm on the day".
[3] Night-time is defined by the Policy as "the period after 10pm on a day to 7am on the next day".
[4] In accordance with the WHO Guidelines, indoor noise levels can be converted to outdoor levels by the addition of 15 dB(A) assuming windows being partially open for ventilation.

It is noted that the L_{Aeq} levels are often considered to be 3 dB(A) higher than the L_{A90} levels for distant noise sources as described in the "Planning for Noise Control Guideline" and therefore the levels summarised in table 4.1 can be increased by 3 dB(A) to convert the levels to the $L_{Aeq,adj,1hr}$ descriptor. The $L_{Aeq,adj,1hr}$ criteria to achieve the Environment Protection (Noise) Policy are summarised in Table 4.3.

Table 4.3: Criteria to achieve Environment Protection (Noise) Policy.

$L_{Aeq,adj,1hr}$ dB(A)		
Day	**Evening**	**Night**
32	36	31

4.1.2 Planning for Noise Control Guideline

The "Planning for Noise Control" Guideline (the DERM Guideline) provides criteria to control background noise creep as well as planning noise levels to protect amenity.

To control background noise creep in a rural area, the most stringent recommended $L_{A90,1hr}$ of the DERM Guideline is 25 dB(A). In accordance with the procedure in the Guideline, this equates to a $L_{Aeq,1hr}$ of 28 dB(A).

The planning noise level (PNL) to protect amenity for a rural area is summarised in Table 4.4:

Table 4.4: Maximum hourly sound pressure level

$L_{Aeq,1hr}$ (PNL)		
Day	**Evening**	**Night**
40	35	30

Based on the above, the most stringent criterion of the DERM Guidelines is a $L_{Aeq,1hr}$ of 28 dB(A).

4.1.3 World Health Organisation Guidelines

The WHO has developed guidelines[1] for community noise in specific environments. With respect to annoyance, the guidelines state:

"To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB(A) L_{Aeq}."

To avoid sleep disturbance, the WHO suggests that the equivalent noise level (L_{Aeq}) should be limited to 30 dB(A) inside a bedroom at night. Based on the windows being partially open, the WHO suggests that to achieve the internal level described above, the equivalent noise level outside a bedroom window should be limited to 45 dB(A).

Sonus has conducted tests of the noise reduction achieved across the facade of a number of dwellings. These tests include a range of facade constructions from light weight transportable homes to masonry homes. The results of the testing indicate that with windows partially open for ventilation, the noise transfer is typically around 15 dB(A). The tests confirms that the WHO noise reduction of 15 dB(A) across a facade is appropriate.

[1] Berglund, Lindvall and Schwela, 1999, "Guidelines for Community Noise"

4.1.4 Low Frequency Noise Draft Guideline

The noise from the proposed new equipment is not dominated by low frequency noise (refer Table 5.1) but the propagation of sound over large distances attenuates the high and mid frequencies, leaving a greater low frequency component and therefore as a conservative approach, assessment against the suggestions of the Low Frequency Noise Draft Guidelines has been included.

The draft guideline separates the assessment of low frequency noise based on the frequency content of the noise and whether the noise is tonal or broad band. Based on measurements of similar equipment at other sites, the noise experienced at sensitive receptors will not include a significant component of infrasound (less than 20Hz) and will not be tonal.

For non-tonal, low frequency noise in the range of 20Hz to 200Hz, the draft guideline suggests that the noise is considered to be acceptable if the contribution of low frequency noise within a sensitive receptor ($L_{pA,LF}$) does not exceed 20 dB(A) during the evening or night and 25 dB(A) during the day.

The low frequency noise transfer from outside to inside sensitive receptors varies significantly based on the construction of the dwelling. Sonus has recently conducted tests of the noise reduction achieved across the facade of a number of dwellings. The results from these tests indicate that the low frequency noise reduction, with windows partially open, ranges from 10 dB(A) for a light weight transportable home to 20 dB(A) for a well constructed masonry home. This assessment has been based on a noise reduction of 10 dB(A), which represents a worst-case (conservative) assessment.

4.1.5 Operational Noise Summary

The Policy, the DERM Guidelines and the recommendations of the WHO Guidelines have been considered in determining the appropriate criterion for the proposed extension. The existing ambient noise environment, the existing noise sources and the prevailing meteorological conditions at the site have also been taken into account.

With consideration to the above, the proposed noise condition for the operation of the new gas compression unit at the facility is $L_{Aeq,1hr}$ of 28 dB(A), predicted outside all sensitive receptors under worst-case (Category 6) meteorological conditions.

Where the above criterion is achieved, the intent of the Environmental Protection (Noise) Policy 2008, the World Health Organisation (WHO) Guidelines and the DERM Planning for Noise Control Guideline will also be achieved.

4.2 Construction Noise

As construction for the installation of the new gas compression unit is likely to occur over a number of months, it is considered appropriate to ensure noise level from construction activity achieves amenity based criteria at sensitive receptors. Considering the noise from construction is transient, temporary and subject to significant variation, there is no potential for background noise creep.

It is understood that the construction will only occur during the day, between 7am to 6pm. Therefore, the appropriate criterion for day-time construction activity is provided by the Environmental Protection (Noise) Policy and the WHO Guidelines, which is 50 dB(A), achieved outside a sensitive receptor.

4.3 Summary of Proposed Noise Conditions

The proposed operational and construction noise criteria for the new gas compression unit have been summarised in Table 4.5.

Table 4.5: Proposed Noise Conditions.

Activity	**Criteria, $L_{Aeq,1hr}$**	**Time**
Operation	28 dB(A) at all sensitive receptors predicted under worst-case meteorological conditions	24 hours
Construction	50 dB(A) at all sensitive receptors, predicted under worst-case meteorological conditions	7am to 6pm

5 ASSESSMENT

5.1 Operational Noise

5.1.1 Noise Sources

The noise sources of the proposed SSUGS facility considered in this assessment are provided in Table 5.1. The table also contains sound power levels and the quantity of each item of equipment for the new gas compression unit.

Table 5.1: Main noise sources, sound power levels and quantity of equipment.

Noise Source	Quantity	Maximum Sound Power Level (dB re 1 pW) by Octave Band Frequency (Hz)									Total (dB(A))
		32	63	125	250	500	1000	2000	4000	8000	
Compressor											
Ariel KBZ/4	1	113	109	114	113	111	114	119	116	109	123
Drive Equipment											
CAT G3612 – Air Inlet	1	90	90	90	90	93	90	105	116	120	123
CAT G3612 – Exhaust	2	108	123	121	121	123	128	133	139	140	144
CAT G3612 – Mechanical	1	108	121	126	120	120	119	120	119	111	126
Moore CL10K – Fan	1	-	102	101	98	93	91	85	79	73	96

5.1.2 Noise Prediction

The noise from the operation of the new gas compression unit at the sensitive receptors in the vicinity of the site has been predicted using the CONCAWE noise propagation model in the SoundPlan noise modelling software. The CONCAWE propagation model takes into account topography, ground absorption and meteorological conditions, and has been used and accepted around the world as an appropriate sound propagation model. In the noise model, flat ground was considered as the attenuation due to undulating ground surface is considered negligible at the closest sensitive receptor.

Based on the sound power levels of equipment listed in Table 5.1, the predicted noise levels outside the dwelling at each sensitive receptor location, without any specific acoustic treatment measures, are summarised in Table 5.2.

Table 5.2: Predicted Noise Level Outside the Dwellings.

Sensitive Receptor	Predicted Noise Level (dB(A))
Boxleigh	45
Noona	36
Glenmore	25
Glenearn	< 20
Cooma	< 20
Wanganui	< 20
Glen Fosslyn	< 20
Doonba	< 20
Beechwood	< 20

Table 5.2 indicates that the noise level at the two closest sensitive receptors to the site, Boxleigh and Noona, will be approximately 45 dB(A) and 36 dB(A) respectively, without any specific acoustic treatment measures, which exceed the proposed noise criterion of 28 dB(A). Noise contour of the prediction without specific acoustic treatment measure is provided in Appendix B.

5.1.3 Recommended Acoustic Treatment

To achieve the criterion of 28 dB(A) at all sensitive receptors, incorporation of acoustic treatment which provides the following noise attenuation is required:

Table 5.3: Required attenuation of acoustic treatment for new gas compression unit.

Noise Source	Required Noise Level Reduction(dB)					Potential Treatment
	125	250	500	1000	2000	
Compressor						
Ariel KBZ/4	0	0	5	10	5	Noise barrier*
Drive Equipment						
CAT G3612 – Exhaust	5	10	20	25	20	Muffler / Silencer
CAT G3612 – Mechanical	5	8	13	15	10	Noise barrier*

* Required to achieve the criterion at Boxleigh i.e. not required to achieve criterion at Noona.

The noise barrier referred to in Table 5.3 may be constructed from sheet steel and should extend vertically from the ground to a height of 1m above the height of the equipment. The noise barrier should extend horizontally so that line of sight is blocked between the equipment and the sensitive receptor to the south of the site (Boxleigh).

With the above treatment incorporated in the design, the noise from the proposed equipment, when measured at the two closest sensitive receptors to the site, Boxleigh and Noona, is predicted to be no greater than 28 dB(A) under worst-case (CONCAWE Category 6) meteorological conditions, achieving the criterion of 28 dB(A) for operational noise. Noise contour of the prediction with the potential treatment given in Table 5.3 is provided in Appendix B.

The low frequency noise level inside the closest dwelling from the operation of the new equipment at the facility has been predicted under worst-case meteorological conditions with the acoustic treatment recommended in Table 5.3 in place. The prediction indicates that the low frequency noise level inside the closest dwelling is 12 dB(A). Therefore, the draft guideline suggestion of $L_{pA,LF}$ of 20 dB(A) inside a dwelling is easily achieved at all dwellings in the vicinity of the site with the recommended acoustic treatment in place. The level of low frequency noise inside other dwellings would be significantly less.

5.2 Construction Noise

As the exact details regarding the construction techniques and equipment that will be used during the construction phase are not currently available, noise from the construction activity at the site has been predicted based upon typical construction equipment that may be expected to be used. The “worst-case” (i.e. highest) sound power levels for each piece of equipment as detailed in Appendix D of *Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites* have been used in the predictions. Table 5.4 details the equipment and overall sound power levels included in this assessment.

Table 5.4: Construction noise sources.

Equipment	Maximum Overall Sound Power Level (dB(A))
Hand-held grinder	106
Loader	120
Truck	120
Excavator	118
Generator	119
Air Compressor	107
Crane	123

Based upon the above equipment and sound power levels, the noise level from construction activity at the closest sensitive receptor to the site (Boxleigh) has been predicted for a "worst-case" period of all equipment listed above operating simultaneously and continuously. The prediction indicates that the noise from construction activity will be no greater than 40 dB(A) under worst-case meteorological conditions, therefore achieving the criterion for construction of 50 dB(A). It is noted that this conservative scenario of all noise sources operating simultaneously is unlikely to occur.

6 CONCLUSION

An assessment has been made of the noise from the proposed Silver Springs Gas Storage facility which includes the addition of a new gas compression unit. The assessment considered noise from construction and operation of the proposed facility.

Based upon the Environmental Protection (Noise) Policy, appropriate conditions for noise levels at sensitive receptors have been determined, taking into consideration the existing acoustic environment and historical meteorological conditions. The proposed noise conditions for the operation and construction of the project are given in Table 6.1.

Table 6.1: Proposed Noise Conditions.

Activity	Criteria, $L_{Aeq,1hr}$	Time
Operation	28 dB(A) at all sensitive receptors predicted under worst-case meteorological conditions	24 hours
Construction	50 dB(A) at all sensitive receptors, predicted under worst-case meteorological conditions	7am to 6pm

The noise at the sensitive receptors in the vicinity of the site from construction activity and the operation of the new equipment has been predicted. The predictions indicate that the proposed noise condition for the operation of new equipment will be achieved at the closest sensitive receptor and accordingly, at all other sensitive receptors, with a feasible level of acoustic treatment applied. The predictions also indicate that the noise from construction activity will easily achieve the proposed noise conditions.

REFERENCES

Berglund,B., Lindvall, T., and Schwela, D.H. 1999 . Guidelines for Community Noise. World Health Organisation, Geneva.

DERM. 2004. Guideline – Planning for noise control. Department of Environment and Resource Management, Queensland Government, Brisbane, Queensland.

DERM. 2002. Draft Guideline - Assessment of Low Frequency Noise. Department of Environment and Resource Management, Queensland Government, Brisbane, Queensland.

Manning, C.J. 1981. The propagation of noise from petrochemical complexes to neighbouring communities. CONCAWE - The oil companies' international study group for conservation of clean air and water – Europe.

Queensland Government. 2009. Environmental Protection (Noise) Policy 2008. Reprint No.1. Queensland Government, Brisbane, Queensland.

Queensland Government. 2000. Noise Measurement Manual. Third Edition. March. Environment Protection Authority, Queensland Government, Brisbane, Queensland.

APPENDIX A: SENSITIVE RECEPTORS IN THE VICINITY OF THE FACILITY

Table A1: Coordinates and Approximates Distances of the Sensitive Receptors from the Site.

Sensitive Receptor	Longitude (°)	Latitude (°)	Approximate Distance from the Site (km)
Boxleigh	149.111	-27.6257	2.9
Noona	149.111	-27.5579	4.6
Glenmore	149.161	-27.5504	7.4
Glenearn	148.981	-27.5486	13.9
Cooma	149.223	-27.4746	17.8
Wanganui	148.876	-27.6618	24.1
Glen Fosslyn	149.315	-27.4655	25.1
Doonba	149.379	-27.5938	26.6
Beechwood	149.392	-27.5367	28.7
Billinbah	149.376	-27.4310	32.2

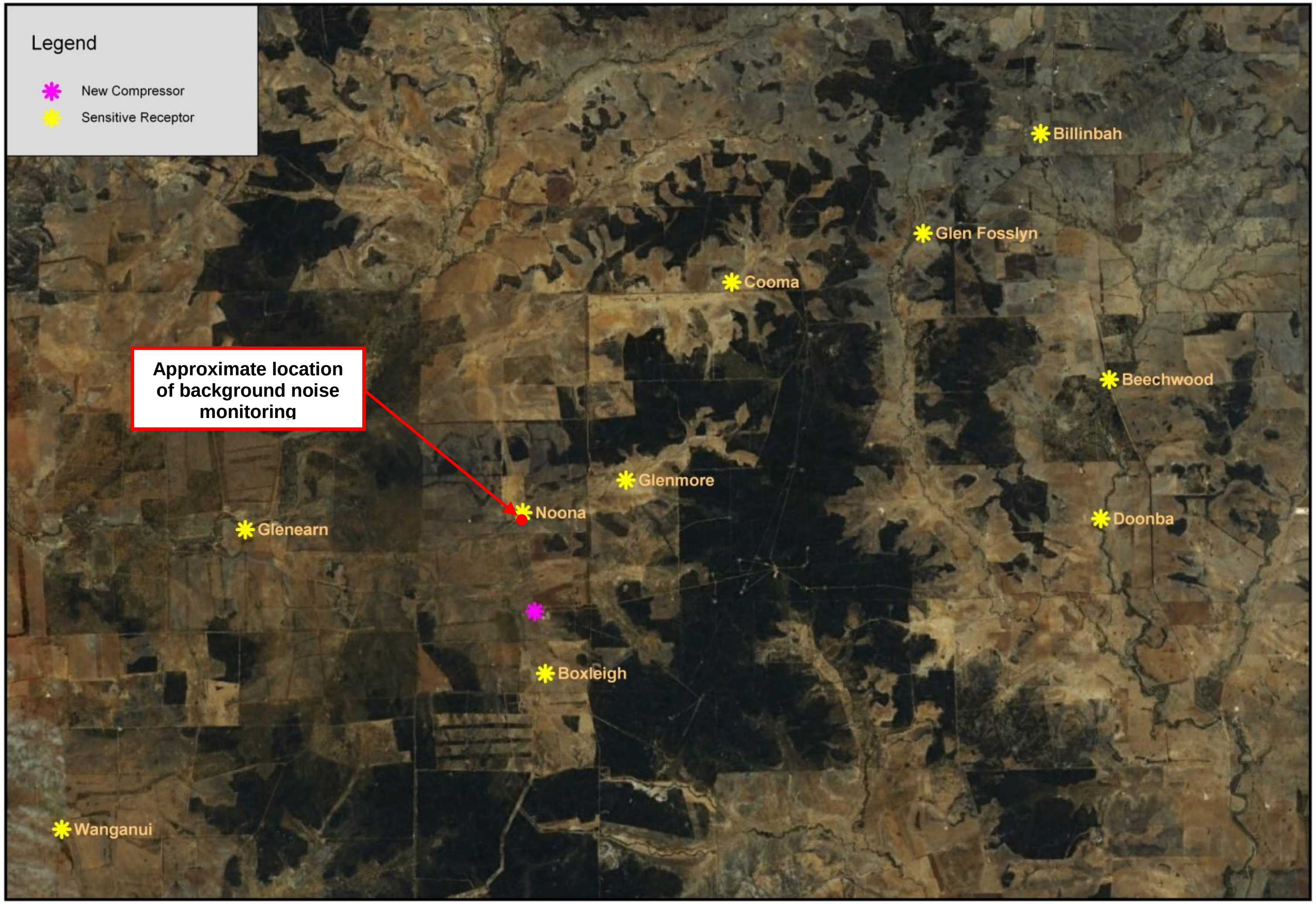
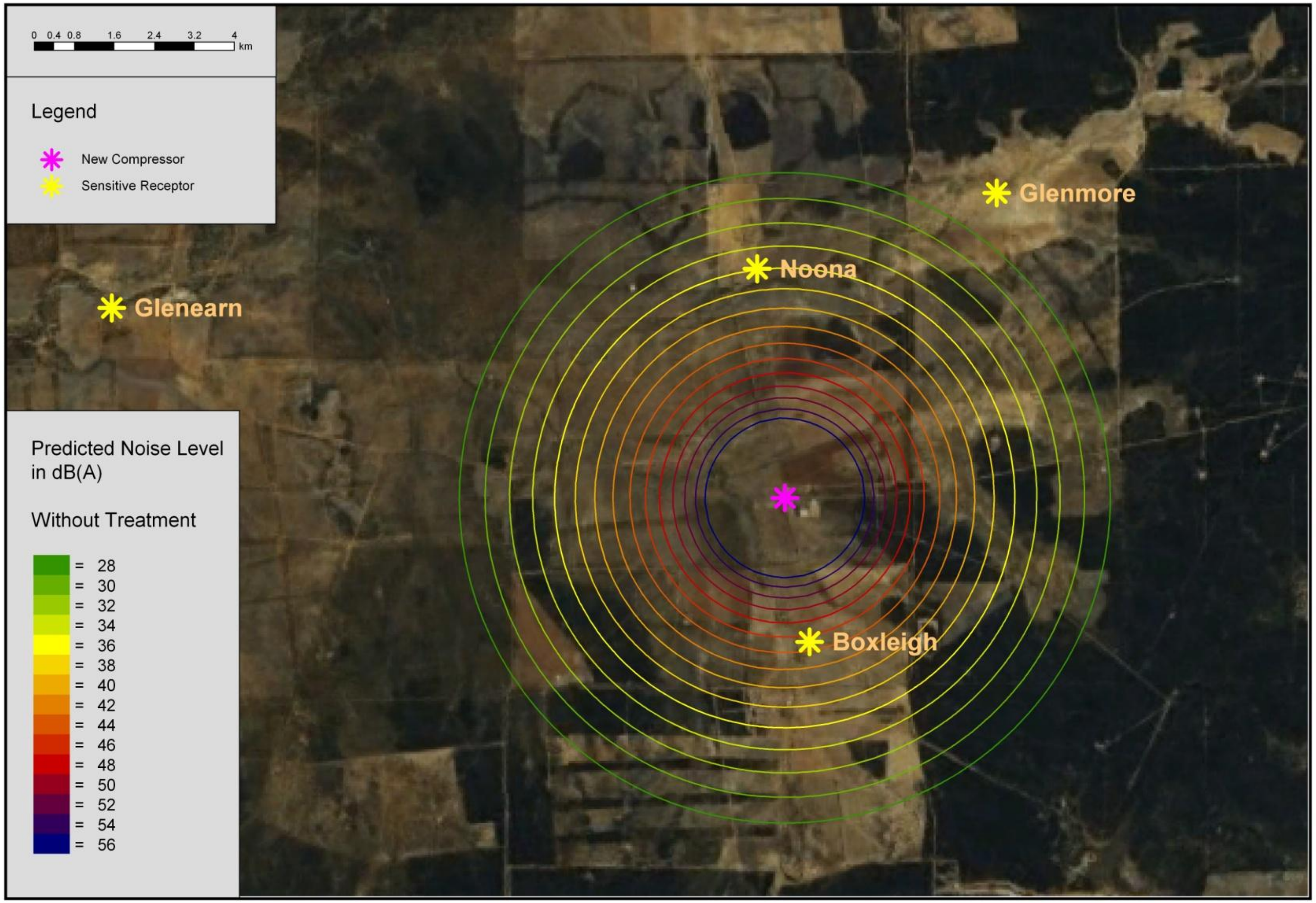


Figure A.1: Sensitive receptors in the vicinity of the facility and the approximate location of the background noise monitoring.

APPENDIX B: NOISE CONTOURS



Contour B.1: Predicted Noise Level under Worst-case Meteorological Conditions – Without Specific Acoustic Treatment

Contour B.2: Predicted Noise Level under Worst-case Meteorological Conditions – With Specific Acoustic Treatment