FINAL REPORT

Queensland Gas Company Limited (QGC)

Queensland Curtis LNG Project: LNG Facility and Associated Infrastructure

Noise & Vibration Impact Assessment - Supplemental Report

January 2010

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For and on behalf of Environmental Resources Management Australia	
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EXECUTIVE SUMMARY

BG International Group (BG) and Queensland Gas Company Limited (QGC) (the Proponents) propose to develop an integrated Liquefied Natural Gas (LNG) project in Queensland (the Project, Queensland Curtis LNG). The Project includes three components: gasfield, pipeline and LNG plant. This report provides supplemental information to the Noise & Vibration section of the QCLNG Project Environmental Impact Statement, with respect to the LNG plant component.

The changes from the EIS Report include the following:

- *The LNG plant has been moved 100-150m to the North-East, further from the coast of Curtis Island and with most of the plant slightly higher in elevation. Changes to predicted noise impacts as a result of this move have been assessed, and revised results from computer modelling are presented in tabular form and as noise contour maps in Annex C;*

- *The impacts of early construction works being undertaken on a 24-hour basis have been assessed;*

- *Haulage of materials (aggregate, construction materials, and removal of waste material) has been investigated in terms of potential traffic noise impacts on residences adjacent to the proposed haulage routes;*

- *Predicted noise impacts on a construction camp at the proposed Santos LNG project have been assessed; and*

- *Cumulative noise impacts have been revised with additional information, including predicted noise levels for the Santos LNG proposal (drawn from the Santos LNG EIS Report).*

Ambient noise monitoring was undertaken at four locations by ERM to allow assessment of traffic noise from haulage of materials.

Prediction of noise levels for the revised LNG plant location indicates that noise impacts at noise-sensitive receptors will be equivalent to or less than the impacts predicted in the EIS Report. As set out in the EIS Report, there are no significant impacts expected from operation of the LNG plant.

Exceedance of the EPA construction noise criteria may occur on occasions, however no significant noise impacts are expected during construction. Noise management practices should be implemented to minimise potential noise impacts from Curtis Island construction activities.

Haulage of bulk materials is not expected to cause any significant impacts during the day and evening periods. Due to low traffic numbers at night, the increased number of vehicle movements may cause some noise impacts. If practical, haulage past residential areas may be limited to the hours of 6am to 10pm.

QCLNG plant construction and operational noise is not expected to cause unacceptable noise impacts on the proposed Santos LNG construction camp, as the

predicted noise levels from QCLNG are expected to be less than typical noise levels in an industrial area. Suitable internal noise levels should be achieved, based on the construction camp being built to account for Santos LNG construction / operational noise.

The assessment of cumulative noise impacts was revised to include predictions from the Santos LNG EIS report. With this new data incorporated, the cumulative total noise impact without QCLNG continues to be significantly higher than the predicted noise level from QCLNG at most locations, hence QCLNG is not predicted to be a significant contributor to cumulative noise levels. Comparison with current L_{Aeq} noise levels indicates that the most significant change in noise environment will occur at Tide Island (NAL5) due to projects other than QCLNG.

1 INTRODUCTION

ERM has been commissioned to undertake a supplemental noise and vibration impact assessment by Queensland Gas Company Limited (QGC) for the proposed Liquefied Natural Gas (LNG) facility located on Curtis Island, Queensland Australia, and associated infrastructure, as part of the Queensland Curtis LNG Project (the Project). This report forms part of a Supplemental EIS for the proposed development.

This assessment will:

- Detail changes in the Project from the previous noise and vibration report (the EIS Report)[1], and provide revised predictions of noise & vibration impacts;
- Assess potential noise impacts from the QCLNG Project, where they have changed from those previously reported, and including potential impacts on the construction camp associated with the neighbouring Santos LNG Project (also known as the Gladstone LNG Project or GLNG Project);
- Provide an updated assessment of cumulative noise levels for proposed industrial projects in the locality, based on currently available materials;
- Outline noise & vibration impacts that may occur as a result of haulage of aggregate and other materials, and personnel movements;
- Propose in-principle management strategies to mitigate impacts where required.

1.1 PROJECT CHANGES

The changes to the proposed Liquefied Natural Gas (LNG) project from the EIS Report are detailed below.

1.1.1 Bridge To Mainland

The EIS Report considered the possibility of a bridge between the mainland and Curtis Island. This bridge is no longer considered as part of this assessment.

[1] Environmental Resources Management Australia, "Queensland Curtis LNG Project: LNG Facility and Associated Infrastructure - Noise & Vibration Impact Assessment", April 2009

1.1.2 LNG Facilities

The proposed LNG facility on Curtis Island has been moved[2] approximately 100-150 metres to the north-east, further away from the shoreline. This move, along with a redesigned bench plan, has resulted in portions of the plant being located at higher levels than those previously assessed.

The LNG process trains were previously located at a base height of RL11.0m AHD. The current proposal has these trains at a base height of RL13.75m AHD. The LNG plant will have the same capacity and the same noise sources as those previously modelled.

In the EIS Report, two operational scenarios were assessed. One, representing initial plant operations, had a single LNG process train operating, while the second, with three trains, represented full capacity production. Recent advice is that two LNG trains will be constructed and brought online together, thus the 1-train scenario has been removed from this report and replaced with the 2-train scenario when determining noise impacts from initial plant operations.

1.1.3 Plant Construction

Plant construction considered in the EIS Report was predominantly a day-time operation, with some activities (e.g. tank slipforming) occurring at night. The current construction schedule has vegetation clearing and bulk earthworks activities occurring on a 24-hour basis, during the early part of the construction program. Some additional periods of 24-hour per day works may be undertaken throughout the remainder of the construction schedule, where uninterruptable activities are being undertaken, or for schedule adjustment.

1.1.4 Haulage Routes

Bulk material haulage routes and traffic numbers for trucks and personnel associated with the project have been clarified, and further assessment of the impacts of these has been incorporated into this report.

1.1.5 Impact On Santos Construction Camp

In response to submissions made on the draft EIS, potential noise impacts on the construction camp for the neighbouring Santos LNG proposal have been included in this report.

[2] Information on revised plans and bench levels supplied by QGC

1.1.6 Cumulative Noise Impacts

The assessment of Cumulative Noise has been revised to include updated noise levels for the Santos LNG proposal. Noise impacts have been included for projects with published EIS reports, where information on predicted noise impacts was available.

2 METHODOLOGY

The following sections describe the methodology used for this Supplementary Noise and Vibration study.

2.1 DESCRIPTION OF EXISTING ENVIRONMENTAL VALUES

2.1.1 Ambient Monitoring

Additional monitoring was carried out to determine current noise levels at residential locations adjacent to proposed access routes within Gladstone, in order to address potential noise impacts associated with Project traffic in the Gladstone region.

A proposed material haulage route from the Bruce Highway at Calliope enters Gladstone via the Dawson Highway from the west, turning north on to Don Young Drive, continuing via Red Rover Road to Hanson Drive, then taking one of two routes: via Alf O'Rourke Drive to a barge terminal near the R G Tanna coal facility, or following Hanson Drive to Glenlyon Road, turning onto the Port Access Road to reach laydown areas / barge terminals at Auckland Point.

Personnel vehicle access to the Auckland Point industrial area may also occur via the Young Street railway overpass to the south.

Noise measurements were carried out at four residential locations adjacent to these transport routes. These locations were considered to be the potentially most affected by traffic associated with QCLNG construction and operations.

Measurements were made with unattended noise loggers, and additional attended measurements were also taken to confirm noise levels and allow further characterisation of the ambient noise environment.

2.1.2 Noise Criteria

Noise criteria were drawn from the legislation and guidelines as set out in the EIS Report. In addition, traffic noise criteria have been drawn from the Queensland Main Roads Code of Practice[3].

[3] Qld Department of Main Roads "Road Traffic Noise Management – Code of Practice", January 2008

2.2 DETERMINATION OF POTENTIAL IMPACTS

2.2.1 Noise Modelling

Noise modelling was carried out using the same methodology as set out in the EIS report.

In order to incorporate the changed LNG plant location, some minor editing of terrain data was required in the vicinity of the plant, as detailed below.

2.2.2 LNG Plant Noise Sources

The LNG Plant Noise Sources were unchanged in emission level and height above base elevation from the previous model. The locations of the sources were moved to their respective locations within the new plant layout, and noise source heights adjusted to suit the new benching levels.

2.2.3 Terrain Model

Bench locations and levels within the plant were based on drawings provided by QCLNG. All other aspects of the noise model remained the same as for the EIS report.

2.2.4 Meteorological Effects

Meteorological effects were modelled as per the conditions outlined in the EIS report, with one exception – *Table 2.1* in the EIS Report indicated that a Pasquill Stability Class of 'B' was used for modelling 'Typical' sea breeze conditions, whereas in fact a Pasquill Stability Class of 'C' (which is considered more conservative) was used both for that modelling and the present modelling. This has the effect of reducing dissipation of noise due to turbulent air conditions, and predicted noise levels for the 'Typical' case are higher (both in the EIS Report and in this Supplementary EIS Report) than if Pasquill Stability Class 'B' conditions were modelled.

2.2.5 Assessment of Noise Impacts

Predicted noise levels during operation of the LNG plant in the new proposed location have been compared with the noise criteria to assess potential impacts for the proposed QCLNG project.

The cumulative noise assessment has been modified to account for more recent information. The Santos LNG project has published an EIS report[4], and predicted noise levels have been drawn from the noise assessment attached to that report, and used in place of the estimates in the QCLNG EIS Report.

[4] URS "GLNG Project – Environmental Impact Statement", March 2009

3 EXISTING NOISE ENVIRONMENT

A key element in assessing environmental noise is to quantify the existing ambient and background noise environment. The following section describes the procedure undertaken.

3.1 ADDITIONAL NOISE ASSESSMENT LOCATIONS

A total of four (4) residential properties have been identified as potentially affected by traffic noise associated with the QCLNG proposal and as such have been designated as noise assessment locations (NAL 8 through NAL 11). The noise assessment locations are described in *Table 3.1* and are illustrated in *Figure S5.13.7*. These locations are all adjacent to proposed haulage or access routes for QCLNG activities near R G Tanna or at Auckland Point. For reference, noise assessment locations NAL1 through NAL7 have also been included in *Table 3.1*.

Table 3.1 Noise Assessment Locations

Noise Assessment Location	Address and Description
NAL1	Gladstone Marina
NAL2	Fisherman's Rd, Yarwun
NAL3	South End, Curtis Island
NAL4	Flinders Pde, Gladstone
NAL5	Tide Island
NAL6	Lord St, Gladstone
NAL7	Smith St, Targinie
NAL 8	148 Col Brown Ave corner of Don Young Drive
NAL 9	Apartments on corner of Glenlyon St and Port Access Rd
NAL 10	107 Auckland St adjacent Port Access Road as it crosses over Auckland St
NAL 11	43 Toolooa St opposite Young St bridge over railway – potential southern access route to Auckland Pt lay down area

3.2 AMBIENT NOISE MONITORING

Attended and unattended (noise logging) noise monitoring was undertaken at representative locations in the study area, as discussed below. Details of the monitoring equipment and data are provided in *Annex B*.

3.2.1 *Unattended Monitoring*

Four noise loggers were used to monitor background noise levels at the noise assessment locations. The loggers continuously recorded and logged noise

statistics every 15 minutes for the duration of logging. Noise loggers were placed on the afternoon of 9 November, 2009, and retrieved on 23 November 2009. The loggers collected overall A-weighted data, including L_{max}, L_{10}, L_{eq}, and L_{90} noise levels for each interval.

Weather data including wind speed, direction and rainfall for the sample period was collected from both Gladstone Airport and Gladstone Radar weather stations, which are run by the Bureau of Meteorology (BOM). Weather conditions were unfavourable during the first week, with wind speeds above 30km/h at times, hence noise loggers were left out for a second week.

3.2.2 Attended Monitoring

Day, evening and night time attended monitoring was conducted at each monitoring location to supplement the unattended noise monitoring surveys and to quantify the contribution from existing industry, road and other sources at the noise assessment locations.

The attended monitoring indicated that road traffic dominated the ambient noise environment at all locations during the day and evening, with night time noise levels being characterised by lower background noise levels punctuated by individual vehicle pass-by events. The L_{10} noise levels for each monitoring location is set by road traffic for the day and evening periods, while the night-time levels vary significantly, depending on the number of vehicles (if any) during any 15-minute monitoring interval.

From *Table B.1* to *Table B.3* in *Annex B*, it can be seen that noise levels from passing trucks varied from 72-79 dB(A), with other vehicle pass-by noise levels up to 84 dB(A).

3.2.3 Analysis and Summary of Results

Initial analysis of noise logger data indicated that, while the higher wind speeds during the first week of logging affected background (L_{90}) noise levels, L_{10} and L_{eq} noise levels from traffic did not appear to be sensitive to wind speed. This correlates with observations on site during attended monitoring, where wind tended to increase noise from vegetation (e.g. leaves in trees), although this was generally at a much lower level than individual vehicle pass-by noise levels. Consequently, the L_{90} (background) noise levels are slightly higher during the first week of monitoring, when higher wind speeds occurred.

Noise criteria for Noise Assessment Locations NAL1 to NAL7 are unchanged from those in the EIS Report.

4.1 CONSTRUCTION CAMP NOISE CRITERIA

There are no standard noise criteria for construction camps, as they are temporary in nature and while residential in use, they are built for the convenience of construction staff and hence proximity to construction works is usually seen as more important than noise impacts. Depending on construction and operational timing, it is possible that the Santos LNG construction camp may be occupied when the QCLNG facility is under construction or operating. Other construction camps may also be in existence over a period of industrial development on Curtis Island, however no details are available at present.

At that time the land use would be industrial. AS1055[5] provides average background noise levels for different areas containing residences in Australia, and is useful in providing estimated noise levels for future residential uses. For areas within predominantly industrial districts, AS1055 provides the following background noise levels: Day 65dB(A); Evening 60dB(A); Night 55dB(A). When industries construct the buildings for their industrial site, they should be designed to meet suitable internal levels (taking into account sleep disturbance and speech interference) for these types of external noise levels from their own industrial noise sources. Hence, if the noise from an adjacent industry meets these levels then the impact should be acceptable.

4.2 TRANSPORT ROUTE NOISE CRITERIA

For traffic noise generated by the proposed transport routes, the following criterion can be applied[6] for areas with increased traffic on existing roads:

- L_{10}(18hour) 68 dB(A); and
- An increase in L_{10}(18hour) of 3dB(A) or more.

In addition to the above criteria, where additional traffic will occur during the night (i.e. 10pm to 7am), then consideration should be given to the number of

[5] AS1055.2 - 1997 Acoustics – Description and measurement of environmental noise Part 2: Application to specific situations.

[6] Qld Department of Main Roads "Road Traffic Noise Management – Code of Practice", January 2008

vehicle movements, in comparison to existing traffic. In Queensland there are no specific criteria for night-time truck movements, however comparison with existing traffic noise levels can be used to assess the potential noise impacts.

5.1 OPERATION

5.1.1 Operational Noise Levels

As discussed in the methodology section above, the SoundPLAN model for operational noise was constructed using the same noise sources and source levels as the EIS Report. The sources were moved to the appropriate locations for the new plant layout, and noise levels predicted for the same noise assessment locations. The EIS Report assessed the 1-train and 3-train scenarios, however advice from QGC is that two process trains will be constructed simultaneously, thus the 1-train scenario has been replaced with a 2-train scenario.

Predicted noise levels from operational noise for the new LNG plant location are set out in *Table 5.1*, and the noise contour plots are presented in *Annex C*.

Table 5.1 Predicted Operational Noise Levels for revised LNG Plant Location - dB(A)

Receptor	Criteria	Operational Noise, 3-train			Operational Noise, 2-train		
Location	D / E / N	Neutral	Adverse	Typical	Neutral	Adverse	Typical
NAL1	48/47/40	24	32	21	22	30	19
NAL2	39/39/40	30	38	34	28	36	32
NAL3[4]	35/25/27	9	17	7	4	11	1
NAL4	43/39/39	23	31	20	22	30	19
NAL5	33/34/32	30	**37**	27	29	**36**	25
NAL6	45/35/38	23	31	20	22	30	19
NAL7	33/35/33	24	32	30	22	30	28

1. All levels are L_{Aeq} in dB(A)
2. Levels in bold exceed the lowest criterion for that location
3. Neutral is calm weather, Adverse is a moderate temp. inversion, Typical is ESE breeze
4. The 3-train levels are significantly higher than the 2-train levels at NAL3, as the third train experiences less attenuation from natural terrain than the first and second process trains.

Table 5.2 Change from Previous EIS Predictions – 3-Train Scenario dB(A)

Receptor Location	Operational Noise, 3-train		
	Neutral	Adverse	Typical
NAL1	-1	-1	-1
NAL2			
NAL3	-2	-1	-1
NAL4	-1	-1	-1
NAL5			
NAL6	-1	-1	-1
NAL7			

1. All levels are L_{Aeq} in dB(A)
2. Numbers represent the change in predicted noise level for each location
3. Blanks represent no change from the previous predictions
4. Neutral is calm weather, Adverse is a moderate temp. inversion, Typical is ESE breeze

It is clear from *Table 5.1* and *Table 5.2* that the revised LNG plant location results in slightly lower or unchanged predicted noise impacts at all receptors for the 3-train scenario (the 1-train and 2-train scenarios are not directly comparable as they have different noise sources). While the plant has increased in height, it has also moved to the east, and obtains slightly more shielding from terrain.

As noted in the EIS, the predicted operational noise levels are below the relevant criteria for all locations under neutral and typical weather conditions. Under adverse conditions, predicted operational noise levels are below the relevant criteria for all locations except NAL5 (Tide Island).

Predicted noise levels at Location NAL5, the residence at Tide Island, exceed the criteria under adverse conditions (temperature inversion and calm wind conditions) due to its proximity (5km) to the proposed LNG plant. While the predicted noise levels are 5 dB(A) above the criteria, inversions are likely to be infrequent in the Gladstone Harbour area, as they are less likely to form over water, and winds are calm for only 14% of the time, based on BoM windroses. As this is less than the 30% referred to in the EPA EcoAccess Guideline *Planning for Noise Control*, this exceedance is not expected to be significant.

In the future it is likely that noise from the proposed QCLNG plant will be masked by noise from other industry, including the proposed Wiggins Island coal terminal.

5.1.2 Low Frequency Noise

As noise levels are predicted to decrease slightly at all locations with the new LNG plant location, the previous assessment of low-frequency noise stands, i.e. none of the linear-weighted noise levels exceed the 55 dB(Linear) criterion, and no further assessment of low-frequency noise is required.

5.1.3 *IFC And BG Criteria*

Comparison of the levels in *Table 5.1* with IFC and BG criteria (as contained in the EIS noise report), confirms that the criteria are met for all time periods under all meteorological conditions.

5.2 *CONSTRUCTION*

Construction noise was previously assessed in the EIS Report with two scenarios, Plant Construction and Tank Slipforming, as it was understood that the Tank Slipforming would occur on a 24-hour basis while plant construction generally would not.

It is presently understood that some plant construction (early site preparation works and some other activities, such as the tank slip-forming discussed in the EIS Report) may occur on a 24-hour basis, and thus the previously assessed plant construction scenario represents highest noise levels for all time periods.

The revised LNG Plant layout does not significantly affect the assessment of construction noise – this was previously assessed with equipment located on top of the natural terrain levels, i.e. prior to excavation of material to form bench platforms. This results in noise sources being higher relative to nearby terrain that might provide shielding of noise, and represents a highest noise level scenario. Construction work on the completed bench levels will receive additional screening from terrain, and produce lower noise levels.

5.2.1 *Plant Construction*

The construction noise assessment in the EIS Report assessed the highest potential noise impacts from construction activity. This was determined to be during the early stages of construction, when bulk earthworks was underway, due to the large numbers of heavy machinery in operation on the site. The conservative assessment was to model this machinery on the natural terrain surface, without any potential shielding from terrain as equipment cut down to the bench levels. The change in location of the LNG plant does not affect this scenario, thus the previous assessment of construction noise levels remains valid.

It is understood that this phase of plant construction (vegetation clearing and bulk earthworks) may occur on a 24-hour basis. As stated in the EIS Report, construction at night would exceed the criteria at NAL5 (Tide Island) by 2dB(A) under neutral weather conditions. Under adverse conditions (a temperature inversion), the following exceedances are predicted: 3dB(A) at NAL2 (Fishermans Road), 11dB(A) at NAL5 (Tide Island), and 1dB(A) at NAL7 (Targinie).

Given the expected infrequent occurrence of inversion conditions in Gladstone Harbour, it could be expected that neutral conditions would represent the 'highest noise level' scenario during construction. With typical conditions (i.e. an ESE sea breeze) noise levels at sensitive receptors would meet the construction noise criteria.

5.3 *HAULAGE ROUTES*

During construction, large quantities of rock and aggregate material will be supplied to the construction site. It is currently proposed to haul this material via truck. Some will be used to construct a barge/ferry terminal near RG Tanna, some to construct landing facilities at Auckland Point, and the remainder would be shipped via barge to Curtis Island.

The proposed material haulage route from the Bruce Highway at Calliope enters Gladstone via the Dawson Highway from the west, turning north on to Don Young Drive, continuing via Red Rover Road to Hanson Drive, then taking one of two routes: via Alf O'Rourke Drive to a barge terminal near the RG Tanna coal facility, or following Hanson Drive to Glenlyon Road, turning onto the Port Access Road to reach laydown areas / barge terminals at Auckland Point.

Existing traffic on Don Young Drive is 2438 vehicles per day, and 1,750 vehicles per day on the Port Access Road[7]. Traffic numbers for the QCLNG project indicate peak truck movements of approximately 240 truck movements per day. This would not result in any significant increase in traffic noise during the day and evening, when considerable numbers of vehicles (including large numbers of heavy vehicles) already use these roads.

Based upon the change in traffic numbers, the road traffic noise levels at NAL8 (near Don Young Drive) would increase by 1.5dB(A), to approximately 61.5 dB(A). This remains well below the criteria[8] for increases in traffic on an existing road. At NAL9 (the western end of the Port Access Road), an increase of 240 vehicle movements per day would increase traffic noise levels by less than 1 dB(A) to 68-69dB(A), due to the already high numbers of vehicles on Glenlyon St and the Port Access Rd. NAL10 would experience a similar increase of about 1dB(A), to 72 dB(A). The actual increase in noise level will be less than that noted, as a percentage of the 240 truck movements will travel to RG Tanna. While these levels are greater than the L_{10}(18hour) 68 dB(A) criterion, they are less than a 3dB(A) increase considered to be significant as discussed in S*ection 4.2*.

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[7] Data provided by Halcrow MWT via email

[8] Qld Department of Main Roads "Road Traffic Noise Management – Code of Practice", January 2008

At night, traffic numbers indicate a peak night-time traffic load due to the Project of 6 truck movements per hour for Don Young Drive, and 12 truck movements per hour for the Port Access Road. At this low rate, individual vehicle pass-by events are separated by several minutes or more, and the noise levels experienced at residences are dependent upon individual vehicle noise emissions rather than the number of vehicles. Pass-by noise from proposed truck movements would be at a similar level to that from existing traffic. The number of such events occurring during the night would increase with the QCLNG traffic, although the noise level of a typical pass-by event would not.

In order to minimise the impact of traffic, haulage may be limited to day/evening hours (e.g. 6am to 10pm) if practical. This would result in minimal change to the existing noise environments at the assessment locations, and avoid increasing the number of noise events during the night period.

Personnel transport was assessed in the EIS Report based on an assumption of up to 2,000 vehicle movements per day entering and leaving the Auckland Point area. Current projections have reduced this number to approximately 1,050 vehicles per day accessing the Auckland Point area, with some travelling via the Port Access Road, and some departing via Young St to the south. This number is expected to result in a negligible traffic noise level increase of 0.9dB(A) or less in the daily L_{10}(18hour) noise levels.

5.4 IMPACTS ON CONSTRUCTION CAMP

The Santos construction camp, as indicated in the Santos LNG EIS report[9] (refer figure in *Annex D*), will be located to the south-east of the proposed Santos LNG plant. The proposed location is favourable from a noise perspective, with the camp located around RL20-24m, and a ridgeline varying from RL32m to RL56m immediately to the north-west, between the construction camp and the QCLNG site. Noise modelling predicts that noise levels of 40-45dB(A) would be experienced at the Santos construction camp site during construction and operation of the QCLNG facility. These levels are below the background noise levels of 55 dB(A) expected for an industrial area at night. When industries construct the buildings for their industrial site, they should be designed to meet suitable internal levels (taking into account sleep disturbance and speech interference) for these types of external noise levels from their own industrial noise sources, and hence no significant impacts are expected.

[9] URS "GLNG Project – Environmental Impact Statement", March 2009

5.5 CUMULATIVE NOISE IMPACTS

Since the preparation of the QCLNG EIS Report, the Santos LNG project (also known as Gladstone LNG or GLNG, and separate from Gladstone LNG Ltd's proposal for an LNG plant at Fisherman's Landing, which is listed as Gladstone LNG below) has published an EIS. Predicted noise impacts from the Noise & Vibration report[10] attached to the Santos LNG EIS have been used for assessment of cumulative noise impacts in lieu of estimates used previously.

Table 5.3 lists the predicted noise levels from the QCLNG proposal and other projects with published EIS reports under neutral meteorological conditions, updated with predicted impacts from the Santos EIS report. These levels are shown graphically in *Figure 5.1*. *Table 5.3* also includes current minimum daily L_{Aeq} noise levels for comparison purposes.

Table 5.3 Noise Levels from Proposed Projects Around Gladstone Harbour

Location	NAL1	NAL2	NAL3	NAL4	NAL5	NAL6	NAL7
QCLNG	24	30	9	23	30	23	24
Santos LNG	31	33	22		39	28	
Gladstone LNG[6]		35			25		22
Wiggins Is	36				54	32	
Gladstone Nickel		41				19	
Total (no QCLNG)	37	42	22		54	34	22
Total (with QCLNG)	37	43	22	23	54	34	26
Current LAeq	50	41	38	48	41	45	41

1. All levels are L_{Aeq} in dB(A)
2. Levels are for neutral weather conditions.
3. Plant levels for QCLNG & Santos are for 3 train operation.
4. Total levels are logarithmic sums of the individual levels, with and without QCLNG levels
5. Typical minimum daily L_{Aeq} levels at the locations.
6. Gladstone LNG Ptd Ltd proposal for Fisherman's Landing

Examination of the noise levels in *Table 5.3* reveals that the predicted noise impact from QCLNG is exceeded by that from other major industrial projects at all locations except NAL4 (Flinders Pde), where no other predictions were available, and NAL7 (Smith St, Targinie), where it will be 2dB higher than predicted impacts from the proposed Gladstone LNG plant. The Targinie area is State Development land (refer *Figure 1.2*) which will be developed for industrial purposes in the foreseeable future. Furthermore, the total level at both NAL4 and NAL7 is well below the current minimum daily L_{Aeq} noise level.

[10] Heggies Report 20-2014-R1 Revision 4, "Santos Gladstone LNG - Environmental Impact Statement – Noise and Vibration (Terrestrial)", dated 22 May 2009

The cumulative total with and without QCLNG varies by 0 – 1dB(A) for all locations except NAL4 and NAL7, indicating that QCLNG does not make a significant contribution to the cumulative noise levels at most locations. At all locations other than NAL 4 and NAL7, the cumulative total without QCLNG is significantly higher than the predicted noise level from QCLNG.

Comparison of the total noise levels with the current minimum daily L_{Aeq} noise levels indicates that the most significant change will occur at NAL5 (Tide Island) due to projects other than QCLNG. Total noise levels at NAL2 (Lot 2 Fisherman's Road, Yarwun) also slightly exceed the current minimum daily L_{Aeq} noise level due to projects other than QCLNG, however it is understood that this location is on industrial land.

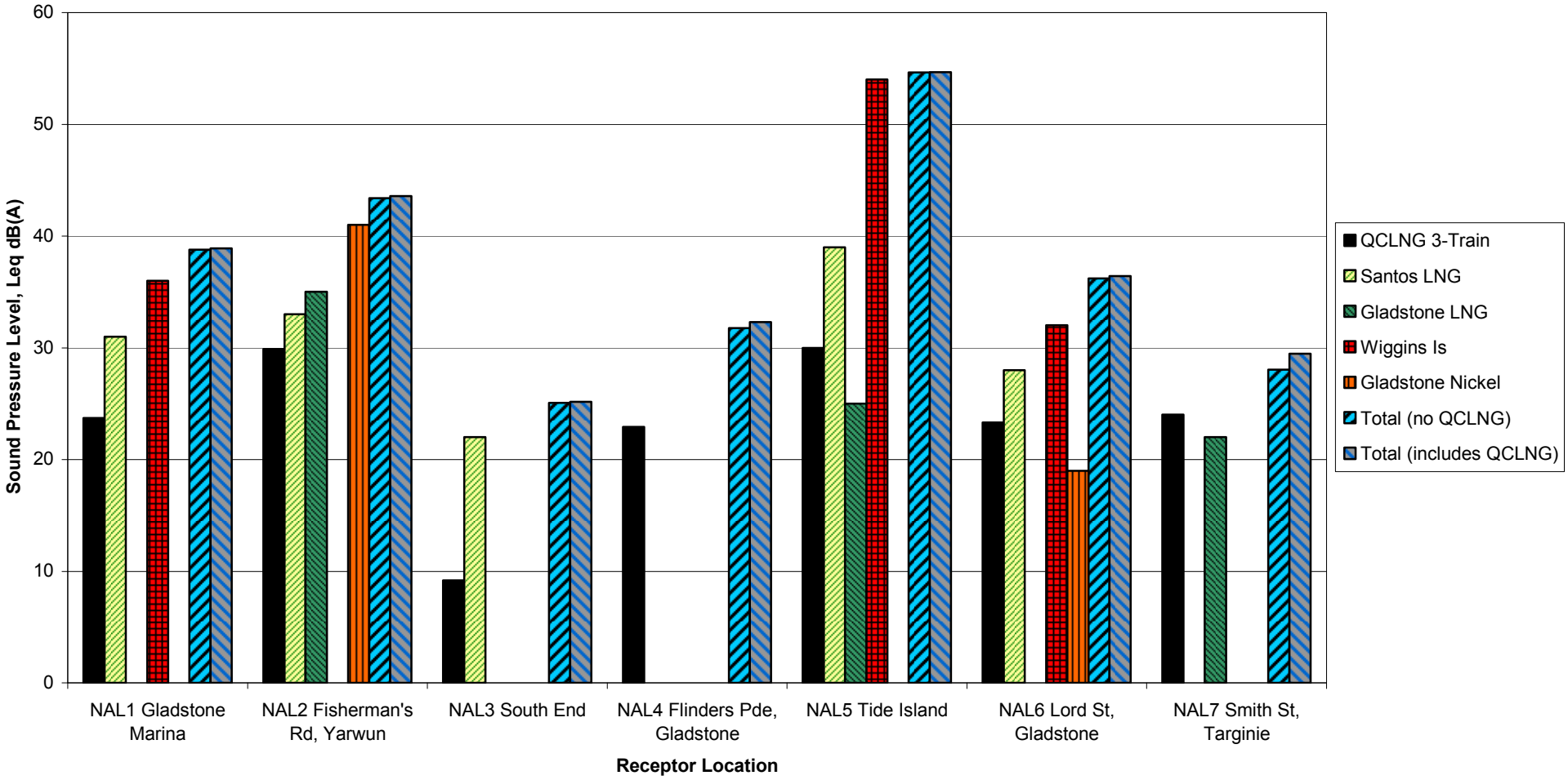


Figure 5.1 Cumulative Noise Levels for Proposed Industrial Projects in Gladstone Area

Operational Noise

No additional mitigation measures are recommended beyond those outlined in the EIS Report.

Construction

In general, predicted impacts from construction are unchanged from the EIS Report, however some additional noise impacts at night may be experienced during early site preparation works. No additional mitigation measures are recommended beyond those outlined in the EIS Report.

Haulage Routes

Projected traffic numbers should not significantly increase $L_{10(18hour)}$ noise levels on the proposed haulage routes, however 24-hour haulage may result in a noticeable increase in trucks passing residential areas at night. Where possible, haulage should be constrained to the hours of 6am to 10pm, when existing traffic will mask the effect of the QCLNG traffic.

In addition, personnel using Don Young Drive and the Port Access Road at night should be educated to drive quietly (e.g. avoid use of air brakes in residential areas, avoid rapid acceleration) and keep vehicles well maintained. All equipment (including trucks) should be kept in good repair including mufflers and equipment covers.

Construction Camps

Construction camp buildings, both on the QCLNG site and other adjacent sites, should be constructed to achieve suitable internal noise levels, given the industrial noise levels that would be experienced at these locations.

7 CONCLUSIONS

Operations

The predicted noise levels at all noise-sensitive receptors are unchanged from or slightly lower than those outlined in the EIS Report. The assessment is unchanged from that previously reported – no significant noise impact during operation is expected.

- Predicted operational noise levels are below the relevant EPA criteria for all locations under neutral and typical weather conditions;

- Under adverse conditions (temperature inversion and calm winds), predicted operational noise levels are below the relevant criteria for all locations except NAL5 (Tide Island), the closest receptor to the QCLNG site (5km distant). The exceedance of 5dB(A) under adverse conditions is expected to occur only occasionally as temperature inversions are expected to be infrequent as they are less likely to form over water, and winds are calm for only 14% of the time. As this is less than the 30% referred to in the EPA EcoAccess Guideline Planning for Noise Control, this exceedance is not expected to be significant.

Construction

Construction of the proposed LNG plant should be inaudible at sensitive receptors (excluding potential construction camps within the GSDA on Curtis Island) under most conditions during the day and under all conditions during tank slipforming works (24 hour work using a reduced amount of construction equipment). Plant construction activity noise meets the construction criteria for 6am – 6pm. Early construction work (vegetation clearing and bulk earthworks) conducted at night would result in an exceedance of 2dB(A) above the night time construction noise criteria at NAL5 (Tide Island) under neutral wind conditions. Under adverse weather conditions (i.e. temperature inversion) full plant construction at night may exceed the construction criteria by 3dB(A) at NAL2 (Fishermans Road), 11dB(A) at NAL5 (Tide Island), and 1dB(A) at NAL7 (Targinie).

The exceedance at NAL5 (Tide Island) indicates that the construction noise would be clearly audible under these unusual conditions. However these levels would only occur for a small percentage of the year on occasions with full plant construction occurring, on a calm night, and with a temperature inversion. Based on the above, plant construction is not expected to cause a significant noise impact.

Haulage Routes

Haulage of bulk materials is not expected to cause any significant impacts during the day and evening periods. Due to low traffic numbers at night, the increased number of vehicle movements may cause some noise impacts. If practical, haulage past residential areas may be limited to the hours of 6am to 10pm.

Impact On Santos LNG Construction Camp

QCLNG plant construction and operational noise is not expected to cause unacceptable noise impacts on the proposed Santos LNG construction camp, as the predicted noise levels from QCLNG are expected to be less than typical noise levels in an industrial area. Suitable internal noise levels should be achieved, based on the construction camp being built to account for Santos LNG construction / operational noise.

Cumulative Noise Impacts

Comparison of QCLNG with other proposed industrial projects in the Gladstone area indicates that the predicted noise impact from QCLNG is exceeded by that from other major industrial projects at all locations other than NAL4 (where no other predictions were available) and NAL7. The cumulative total without QCLNG is significantly higher at most locations than the predicted noise level from QCLNG. QCLNG is not considered to be a significant contributor to cumulative noise levels at locations other than NAL4 and NAL7.

REFERENCES

Australian Standard, "AS1055 – Acoustics – Description and Measurement of Environmental Noise"

Department of Environment and Conservation (now Environmental Protection Agency, Queensland) "E1 environmental guideline - Noise from Construction, Renovation, Maintenance and Demolition sites", 2 May 1989

Qld Department of Main Roads "Road Traffic Noise Management – Code of Practice", January 2008

Department of Transport, Welsh Office, "Calculation of Road Traffic Noise", HMSO, 1988

Environmental Protection Agency, Queensland "EcoAccess Guideline - Planning for Noise Control", 20 July 2004

Environmental Resources Management Australia, "Queensland Curtis LNG Project: LNG Facility and Associated Infrastructure - Noise & Vibration Impact Assessment", April 2009

Heggies Report 20-2014-R1 Revision 4, "Santos Gladstone LNG - Environmental Impact Statement – Noise and Vibration (Terrestrial)", dated 22 May 2009

URS "GLNG Project – Environmental Impact Statement", March 2009

Annex A

Acoustic Terminology

Table A.1 provides a glossary of noise related terms used in this assessment.

Table A.1 Glossary of Terms

Term	Description
ABL	The single-figure background level representing each assessment period – day, evening and night. It is determined based on the lowest tenth percentile of the L_{90}.
dB(A)	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
L_{A1}	The noise level exceeded for 1% of a measurement period, 'A' weighted.
L_{A10}	The noise level exceeded for 10% of a measurement period, 'A' weighted. It is approximately equivalent to the average of maximum noise levels.
L_{A90}	Commonly referred to as the background noise, this is the level exceeded 90% of the time, 'A' weighted.
L_{Aeq}	It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period, 'A' weighted.
L_{max}	The maximum root mean squared (RMS) sound pressure level received at the microphone during a measuring period.
$maxL_{pA}$	The maximum 'A' weighted sound pressure level measured on 'Fast' response time.
PPV	The Peak Particle Velocity (PPV) means the maximum rate of ground movement measured by any of the 3 mutually perpendicular components of ground motion.
RBL/$minL_{90}$	The Rating Background Level (RBL) or $minL_{90}$ is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the specific noise level for noise assessment purposes and is the median of the ABLs.
Sound Power Level - L_W	The sound power level is a measure of the total acoustic energy radiated by a source. Sound power is neither room dependent nor distance dependent. Sound power belongs strictly to the sound source.
Pasquill Stability Class	A method of categorising the amount of atmospheric turbulence present, ranging from A (very unstable) to F (very stable). Sound is scattered by turbulence. Class F implies a moderate temperature inversion, and only occurs during calm and clear conditions at night.
Temperature Inversion	A reversal (or inversion) of the normal temperature lapse rate in the atmosphere, usually occurring under calm, cold, and clear conditions over land, most frequently at night in winter. Temperature inversions cause sound waves to be curved downward toward the ground, reducing the normal spreading loss by concentrating sound waves that would otherwise scatter in the atmosphere.
Drainage Flow	A movement of cold air downhill, due to density differences. Drainage flow only occurs in the absence of other wind, and does not occur on flat terrain.

Annex B

Noise Monitoring Data

B.1 MONITORING EQUIPMENT

Measurements were performed with the following calibrated instrumentation:

- 3 x ARL EL-215 noise loggers for unattended monitoring – Serial Nos. 194683, 194685, 194437;
- 1 x ARL EL-315 noise logger for unattended monitoring – Serial No. 15-004-011
- 1x Rion NA-27 Precision Sound Analyser for attended monitoring – Serial No. 1191143; and
- 1x Brüel & Kjær Type 4230 Sound Level Calibrator – Serial No. 2205468.

The Brüel & Kjær sound level calibrator was used to calibrate all sound monitoring equipment prior to measurement and again checked at the conclusion, with the variation in calibrated levels not exceeding ±0.5 dB(A).

All monitoring practices and equipment were guided by Australian Standard AS1055-1997 "*Description and Measurement of Environmental Noise*", and the EPA "*Noise Measurement Manual*".

B.2 ATTENDED NOISE MONITORING RESULTS

Day, evening and night time attended monitoring was conducted to supplement the unattended noise monitoring surveys and to quantify the contribution from existing industry, road and other sources at the noise assessment locations. The results are summarised in *Table B1, Table B2* and *Table B3*.

Table B.1 Daytime Attended Monitoring Results (7:00am – 6:00pm)

Monitoring Location	Date	Start Time[1]	Measured Sound Pressure Level dB(A)				Comments
			L_{max}	L_{10}	L_{eq}	L_{90}	
NAL8	10/11/09	10:18 AM	85.9	62.3	61.5	43.9	Traffic dominant; cars to 76dB(A), trucks to 79dB(A), motorbike 85dB(A), birds to 52dB(A); moderate SE breeze 3-5 m/s
NAL9	09/11/09	3:58 PM	78.6	69.3	66.1	58.2	Traffic noise dominated; cars to 76dB(A), trucks to 78dB(A), reverse beeper from earthworks across railway 60dB(A); SE wind light-moderate 3-5m/s.
NAL10	09/11/09	5:22 PM	73.2	63.3	59.3	47.8	Traffic dominant (Auckland St); Cars to 68dB(A), trucks to 72dB(A), birds to 50dB(A), diesel train 68dB(A); light – moderate SE breeze 2-5m/s
NAL11	09/11/09	4:35 PM	93.4	69.7	67.4	56.3	Traffic noise dominant; cars to 84dB(A), trucks to 76dB(A), birds to 55dB(A); Moderate SE wind 2-5m/s
Notes:	1. All measurements are 15 minutes in duration unless otherwise noted.						

Table B.2 Evening Attended Monitoring Results (6:00pm -10:00pm)

Monitoring Location	Date	Start Time[1]	Measured Sound Pressure Level dB(A)				Comments
			L_{max}	L_{10}	L_{eq}	L_{90}	
NAL8	09/11/09	6:09 PM	83.3	64.0	60.2	43.4	Traffic noise dominant; cars to 72dB(A), trucks to 74dB(A), birds to 55dB(A), gecko 45dB(A); light SE breeze 2-4m/s
NAL9	09/11/09	7:34 PM	83.1	64.4	60.6	46.1	Traffic on Glenlyon St dominant; Cars to 83dB(A), trucks to 73dB(A), motorbike to 70dB(A); light SE breeze 2-4m/s
NAL10	09/11/09	7:54 PM	74.4	60.5	58.3	43.7	Cars on Auckland St to 74dB(A), trucks to 60dB(A), trains shunting to 56dB(A); light SE breeze 3-5m/s
NAL11	09/11/09	8:15PM	71.0	60.0	55.8	41.3	b/g set by TV in nearby house, cars to 70dB(A), diesel loco 50dB(A); light SE breeze
Notes:	1. All measurements are 15 minutes in duration unless otherwise noted.						

Table B.3 Night-time Attended Monitoring Results (10:00pm – 7:00am)

Monitoring Location	Date	Start Time[1]	Measured Sound Pressure Level dB(A)				Comments
			L_{max}	L_{10}	L_{eq}	L_{90}	
NAL8	09/11/09	10:12 PM	73.9	44.5	49.2	31.5	b/g set by wind in trees, distant traffic to 49dB(A), insects to 34dB(A), cars to 73dB(A) (3 vehicles passed); light breeze 2-3m/s
NAL9	09/11/09	10:43 PM	69.3	54.3	51.5	39.1	b/g set by wind in trees; cars to 70dB(A), bus 69dB(A), truck 67dB(A), crossing signals to 45dB(A); moderate breeze 3-5m/s
NAL10	09/11/09	11:02 PM	74.9	44.4	50.9	39.0	b/g set by plant to west, few vehicle passbys; cars to 74dB(A), shunting 43dB(A); moderate breeze 3-5m/s
NAL11	09/11/09	11:23 PM	71.3	50.3	50.9	38.8	b/g set by industry to east, little traffic; cars to 70dB(A), insects, geckos, aircon; light SE breeze 2-5m/s
Notes:	1. All measurements are 15 minutes in duration unless otherwise noted						

B.3 NOISE LOGGING RESULTS – UNATTENDED NOISE MONITORING

The following information details the results of the noise logging undertaken by ERM. Note that a nominal wind speed cutoff of 15m/s (as measured 10m above ground level at the Gladstone or Gladstone Airport monitoring stations) was used to generate ABL levels, as the emphasis for monitoring was on traffic noise levels.

Table B.4 Noise Logger NAL8: Results Table, dB(A)

Date	ABL Day	ABL Evening	ABL Night	L10(18hour)
Monday, 09-11-09	-	36	28	-
Tuesday, 10-11-09	40	32	27	61
Wednesday, 11-11-09	43	34	28	62
Thursday, 12-11-09	39	32	29	61
Friday, 13-11-09	33	34	28	61
Saturday, 14-11-09	33	32	28	59
Sunday, 15-11-09	31	32	31	56
Monday, 16-11-09	35	35	30	60
Tuesday, 17-11-09	37	33	31	60
Wednesday, 18-11-09	36	36	31	60
Thursday, 19-11-09	37	34	31	60
Friday, 20-11-09	34	32	31	60
Saturday, 21-11-09	36	31	30	57
Summary Values	**36**	**33**	**30**	
1. (-) indicates periods with too few valid samples due to weather or logger operation				

Table B.5 Noise Logger NAL9: Results Table, dB(A)

Date	ABL Day	ABL Evening	ABL Night	L10(18hr)
Monday, 09-11-09	-	42	39	-
Tuesday, 10-11-09	57	45	39	68
Wednesday, 11-11-09	57	45	37	68
Thursday, 12-11-09	56	45	36	68
Friday, 13-11-09	55	45	39	67
Saturday, 14-11-09	47	41	37	65
Sunday, 15-11-09	41	36	35	62
Monday, 16-11-09	55	40	37	67
Tuesday, 17-11-09	56	42	0	68
Summary Values	**56**	**42**	**37**	n/a

1. (-) indicates periods with too few valid samples due to weather or logger operation

Table B.6 Noise Logger NAL10: Results Table, dB(A)

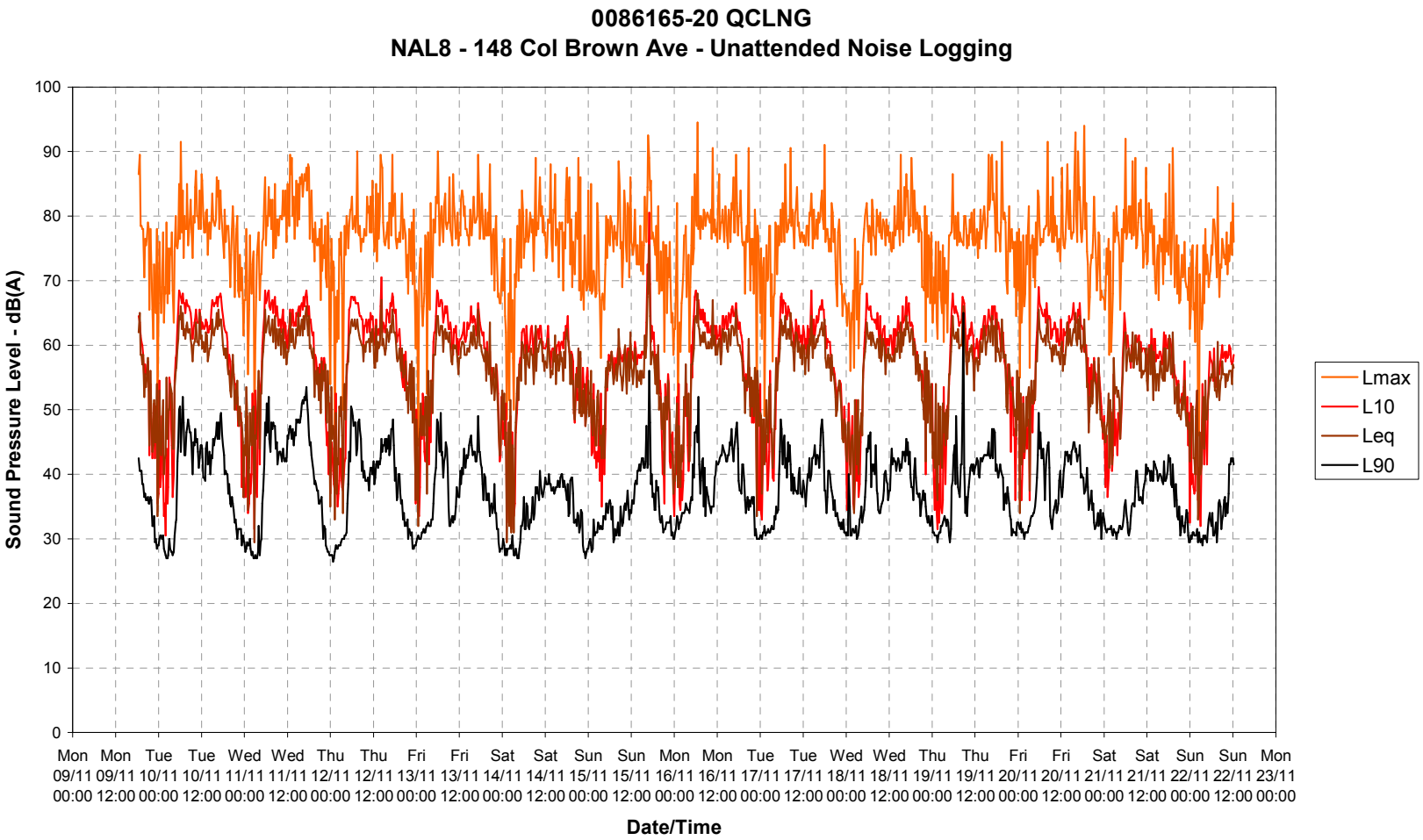
Date	ABL Day	ABL Evening	ABL Night	L10(18hr)
Monday, 09-11-09	-	54	53	-
Tuesday, 10-11-09	59	53	52	72
Wednesday, 11-11-09	59	53	51	72
Thursday, 12-11-09	59	50	49	70
Friday, 13-11-09	57	50	51	69
Saturday, 14-11-09	54	50	51	67
Sunday, 15-11-09	51	54	54	66
Monday, 16-11-09	57	52	53	69
Tuesday, 17-11-09	57	53	52	69
Wednesday, 18-11-09	57	52	51	69
Thursday, 19-11-09	57	51	0	70
Friday, 20-11-09	56	52	49	69
Summary Values	**57**	**52**	**51**	n/a

1. (-) indicates periods with too few valid samples due to weather or logger operation

Table B.7 Noise Logger NAL11: Results Table, dB(A)

Date	ABL Day	ABL Evening	ABL Night	L10(18hour)
Monday, 09-11-09	-	41	41	-
Tuesday, 10-11-09	53	45	39	66
Wednesday, 11-11-09	53	43	40	67
Thursday, 12-11-09	53	41	39	67
Friday, 13-11-09	53	37	36	67
Saturday, 14-11-09	46	39	38	65
Sunday, 15-11-09	39	42	38	63
Monday, 16-11-09	51	43	40	66
Tuesday, 17-11-09	55	38	39	67
Wednesday, 18-11-09	55	47	46	67
Thursday, 19-11-09	54	40	37	67
Friday, 20-11-09	52	44	38	67
Saturday, 21-11-09	48	42	35	65
Sunday, 22-11-09	45	39	38	63
Summary Values	**53**	**41**	**38**	n/a

1. (-) indicates periods with too few valid samples due to weather or logger operation


0086165-20 QCLNG
NAL8 - 148 Col Brown Ave - Unattended Noise Logging
Sound Pressure Level - dB(A)
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90
80
70
60
50
40
30
20
10
0
Mon 09/11 00:00
Mon 09/11 12:00
Tue 10/11 00:00
Tue 10/11 12:00
Wed 11/11 00:00
Wed 11/11 12:00
Thu 12/11 00:00
Thu 12/11 12:00
Fri 13/11 00:00
Fri 13/11 12:00
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Sun 15/11 00:00
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Mon 16/11 00:00
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Tue 17/11 12:00
Wed 18/11 00:00
Wed 18/11 12:00
Thu 19/11 00:00
Thu 19/11 12:00
Fri 20/11 00:00
Fri 20/11 12:00
Sat 21/11 00:00
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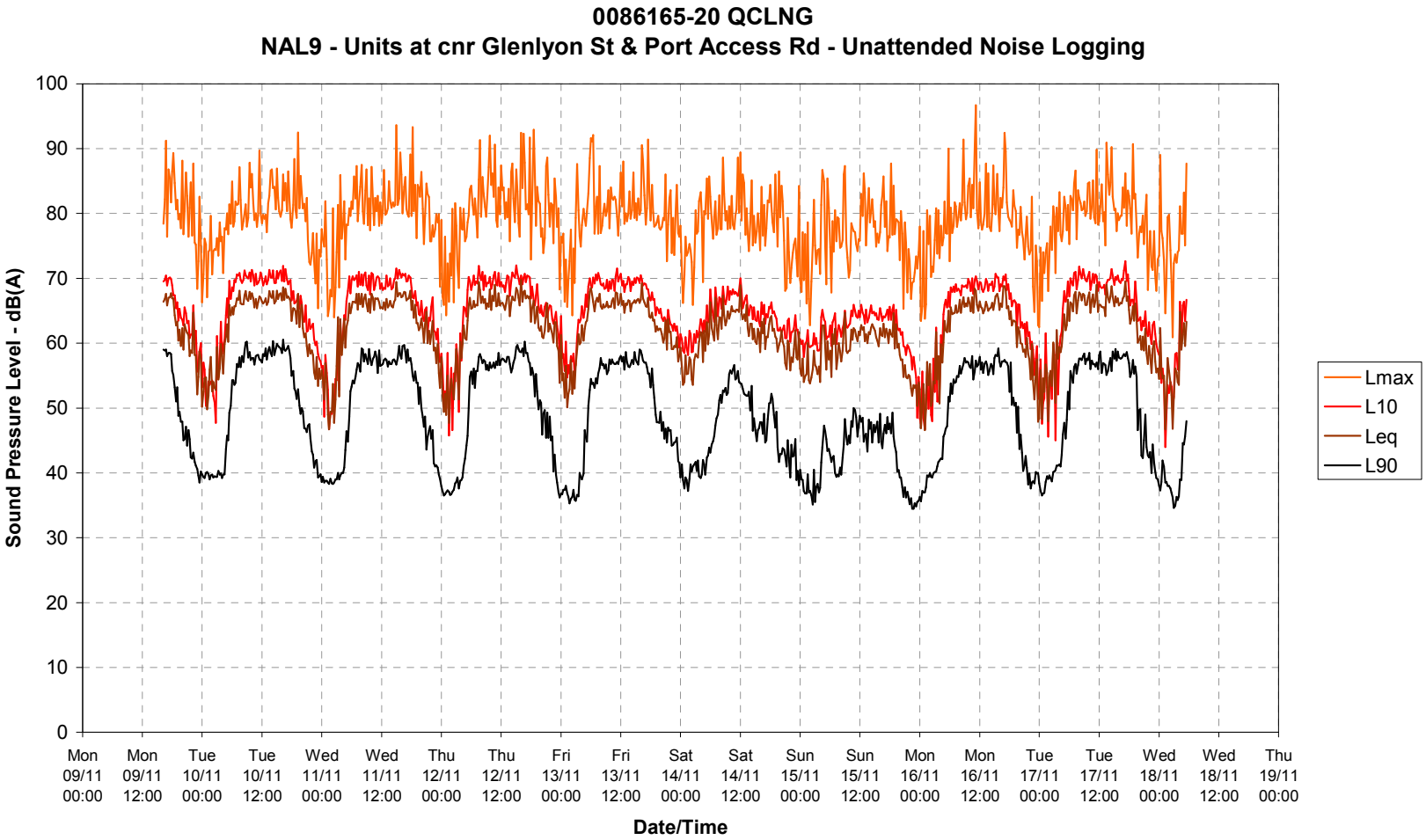
Mon 23/11 00:00
Date/Time
Lmax
L10
Leq
L90


0086165-20 QCLNG
NAL9 - Units at cnr Glenlyon St & Port Access Rd - Unattended Noise Logging
Sound Pressure Level - dB(A)
100
90
80
70
60
50
40
30
20
10
0
Mon 09/11 00:00
Mon 09/11 12:00
Tue 10/11 00:00
Tue 10/11 12:00
Wed 11/11 00:00
Wed 11/11 12:00
Thu 12/11 00:00
Thu 12/11 12:00
Fri 13/11 00:00
Fri 13/11 12:00
Sat 14/11 00:00
Sat 14/11 12:00
Sun 15/11 00:00
Sun 15/11 12:00
Mon 16/11 00:00
Mon 16/11 12:00
Tue 17/11 00:00
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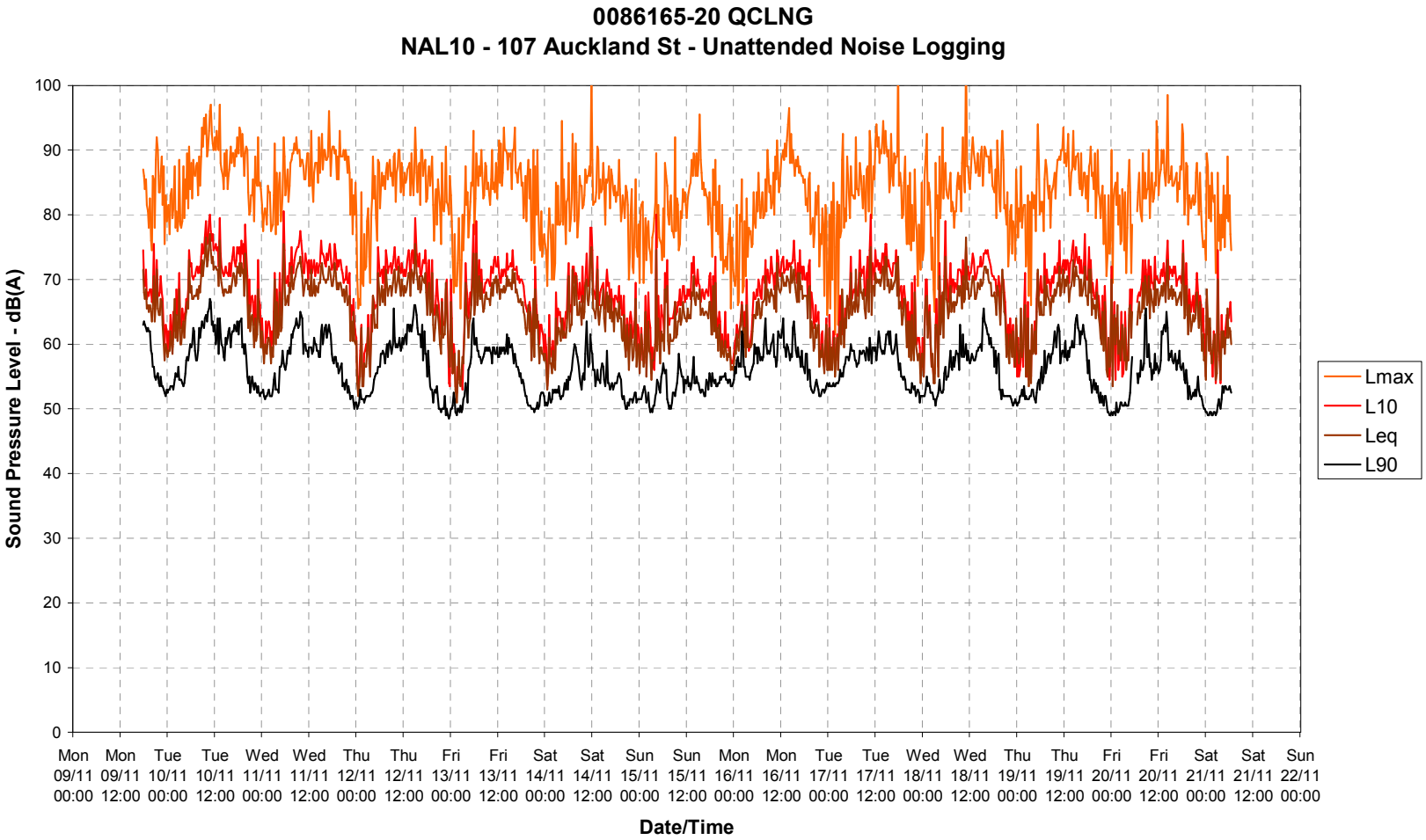
Thu 19/11 00:00
Date/Time
Lmax
L10
Leq
L90


0086165-20 QCLNG
NAL10 - 107 Auckland St - Unattended Noise Logging
Sound Pressure Level - dB(A)
100
90
80
70
60
50
40
30
20
10
0
Mon 09/11 00:00
Mon 09/11 12:00
Tue 10/11 00:00
Tue 10/11 12:00
Wed 11/11 00:00
Wed 11/11 12:00
Thu 12/11 00:00
Thu 12/11 12:00
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Date/Time
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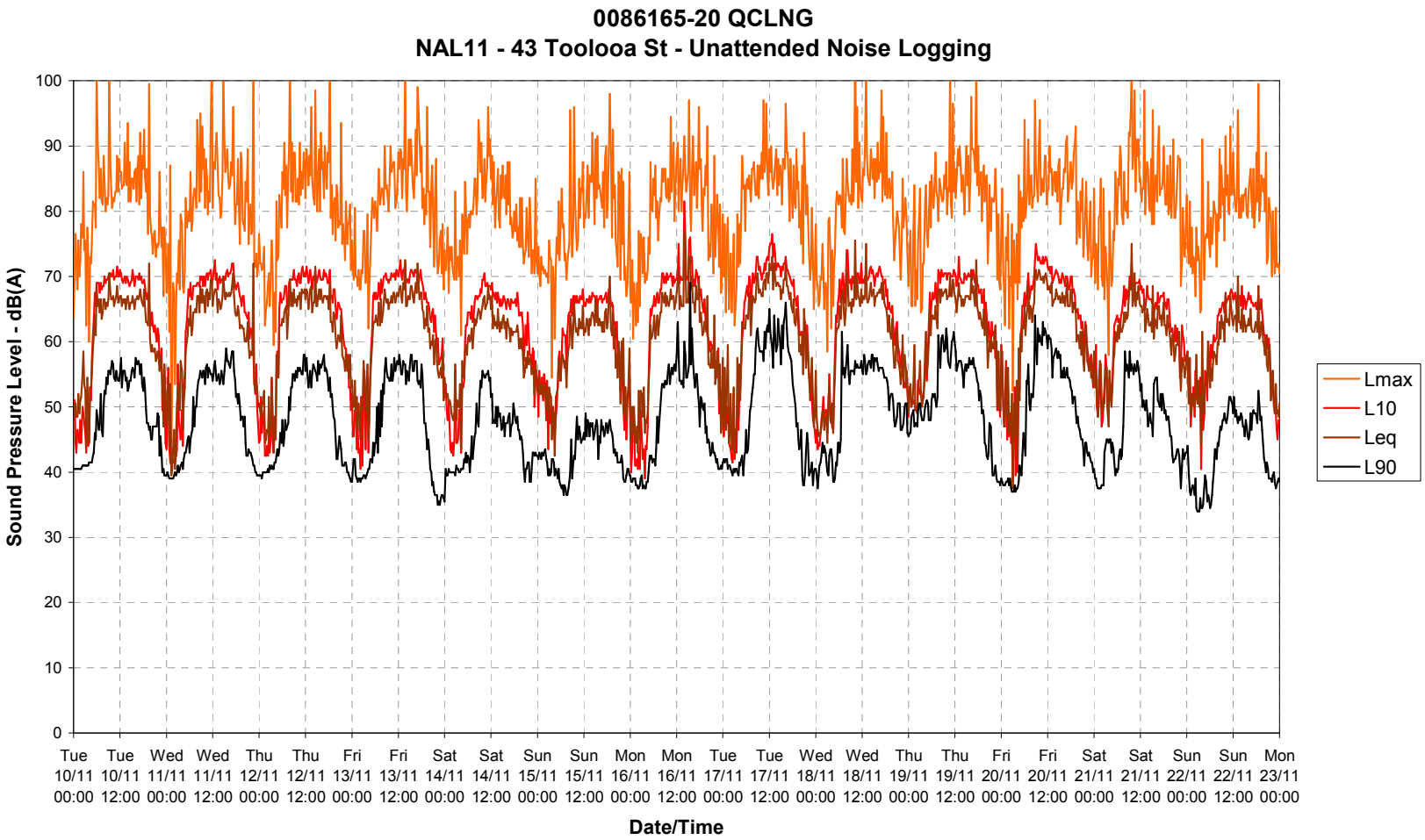
Leq
L90


0086165-20 QCLNG
NAL11 - 43 Toolooa St - Unattended Noise Logging
Sound Pressure Level - dB(A)
100
90
80
70
60
50
40
30
20
10
0
Tue 10/11 00:00
Tue 10/11 12:00
Wed 11/11 00:00
Wed 11/11 12:00
Thu 12/11 00:00
Thu 12/11 12:00
Fri 13/11 00:00
Fri 13/11 12:00
Sat 14/11 00:00
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Mon 16/11 12:00
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Thu 19/11 12:00
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Fri 20/11 12:00
Sat 21/11 00:00
Sat 21/11 12:00
Sun 22/11 00:00
Sun 22/11 12:00
Mon 23/11 00:00
Date/Time
Lmax
L10
Leq
L90

QUEENSLAND CURTIS LNG	Project	Queensland Curtis LNG Project	Title: Proposed Gladstone Industrial Projects
	Client	QGC - A BG Group business	
ERM Environmental Resources Management Australia Pty Ltd	Drawn: JB	SEIS Volume 5 Figure S5.13.7	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: BW	File No: 0086165b_SUP_AC_GIS002_F5.13.7	
	Date: 30.11.09	Revision: 0	

Annex C

Updated Noise Contour Maps - Operations

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: LNG Facility Operational Noise Contours, 2 - Train Scenario, Neutral Conditions

ERM
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Drawn	JB	SEIS Volume 5	Figure S5.13.1
Approved	BW	File No:	0086165b_SUP_AC_GIS002_F5.13.2
Date	25.03.09	Revision	0

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: LNG Facility Operational Noise Contours, 2 - Train Scenario, Adverse Conditions

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	JB	SEIS Volume 5	Figure S5.13.2
Approved	BW	File No:	0086165b_SUP_AC_GIS003_F5.13.2
Date	25.03.09	Revision	0

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: LNG Facility Operational Noise Contours, 2 - Train Scenario, Typical Conditions

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	JB	SEIS Volume 5	Figure S5.13.3
Approved	BW	File No:	0086165b_SUP_AC_GIS004_F5.13.3
Date	25.03.09	Revision	0

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: LNG Facility Operational Noise Contours, 3 - Train Scenario, Neutral Conditions

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	JB	SEIS Volume 5	Figure S5.13.4
Approved	BW	File No:	0086165b_SUP_AC_GIS005_F5.13.4
Date	25.03.09	Revision	0

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: LNG Facility Operational Noise Contours, 3 - Train Scenario, Adverse Conditions

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	JB	SEIS Volume 5	Figure S5.13.5
Approved	BW	File No:	0086165b_SUP_AC_GIS006_F5.13.5
Date	25.03.09	Revision	0

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: LNG Facility Operational Noise Contours, 3 - Train Scenario, Typical Conditions

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Drawn	JB	SEIS Volume 5	Figure S5.13.6
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Date	25.03.09	Revision	0

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Annex D

Santos LNG Construction Camp Location

N
W E
S

0 250m 500m

Scale 1:20 000 (A4)
Datum : GDA94

Gas Transmission Pipeline

Potential LNG Facility Access Road

Site Boundary

Client	Project	Title
LNG / URS	GLADSTONE LNG PROJECT ENVIRONMENTAL IMPACT STATEMENT	**LNG FACILITY SITE**

Drawn: CA	Approved: JB	Date: 18-03-2009	Figure: **3.4.6**	Rev:D
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