Stolthaven Australasia Pty Ltd
20-Aug-2015
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Noise and Vibration Impact Assessment

Stolthaven Mayfield Terminal - SSD_6664 (MOD 1)

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Prepared for

Stolthaven Australasia Pty Ltd

Prepared by

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1.0 Introduction

1.1 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by Stolthaven Australasia Pty Ltd (Stolthaven) to undertake an assessment of the potential operational noise and vibration impacts of the proposed increase in annual throughput from 1010 ML to 1,300 ML at the Bulk Liquid Fuels Storage Facility (the Facility) operated by Stolthaven at Mayfield, NSW.

This noise and vibration impact assessment has been prepared by AECOM to support the Statement of Environmental Effects (SEE) for a State Significant Development (SSD) 6664 (MOD 1). Stolthaven is seeking approval to increase its capacity to receive, store and distribute diesel and biodiesel for customers throughout the Hunter Region (the Project).

The Project consists of elements which have been approved and constructed as part of previous project applications under Part 3A (repealed) of the Environmental Planning and Assessment Act 1979 (The EP&A Act), as well as new elements. The existing Facility's approval provides terminal facilities for the storage and distribution of 1010 ML per annum of bulk liquid fuels, including diesel and biofuels.

The Project includes consideration and assessment of the existing Facility and approved modifications as described further in the SEE. In addition to those elements previously assessed and approved, the Project also proposes to:

- Increase throughput of diesel and biofuels up to 1,300 ML per annum;
- Increased management of fuels within the Facility (increased pumping); and
- Increased distribution of fuels by road (increased vehicle movements).

The nearest residential areas to the site are located to the south-west of the Project site at Mayfield, with the closest receptors in Crebert Street, approximately 900 m from the terminal site. To the south east there are residential receivers located in Carrington, approximately 2 km away.

The purpose of the assessment is to assess potential operational environmental noise and vibration impacts that may be generated as part of the proposed throughput increase, and recommend mitigation measures, where necessary.

The environmental noise emissions impact assessment has been carried out in accordance with the NSW Environment Protection Authority's (EPA) *NSW Industrial Noise Policy* (INP, 2000), the *NSW Road Noise Policy* (RNP, 2011) and *Assessing Vibration: a technical guideline*', (DECCW, 2006).

As the Facility lies within the Mayfield Concept Plan approval area, it requires noise emissions from the site to be consistent with the environmental assessment requirements of the Mayfield Concept Plan Approval. Consistency with the Mayfield Concept Plan Approval requirements has also been addressed in this report.

The nearest residential receivers (vibration sensitive) are approximately 900 m from the proposed development site. At such distances, the risk of discomfort, regenerated noise and structural damage impacting receivers is extremely low and therefore will not be considered further in this report. Nearby existing industrial developments are adjacent to the Facility site. These industrial facilities are neither noise nor vibration sensitive.

This report is technical in content. A glossary of acoustic terminology can be found in **Appendix A**.

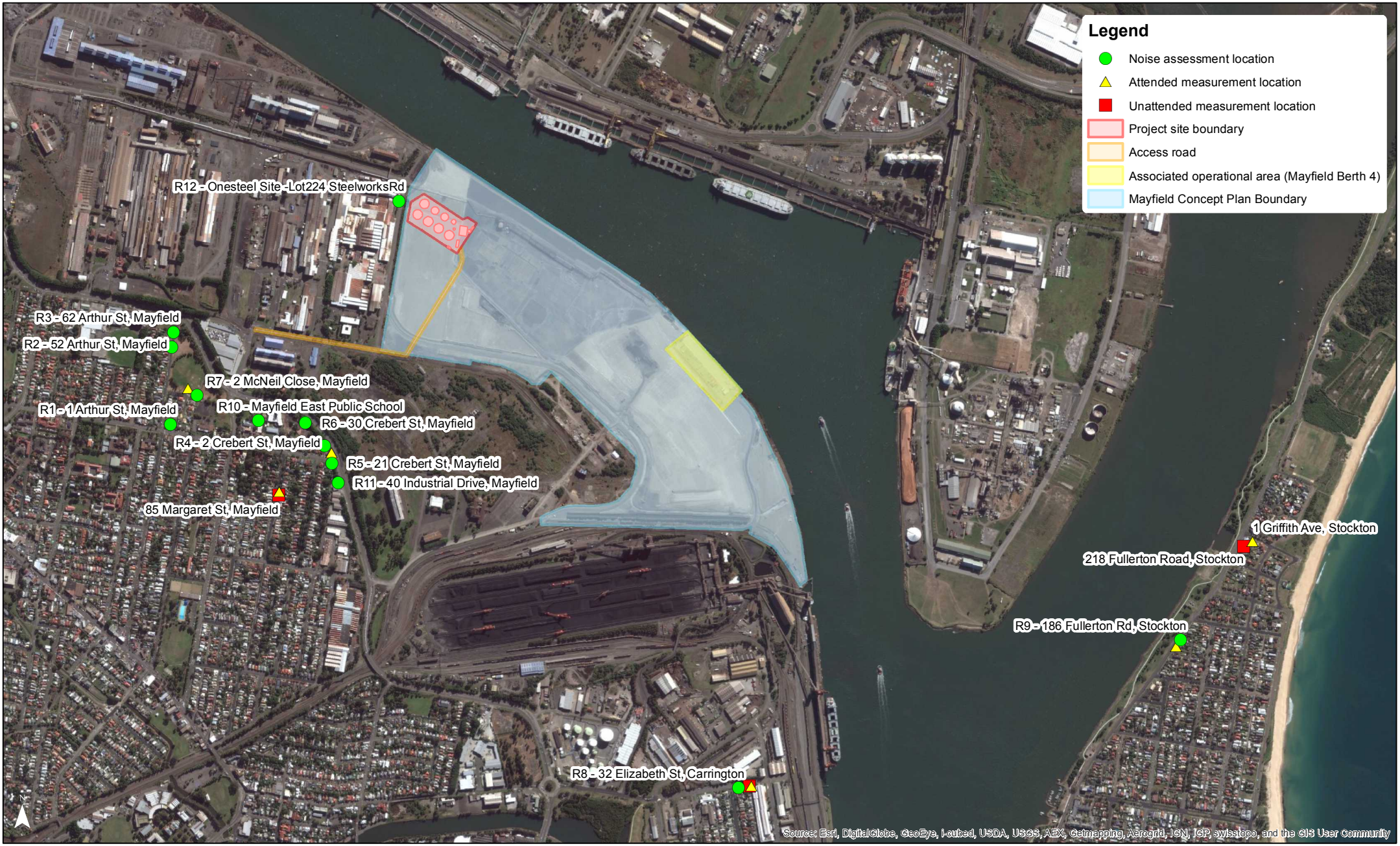
1.2 Site Description

The Facility is located on the former BHP steelworks site in Mayfield North, adjacent to the Hunter River, approximately 5 km north-west of Newcastle CBD.

The Facility is used for the storage of diesel and biodiesel fuels, imported from domestic and international markets, and stored onsite prior to the dispatch of fuels to end users via road. The Facility consists of five primary storage tanks for the storage of diesel, and one smaller storage tank for the storage of biodiesel, as well as a receiving terminal for ships at Mayfield Berth No.4 with pipeline infrastructure linking the two sites.

During operations, haulage ships dock at Mayfield Berth No.4 and pump fuel via the pipeline into storage tanks at the Facility. Haulage trucks receive the fuels and depart the Facility for dispatch through an access road leading to the intersection of Industrial Drive and Ingall Street.

The site location, noise monitoring locations and key sensitive receivers are shown in **Figure 1**.



Stolthaven Mayfield Terminal - State Significant Development

Project site location, noise assessment locations, and noise measurement locations

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0 500 1,000 2,000 m

Figure 1

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2.0 Existing Noise Environment

2.1 Surrounding Receivers

The locations of the Facility and nearby sensitive receivers are shown in **Figure 1**. The representative receiver locations and the associated receiver areas for assessment purposes, along with the land use classification (as defined in the INP) of each receiver are presented in **Table 1**.

Table 1 Representative Sensitive Receiver Locations

Receiver Number	Address	Land use Classification	Associated Receiver Area
R1	1 Arthur Street, Mayfield	Residential - Urban	Mayfield
R2	52 Arthur Street, Mayfield	Residential - Urban	Mayfield
R3	62 Arthur Street, Mayfield	Residential - Urban	Mayfield
R4	2 Crebert Street, Mayfield	Residential - Urban	Mayfield (Industrial Drive)
R5	21 Crebert Street, Mayfield	Residential - Urban	Mayfield (Industrial Drive)
R6	30 Crebert Street, Mayfield	Residential - Urban	Mayfield (Industrial Drive)
R7	50 Crebert Street, Mayfield	Residential - Urban	Mayfield
R8	32 Elizabeth Street, Carrington	Residential - Urban	Carrington
R9	186 Fullerton Road, Stockton	Residential - Suburban	Stockton
R10	Mayfield East Public School	School	-
R11	40 Industrial Drive, Mayfield	Commercial	-
R12	OneSteel Site -Lot 224 Steelworks Road, Mayfield	Industrial	-

2.2 Existing Noise Environment

In order to establish the existing noise environment adjacent to the project area, ambient noise monitoring results presented in a noise assessment that incorporates the Project area has been reviewed in addition to attended and unattended measurements undertaken by AECOM. The following noise assessments were referenced:

- *"Mayfield Site Port-Related Activities Concept Plan EA"*, Report No. 09077, Revision F, July 2010 by Wilkinson Murray'.
- *Noise Impact Assessment, Modification of Project Approval 08_0129*, by AECOM referenced as 60306451, Rev 3, dated 13 November 2013.

These background noise levels have been established to be consistent with previous site assessments, as this assessment is looking at the modification of an existing site. As such, recent attended measurements presented in **Section 2.2.4** have been included to validate that these background noise levels are still valid for each of the receiver areas.

Additional measurements were undertaken in July 2014 by AECOM to validate that the long term noise logging was still valid for this assessment, and as shown in **Table 7**. It was found that the long term noise logging is still valid for this assessment.

2.2.1 Background Noise Monitoring

Ambient noise logging was undertaken at a location deemed to be representative of noise sensitive receivers in the area of Mayfield. The logger locations, and attended measurement locations and the representative receiver locations are shown in **Figure 1**.

A noise logger was used to continuously monitor background noise levels between 7 September 2011 and 15 September 2011.

Provided in **Table 2** are details of the measurement locations.

Table 2 Ambient Noise Monitoring Locations

Location Duration	Instrumentation	Comments
81 Margaret Street, Mayfield Start: 07 Sept 11 Finish: 15 Sept 11	ARL-315 Noise Logger S/N: 15-199-414	Noise sensitive residential receiver. Assessment location to determine noise levels impacting on residential receivers in the Mayfield area. Noise logger located approximately 1.5 m above ground level.

Ambient noise monitoring results at this location are illustrated in **Appendix B** and **Table 3**.

A noise logger measures the noise level over the sample period and then determines L_{A1}, L_{A10}, L_{A90}, L_{Amax} and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the noise levels exceeded for 1%, 10% and 90% of the sample period respectively. The L_{Amax} is indicative of maximum noise levels due to individual noise events. The L_{A90} is taken as the background noise level.

The assessment background level (ABL) is established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each of the day, evening and night periods. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over each period for the entire monitoring duration.

Table 3 Ambient Noise Monitoring Results

Logger Location	Day		Evening		Night	
Sensitive Receiver Catchment - Mayfield						
81 Margaret Street, Mayfield East	**L_{A90}**	**L_{Aeq}**	**L_{A90}**	**L_{Aeq}**	**L_{A90}**	**L_{Aeq}**
Wednesday, 7 September 2011			38	46	33	45
Thursday, 8 September 2011	41	57	36	48	37	47
Friday, 9 September 2011	43	54	37	44	37	44
Saturday, 10 September 2011	42	60	40	45	37	47
Sunday, 11 September 2011	40	52	35	42	34	53
Monday, 12 September 2011	44	55	43	47	42	49
Tuesday, 13 September 2011	43	62	41	47	39	46
Wednesday, 14 September 2011	*	*	*	*	*	*
Thursday, 15 September 2011	*	*				
RBL	**43**		**38**		**37**	
Log Average L_{Aeq}		**58**		**46**		**47**

Notes:

1) Fields marked with (*) in **Table 3** are periods that were affected by adverse weather conditions such as rain, excessive wind speeds or extraneous noise events.

2) Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and Public Holidays. Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday and Public Holidays. Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays & Public Holidays.

3) RBL - Rating Background Noise Level (RBL) is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level L_{A90}. The RBL is based on the median of the individual daily background noise levels during each assessment period over the entire monitoring period.

4) The L_{Aeq} level is the equivalent continuous sound level and has the same sound energy over the sample period as the actual noise environment with fluctuating sound levels. The overall representative L_{Aeq} noise level is determined by logarithmically averaging each assessment period for the entire monitoring period.

2.2.2 Ambient noise monitoring adjacent to Industrial Drive, Mayfield

Ambient noise logging was undertaken at a location deemed to be representative of noise sensitive receivers in the area of Mayfield, adjacent to Industrial Drive.

Existing ambient noise levels along Industrial Drive, Mayfield were measured at 118 Woodstock Street, Mayfield. A noise logger was used to continuously monitor background noise levels between 29 July 2014 and 4 August 2014.

Provided in Table 4 are details of the measurement location.

Table 4 Ambient Noise Monitoring Locations

Location Duration	Instrumentation	Comments
118 Woodstock Street, Mayfield Start: 29 July 14 Finish: 4 Aug 14	SVAN 957 Noise Logger S/N: 27540	Noise sensitive residential receiver. Assessment location to determine traffic noise levels impacting on residential receivers in the Mayfield adjacent to Industrial Drive. Noise logger located approximately 1.5 m above ground level, free field. A correction for façade reflection in accordance with the EPA RNP has been applied to the results for use in the traffic assessment.

Ambient noise monitoring results at this location are presented in Table 5, with noise logging graphs included in **Appendix B**.

Table 5 Ambient noise monitoring results - 118 Woodstock Street, Mayfield

Logger Location	Day		Evening		Night	
Industrial Drive Receiver Locations, Mayfield						
118 Woodstock Street, Mayfield	**L_{A90}**	**L_{Aeq}**	**L_{A90}**	**L_{Aeq}**	**L_{A90}**	**L_{Aeq}**
Tuesday 29 July, 2014	-	-	-*	-*	-*	-*
Wednesday 30 July, 2014	-*	-*	51	67	44	64
Thursday 31 July, 2014	-*	-*	53	66	47	65
Friday 01 August, 2014	-*	-*	-*	-*	44	63
Saturday 02 August, 2014	55	67	48	63	42	63
Sunday 03 August, 2014	53	66	50	63	48	63
Monday 04 August, 2014	58	71	-	-	-	-
RBL	**55**	**-**	**51**	**-**	**44**	**-**
Log average L_{Aeq}	**-**	**68**	**-**	**65**	**-**	**64**

Notes:

1) Fields marked with (*) in Table 5 are periods that were affected by adverse weather conditions such as rain, excessive wind speeds or extraneous noise events.

2) Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and Public Holidays. Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday and Public Holidays. Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays & Public Holidays.

3) RBL - Rating Background Noise Level (RBL) is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level L_{A90}. The RBL is based on the median of the individual daily background noise levels during each assessment period over the entire monitoring period.

4) The L_{Aeq} level is the equivalent continuous sound level and has the same sound energy over the sample period as the actual noise environment with fluctuating sound levels. The overall representative L_{Aeq} noise level is determined by logarithmically averaging each assessment period for the entire monitoring period.

2.2.3 Existing Noise Environment – Additional Studies

Long term noise monitoring in the vicinity of the residential receivers of Carrington was undertaken from 18 to 26 March 2009 by Wilkinson Murray. The results of the noise monitoring are presented in the study "*Mayfield Site Port-Related Activities Concept Plan EA"*, Revision F, July 2010 by Wilkinson Murray. This is consistent with ambient noise data used in the EIS acoustic assessment for Phase 1, 1A, MOD 3 and SSD projects for the subject development.

Details of the noise monitoring and a summary of the results are presented in **Table 6** and the graphical noise logging charts are presented in **Appendix C**. Results from the EPA Newcastle Automatic Weather Station (AWS) have been checked over the monitoring period, and no adverse weather conditions that would significantly impact the overall results occurred during the monitoring period.

Validation of these results and quantification of the industrial contribution during the night-time period was undertaken and is presented in the attended measurements in **Table 7**. Additional measurements were undertaken in July 2014 by AECOM to validate that the long term noise logging was still valid, and as shown in **Table 7**, this was found to be the case. The industrial contribution during the day and evening periods was quantified in the Wilkinson Murray report, July 2010.

Table 6 Measured Noise Levels

Location	Noise Level Descriptor	Measured Noise Level		
		Day 7 am – 6 pm	Evening 6 pm – 10 pm	Night 10 pm – 7 am
Carrington	L_{A90}	44[1]	43[1]	39[1]
	L_{Aeq}	57[1]	54[1]	46[1]
	Existing industrial noise L_{Aeq}	57[1]	54[1]	47[2]
Stockton[3]	L_{A90}	47[3]	46[3]	46[3]
	L_{Aeq}	58[3]	54[3]	54[3]
	Existing industrial noise L_{Aeq}	52[4]	52[4]	52[4]

Notes:

1) Mayfield Site Port-Related Activities Concept Plan EA", Revision F, July 2010 by Wilkinson Murray. However, long term $L_{Aeq\ 15\ minute}$ measurements were not presented as part of this assessment.

2) AECOM attended measurement, 16 January 2012, 38 Elizabeth St, Carrington, verified on 28 July 2014.

3) 218 Fullerton Road, Stockton from AECOM report *Noise Impact Assessment, Modification of Project Approval 08_0129*, referenced as 60306451, Rev 3, dated 13 November 2013, with measurements undertaken from 20 May 2013 until 28 May 2013.

4) AECOM attended measurement, 28 July 2014. For Stockton, it has been assumed that the night time industrial contribution estimation from measurements is applicable for all periods.

2.2.4 Attended Noise Monitoring

Attended noise monitoring was undertaken at a number of relevant locations including all the long term noise logger locations. The results of these attended measurements are shown in **Table 7**. The attended noise monitoring locations are shown in **Figure 1.** The attended measurements were made to assist in quantifying the contributing noise sources at the different monitoring locations, for validation of the monitoring data and to assist in calibrating the computer noise model.

Table 7 Attended Noise Monitoring Results Summary at Logging Locations

Monitoring Location	Date of Measurement	Time of Measurement	$L_{Aeq, 15min}$	Industrial contribution, dB(A)	$L_{A90, 15\ min}$ (Background Noise Level)	Existing Noise Environment
85 Margaret Street, Mayfield	16 January 2012	00:52	45	45	44	Industrial noise dominant coming from N-NE direction. Intermittent horns & alarms sounding. Bat noise also noticeable, sporadic traffic
85 Margaret Street, Mayfield	15 September 2011	16:00	58	48	46	Traffic noise dominant along Industrial Drive. Birds and dogs also noted. Industrial noise practically inaudible
38 Elizabeth Street, Carrington	16 January 2012	02:49	49	47	47	Noise dominated by industry. Crickets and insects also clearly noticeable
1 Griffith Avenue, Stockton	15 January 2012	23:35	51	48	48	-

Monitoring Location	Date of Measurement	Time of Measurement	$L_{Aeq, 15min}$	Industrial contribution, dB(A)	$L_{A90, 15 min}$ (Background Noise Level)	Existing Noise Environment
32 Elizabeth Street, Carrington	28 July 2014	22:32	47	46/47	45	**INDUSTRIAL CONTRIBUTION:** Background constant broadband industrial hum at ~290-350deg ~46 dB(A), faint but audible warning alarms in similar direction. Rail car shunting/banging from ~300deg to 350deg, instantaneous levels up to ~53-62 dB(A). **TRAFFIC CONTRIBUTION:** None directly contributing *Average Wind – 1.3 m/s, W*
186 Fullerton Street, Stockton	28 July 2014	23:27	56	52/55	52	**INDUSTRIAL CONTRIBUTION:** Strong constant broadband industrial hum from Kooragang Island ~53/54 dB(A) up to 55/56 dB(A), ranging over ~290-330deg. Nearby water treatment plant faintly audible ~45/46 dB(A). **TRAFFIC CONTRIBUTION:** Occasional car pass-by on Fullerton St. *Average Wind – 1.1 m/s, WNW*
2 McNeil Close, Mayfield	29 July 2014	00:30	53	46/47	47	**INDUSTRIAL CONTRIBUTION:** Background constant broadband industrial hum at ~350-0 deg, ~46/47 dB(A). Distant train movement, ~280deg, ~50/51 dB(A). Banging of metal up to ~55 dB(A) at 0 deg. No distinguishable sources in the direction of the Stolthaven Facility. **TRAFFIC CONTRIBUTION:** Intermittent traffic on Industrial Drive in the main noise source other than the background industrial hum from the north, with traffic around ~51/52 – 54/55 dB(A), truck pass-bys up to 63 dB(A). *Average Wind – 0.8 m/s, WNW*
2 Crebert Street, Mayfield	29 July 2014	01:21	63	48/50	49	**INDUSTRIAL CONTRIBUTION:** Background constant broadband industrial hum at ~340-10 deg, ~48/50 dB(A). Distant train movement, ~280deg, ~50/51 dB(A). Quite a few events which sound like banging of metal up to ~57-60 dB(A) at ~340 deg. Faint but audible warning alarms to north. Distant train movement, ~240deg, ~45/46 dB(A). No distinguishable sources in the direction of the Stolthaven Facility. **TRAFFIC CONTRIBUTION:** Intermittent traffic on Industrial Drive in the main noise source other than the background industrial hum from the north, with traffic around ~68 – 72 dB(A), truck pass-bys up to ~77-85 dB(A). *Average Wind – 0.9 m/s, NW*

3.0 Operational Noise and Vibration Criteria

3.1 Operational Noise Criteria

3.1.1 Protection of the Environment Operations Act 1997 – Section 139

The main acoustic requirement of Protection of the Environment Operations Act 1997 (POEO Act) is to ensure that "a noise is not offensive". The definition for an offensive noise is included below.

offensive noise *is:*

> *(d) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:*
>
> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
>
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
>
> *(e) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.*

To determine if a noise source is offensive, a primary consideration is to determine whether the noise source is intrusive. The EPA provides guidelines for external noise emissions from developments in its *Industrial Noise Policy*. The INP recommends a method which can be used to ascertain the intrusiveness of noise emissions.

EPA states that the relationship between the statutory definition of offensive noise and intrusive noise is that intrusive noise can represent offensive noise, but whether this is always true can depend on the source of the noise, noise characteristics and cumulative noise levels. Therefore to avoid the emission of an offensive noise, noise emissions should not be intrusive as defined by the EPA in the following manner:

> *"A noise source is generally considered to be intrusive if noise from the source, when measured over a 15 minute period, exceeds the background noise by more than 5 dB(A).*

Any noise generated within the Facility site boundary, including noise from plant, truck movements and mechanical services or associated with site buildings has been assessed in accordance with the INP.

3.1.2 Industrial Noise Policy

The INP provides guidance and recommendations on the assessment of noise impacts from industrial and commercial facilities throughout all periods of the day. The assessment procedure for industrial noise sources has two components that must be satisfied:

- Controlling ***intrusive noise*** impacts in the short term for residences; and
- Maintaining ***noise level amenity*** for particular land uses for residences and other land uses.

3.1.2.1 Intrusive Noise Impacts

The INP states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (L_{Aeq}), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is termed the *Intrusiveness Criterion*. The *Rating Background Level* (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in Section 3.1 of the INP. Adjustments are to be applied to the level of noise produced if the noise at the receiver contains potentially annoying characteristics such as tonality or impulsiveness. The project intrusive noise criteria levels are shown in **Table 8**.

Table 8 Recommended $L_{Aeq, 15\ minute}$ Intrusive Noise Criteria Levels from Industrial Noise Sources

Receiver Area	Time of Day	RBL ($L_{A90, 15\ minute}$)	Intrusive Criterion RBL + 5 ($L_{Aeq, 15\ minute}$)
Mayfield	Day	43	48
	Evening	38	43
	Night	37	42
Carrington[1]	Day	44	49
	Evening	43	48
	Night	39	44
Stockton[2]	Day	47[2]	52
	Evening	46[2]	51
	Night	46[2]	51

Notes:

1) Mayfield Site Port-Related Activities Concept Plan EA", Revision F, July 2010 by Wilkinson Murray.

2) 218 Fullerton Road, Stockton from AECOM report *Noise Impact Assessment, Modification of Project Approval 08_0129*, referenced as 60306451, Rev 3, dated 13 November 2013, with measurements undertaken from 20 May 2013 until 28 May 2013.

3.1.2.2 Protecting Noise Amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from industrial noise sources should not normally exceed the acceptable noise levels specified in *Table 2.1* of the INP. That is, the industrial noise level should not exceed the level appropriate for the particular locality and land use. This is termed the Amenity criterion.

For a residential receiver in an urban or suburban area, the amenity criteria are shown in **Table 9**.

Table 9 Recommended $L_{Aeq, period}$ Amenity Noise Criteria Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level dB(A)	
			Acceptable	Recommended Maximum
Residence	Urban	Day	60	65
		Evening	50	55
		Night	45	50
Residence	Suburban	Day	55	60
		Evening	45	50
		Night	40	45

The INP application notes state:

Where the ambient noise levels are below the Acceptable Noise Level (ANL), then ideally the measurement of the existing level of noise should include only noise from industrial sources. In these situations, however, it may be acceptable to include noise from other sources (for example, roads, and neighbourhood). The reasons for this are that:

- *including noise from other sources typically results in assessing the worst case for impacts on amenity; and*
- *strictly excluding noise from sources other than industry can be difficult and costly and may not be necessary if the development meets the criteria.*

As it was possible to determine the contribution from existing industrial sources, the modification factors in Table 2.2 in the INP have been applied when determining the final environmental noise criteria. The amenity criteria for the residential receivers are as shown in **Table 11**.

Furthermore, the application notes go on to state:

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

3.1.2.3 Assessments in areas of high traffic noise

Section 2.2.3 of the INP, and the INP Application note "*Amenity criteria in high traffic noise areas*" are applicable when receiver locations are exposed to road traffic noise that;

1) Dominates the noise at the receiver location;

2) Is 10 dB or more above the Acceptable Noise Level for the receiver type; and

3) It is highly unlikely that the road traffic noise level would decrease in the future.

Existing traffic noise levels along Industrial Drive, Mayfield were measured at 118 Woodstock Street, Mayfield. A noise logger was used to continuously monitor noise levels between 29 July 2014 and 4 August 2014.

Further details of the traffic noise measurements are presented in Section 3.3.

Table 10 Mayfield receivers located along Industrial Drive measured road traffic noise levels and Amenity Criterion derivation

Period	Measured Sound Pressure Level, dB(A), $L_{Aeq, (Period)}$	Acceptable Noise Level (ANL) (Table 2.1 INP), $L_{Aeq, (Period)}$	High traffic noise levels (>10dB ANL)	Project Specific Acceptable Noise Level[1], $L_{Aeq, (Period)}$	Industrial Contribution, ($L_{Aeq\ 15\ minute}$)	Amenity Criterion[2] ($L_{Aeq, Period}$)
Mayfield Receiver Locations along Industrial Drive						
Day (7:00 am – 6:00 pm)	68	60	No	60	48[3]	60
Evening (6:00 pm - 10:00 pm)	65	50	Yes	55	47[4]	55
Night (10:00 pm – 7:00 am)	64	45	Yes	54	49[5]	52

Notes:

1) Refer to Section 2.2.3 of the INP, and the INP Application notes "*Amenity criteria in high traffic noise areas*" for derivation of the Project Specific Acceptable Noise Level

2) The amenity criterion has been modified in accordance with the industrial contribution adjustment in Table 2.2 of the INP.

3) AECOM attended measurement, 15 September 2011.

4) This industrial contribution has been based upon the evening Mayfield industrial contribution presented in *"Noise Impact Assessment, Stolthaven Terminals Newcastle, Mayfield (BHP) Site, NSW",* 2008 by Spectrum Acoustics.

5) AECOM attended measurement, 29 July 2014.

3.1.3 Environmental Noise Criteria

A summary of the environmental noise criteria for the Facility is given in **Table 11**. The Project Specific Noise Levels for each residential receiver area have been highlighted.

Table 11 Project Specific Noise Levels

Receiver Area	Period	RBL ($L_{A90, 15\ minute}$)	Intrusive Criterion RBL + 5, ($L_{Aeq, 15\ minute}$)	Ambient ($L_{Aeq, period}$)	Industrial Contribution, ($L_{Aeq\ 15\ minute}$)	Amenity Criterion[1] ($L_{Aeq, Period}$)
Mayfield (Industrial Drive)[8]	Day	43	**48**	58	48[4]	**60**
	Evening	38	**43**	46	47[6]	**55**
	Night	37	**42**	47	49[5]	**52**
Mayfield	Day	43	**48**	58	48[4]	**60**
	Evening	38	**43**	46	47[6]	**47**
	Night	37	**42**	47	45[3]	**37**
Carrington	Day	44	**49**	57	57[2]	**57**
	Evening	43	**48**	54	54[2]	**44**
	Night	39	**44**	46	47[3,5]	**37**
Stockton	Day	47[7]	**52**	58[7]	52[5]	**52**
	Evening	46[7]	**51**	54[7]	52[5]	**42**
	Night	46[7]	**51**	54[7]	52[5]	**42**

Notes:

1) The amenity criterion has been modified in accordance with the industrial contribution adjustment in Table 2.2 of the INP.

2) *Mayfield Site Port-Related Activities Concept Plan EA"*, Revision F, July 2010 by Wilkinson Murray.

3) AECOM attended measurement, 16 January 2012.

4) AECOM attended measurement, 15 September 2011.

5) AECOM attended measurement, 28/29 July 2014. For Stockton, it has been assumed that the night time industrial contribution estimation from measurements is applicable for all periods.

6) This industrial contribution has been based upon the evening Mayfield industrial contribution presented in *"Noise Impact Assessment, Stolthaven Terminals Newcastle, Mayfield (BHP) Site, NSW",* 2008 by Spectrum Acoustics.

7) 218 Fullerton Road, Stockton from AECOM report *Noise Impact Assessment, Modification of Project Approval 08_0129*, referenced as 60306451, Rev 3, dated 13 November 2013, with measurements undertaken from 20 May 2013 until 28 May 2013

8) Refer to Section 3.1.2.3 and Table 10 for full amenity criterion derivation.

3.1.4 Other Noise Sensitive Receivers

The INP specifies the following noise criteria for non-residential land uses as detailed in **Table 12**.

Table 12 Non-residential Receiver Noise Criteria

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level dB(A)	
			Acceptable	Recommended Maximum
School classroom - Internal	Noisiest 1-hour period when in use	When in use	35[1]	40[1]
Commercial Premises	All	When in use	65	70
Industrial Premises	All	When in use	70	75

Notes:

1) In the INP, the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

3.1.5 Tonality and INP Modifying Factors

The INP provides additional guidance and criteria for assessing noise emission from sources defined as 'tonal' in nature. Penalties of up to 5 dB(A) may be applied where the subject noise emission is tonal in character at the receiver.

A penalty is applied when the level of a one-third octave band exceeds the level of each adjacent band by:

- 5 dB(A) or more if the frequency band containing the tone is above 400 Hz;
- 8 dB(A) or more if the frequency band containing the tone is below 400 Hz and above 160 Hz inclusive; and
- 15 dB(A) or more if the frequency band containing the tone is below 160 Hz.

As part of this assessment, a 'screening test' to determine the potential for tonality has been conducted, to assess if the sources have the potential to generate tonal noise.

Additionally the INP provides guidance on applying penalties if the noise source contains characteristics such as impulsiveness, intermittency, irregularity or dominant low-frequency content. These have reviewed in operational noise assessment.

3.1.6 Sleep Disturbance Criteria

The INP was updated in June 2013 with application notes which discuss sleep disturbance and its objective assessment. To minimise the risk of sleep disturbance as a result of industrial type operations during the night-time period, the INP application notes reference the RNP.

The guidance provided in the RNP for assessing the potential for sleep disturbance recommends that to minimise the risk of sleep disturbance during the night-time period (10.00 pm to 7.00 am), the $L_{A1(1\ minute)}$ noise level outside a bedroom window should not exceed the $L_{A90\ (15\ minute)}$ background noise level by more than 15 dB(A). The EPA considers it appropriate to use this metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

The RNP contains a review of research into sleep disturbance which represents NSW EPA advice on the subject of sleep disturbance due to noise events. It concludes that having considered the results of research to date that, 'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions'. Therefore, given that an open window provides approximately 10 dB(A) in noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

Based on the measured background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are presented in **Table 13**.

Table 13 Night-time Sleep Disturbance Criteria

Location	Measured RBL $L_{A90,\ 15\ minute}$ dB(A)	Sleep Disturbance Criteria $L_{A1\ (1\ minute)}$ dB(A)	
		Screening Criterion	Awakening Reaction
Mayfield	37	52	60 - 65
Carrington	39	54	60 - 65
Stockton	46	61	60 - 65

3.2 Mayfield Concept Plan Noise and Vibration Limits

As part of the NSW Planning and Environment Secretary's Environmental Assessment Requirements, Stolthaven Fuel Terminal, Mayfield (SSD-6664), dated 19 September 2014, the following requirements are stated:

"– a clear demonstration that the proposed development is consistent with all environmental assessment requirements set out in the Concept Plan for the Port Facilities at Mayfield (MP 09_0096) and subsequent modifications of this approval"

And

"– details of a protocol that has been agreed with the Port of Newcastle for the provision of input into the Mayfield Concept Plan Noise Model (MP 09_0096)".

The Facility is located within the Mayfield Concept Plan (MCP) approval area that is currently subject to concept approval MP 09_0096, approved 16 July 2012 for the Port of Newcastle (PON). This approval has had an approved modification, which is dated 17 March 2014.

As part of MCP approval sections 2.16 – 2.20 outline the operational noise and vibration requirements related to projects sites that are situated with the MCP area.

Section 2.17 sets out project specific noise goals for the cumulative noise impact of all projects associated with MCP. The MCP approval aims to address cumulative noise impacts from all sites that make up the entire MCP area, with a purpose of addressing cumulative noise impacts as the concept area is developed over time.

PON is in the process of developing and implementing a Cumulative Environmental Noise Management Tool (CENMT), which includes the development of a Site Noise Model as required by Condition 2.16, to take into consideration all existing and future developments to determine the applicable noise quotas for individual sites within the MCP area. These overall noise criteria for the entire MCP site are presented in **Table 14**. No specific quotas have been provided to Stolthaven for assessment of the current proposal. Predicted amenity noise emission levels have been as presented in **Section 4.7** for review and recommendation by PON following the finalisation of the CENMT.

Table 14 Mayfield Concept Plan Amenity Noise Goals

Location	Project Specific Noise Goals (dB(A)) $L_{Aeq(period)}$		
	Day (7.00 am to 6.00 pm)	Evening (6.00 pm to 10.00 pm)	Night (10.00 pm to 7.00 am)
A - 1 Arthur Street, Mayfield (Urban)	60	49	43
B - 2 Crebert Street, Mayfield (Urban)	60	50	43
C – 32 Elizabeth Street, Carrington (Urban)	57	44	45
D – Stockton (Suburban)	55	37	37

Upon finalising a methodology for assessing cumulative noise impacts from the MCP, noise levels from the operations of the Facility are to be provided so that the noise contribution from the Facility can be included in the MCP cumulative noise map, and compliance with the allocated noise limits for the Facility determined.

3.3 Road Traffic Noise Criteria

EPA's RNP has been used to assess the noise arising from operational traffic generated by the proposed development.

3.3.1 Road Traffic Noise Levels

Access to the Facility will be via Industrial Drive. This road would be classified as a sub-arterial road. **Table 15** presents the applicable road traffic noise criteria from the RNP. The external noise criteria are applied 1 m from the external facade of the affected building.

Table 15 Road Traffic Noise Criteria – Sub-arterial Roads

Period	Parameter	Criterion
Sub-arterial roads		
Day (7:00 am – 10:00 pm)	$L_{Aeq, (15\ hour)}$	60 dB(A)
Night (10:00 pm – 7:00 am)	$L_{Aeq, (9\ hour)}$	55 dB(A)

Note that where the criteria are already exceeded, the EPA recommends that:

> *"Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of the project by applying the relative increase criteria.*
>
> *In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*
>
> *...*
>
> *For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'."*

Existing road traffic noise levels along Industrial Drive, Mayfield were measured at 118 Woodstock Street, Mayfield. A noise logger was used to continuously monitor background noise levels between 29 July 2014 and 4 August 2014. The ambient noise monitoring results at these locations are presented in Table 5, with noise logging graphs included in **Appendix B**.

The measured road traffic noise levels with and without façade correction in accordance with the EPA RNP are presented in **Table 16**. It is to be noted that the measured traffic noise levels exceed the recommended criteria presented in **Table 15**. As such, the assessment will determine if traffic noise from the development is predicted to increase the traffic noise impacts on residential receiver locations in Mayfield by more than 2 dB(A).

Table 16 Measured Road Traffic Noise Levels – Industrial Drive, Mayfield

Period	Parameter	Measured Sound Pressure Level (Free field), dB(A)	Traffic Noise Levels (Façade reflected), dB(A)
Industrial Drive, Mayfield			
Day (7:00 am – 10:00 pm)	$L_{Aeq, (15\ hour)}$	68	70
	$L_{Aeq, (Worst\ 1\ hour)}$	70	72
Night (10:00 pm – 7:00 am)	$L_{Aeq, (9\ hour)}$	64	66
	$L_{Aeq, (Worst\ 1\ hour)}$	69	71

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4.0 Operational Noise Assessment

4.1 Equipment

Noise sources levels are based upon measurements undertaken at the existing operations of the Facility. Measurements were undertaken on-site on 28 July 2014 by AECOM.

Based upon the attended measurements and discussions with Stolthaven personnel, 'reasonable' worst case operational scenarios were established and modelled for the operations during the day, evening and night assessment periods. The operational noise source assumptions are presented below.

The modelling scenarios were developed based upon observations and measurements. The modelled sound power levels are included in **Table 17** - **Table 20**, which were then adjusted for duration and frequency of operations in accordance with the operations in the models. The full modelled scenarios are outlined in **Section 4.2.5.**

4.1.1 Truck Operations

Truck operations would take place 24 hours a day, 7 days per week.

Up to 300 truck movements (150 trucks) are proposed for diesel and biodiesel delivery and dispatch per day (24 hour period) as part of the proposed throughput increase. While fewer trucks would typically be required, up to 300 movements per day may be needed to accommodate fluctuations in customer demand. Typically, trucks would load fuel within a 30-45 min period. It has been assumed that the truck movements which occur within the 7 am to 10 pm period will occur at the rate of 8 trucks per hour, and the additional trucks would be evenly spread throughout the remaining 10 pm to 7 am period. As such 240 truck movements during the 7 am to 10 pm peak period, while the other 60 truck movements will occur outside of these times. For the night-time period (10 pm to 7 am) it is assumed in the assessment that 60 truck movements as a 'reasonable' worst case scenario during the night-time amenity assessment period. During the night-time period it is assumed that will occur at the rate of 3 trucks (5 movements) per hour.

For the 'reasonable' worst case 15-minute period assessments two scenarios for truck operations have been assessed, which were developed based upon on-site observations and the proposed truck movements.

Scenario 1 is where trucks are filling in the facility throughout the 15 minute period while two trucks arrive at the facility and wait out the front. During the night period it is assumed up to three trucks will be filling throughout the period, while outside of this period it is assumed that 4 trucks will be filling.

Scenario 2 is where one truck is filling in the facility, and all other trucks are moving into and out of the facility during the 15 minute period. During the night period it is assumed that the reasonable worst case could be two trucks arrive and two trucks leave the facility, and outside of this period it is assumed that the reasonable worst case would be three trucks arrive and three trucks leave the facility. The full modelled operational scenarios are outlined in **Section 4.2.5**.

During on-site measurements undertaken on 28 July 2014 it was observed that truck operations were typically B-Double trucks, and that a typical 'in-and-out' cycle time in the Facility was approximately 30 minutes, with each tank taking approximately 5-8 minutes each to fill.

It was observed that two trucks seemed to typically arrive in close timing to each other, and would then wait outside the gate for a free loading bay. Bays are designated for different clients, and as such, even if a bay was empty it did not mean that a truck would not stop and wait outside the entrance gate. Trucks would sometime wait with engines idling, others would turn off the engine while waiting. The maximum number of trucks using the fuelling loading bays during the day was observed to be three simultaneously.

Air-break releases would occur when the trucks arrived on-site and stopped prior to swiping in at the gate, and also when they stopped after moving into the bays. It should be noted that as a result of the design of the Facility, at no stage was it observed that trucks were required to reverse, and as such, no truck reversing beepers have been included in the assessment.

When the truck entered or exited the Facility a warning alarm at the gate would sound as the gate opened or closed.

Staff/visitor light vehicle movements are approximately 14 vehicles, which when compared to the truck operations the noise impacts would be negligible and inconsequential, and as such these have not been included in the acoustic modelling.

The base sound power levels for truck operations are presented in **Table 17**.

Table 17 Truck Operational Sound Power Levels

Plant Item / Operation	Sound Power Level, dB(A)
Trucks approaching/leaving site - Accelerating	86 dB(A)/m
Trucks approaching/leaving site – Using main access road	78 dB(A)/m
Trucks idling at site	97
Truck airbrake event	107[1]
Entrance gate/ exit gate alarm	105

Notes:

1) This has been based upon an 8 second measurement, and has been modelled accordingly.

4.1.2 Fuel Pumps

Fuel pumps were measured on-site during a series of measurements during operations.

It was observed that when a truck was loading typically two pump/motor sets would be serving the truck during the loading operations.

From discussions with personnel onsite it was noted that a maximum of six pumps would operate at the same time.

The assessment has been conducted assuming the pumps have not benefitted from any mitigation or acoustic enclosure, as is currently the case.

The base sound power levels for fuel pump/motor operations are presented in **Table 18**.

Table 18 Fuel Pump/Motor Sound Power Levels

Plant Item / Operation	Sound Power Level, dB(A)
Individual Fuel Pump/Motor set	96

4.1.3 Compressor Shed and Office Area Operations

It was observed two compressors could run at the same time.

It was also observed that an air-release vale that protruded from the southern façade of the compressor shed would operate intermittently for approximately six second spurts approximately every 45 seconds.

At the time the office plant was not in operation. The sound power level of some of the ventilation units was noted on the side of the units, and that unit types were also noted. As such, these were included in the modelling.

The base sound power levels for compressor shed and office area operations are presented in **Table 19**.

Table 19 Compressor Shed and Office Area Sound Power Levels

Plant Item / Operation	Sound Power Level, dB(A)
Compressor 1	73
Compressor 2	87
Compressor shed air release valve	93
Office plant (individual item)	68

4.1.4 Operational Peak Sound Power Levels

For the sleep disturbance assessment, the key noise sources with the greatest potential for causing sleep disturbance are the operations of the trucks airbrakes when they are entering the site and the gate opening alarm. These are based upon attended measurements on-site on 28 July 2014. The sound power levels for key peak noise events that occur on-site are presented in **Table 20**.

Table 20 The Facility Plant Items Sound Power Levels for Peak Events

Plant Item / Operation	$L_{A1\ 1\ minute}$ Sound Power Level, dB(A)
Trucks approaching/leaving site - Accelerating	108
Truck airbrake event	117
Entrance gate/ exit gate alarm	108

4.1.5 Fuel Ship/tankers

Ship/tankers operating in association with the Facility will be docked at Mayfield Berth No.4 and pump fuel via the pipeline into storage tanks at the Facility. Operations at Mayfield Berth No.4 are controlled by NSW Department of Planning & Environment (DPE) Consent Condition DA-293-08-00 MOD 9, dated 29 August 2013. Accordingly, assessment of ship operations when at berth should be undertaken against this condition.

However, as part of the NSW Planning and Environment Secretary's Environmental Assessment Requirements, Stolthaven Fuel Terminal, Mayfield (SSD_6664), dated 19 September 2014, the following requirements are stated:

"– a quantitative assessment on construction, operational and transport noise and vibration activities (including shipping) in accordance with the relevant EPA guidelines"

And as such, for consistency with the previous State Significant Development Assessment (SSD_6664), ship/tankers operations have been assessed as part of this assessment separately.

AECOM has experience in assessment of fuel transportation ships. Typically Deep Well Pump (DWP) ships and Central Pump Room (CPR) ships operate at fuel terminal.

Sound power levels have been based upon AECOM's experience in which they have found that fuel ships typically operate with a range of sound power levels.

The mean and standard deviation of calculated sound power levels was determined in order to characterise the worst and best ships visiting the terminal.

In AECOM's experience there is high variability in noise characteristics of ships visiting fuel terminals. AECOM has undertaken a statistical analysis of ship noise using the calculated mean and standard deviation of measured fuel ships sound power levels. This analysis has assumed ship noise characteristics are distributed normally.

The distribution of data with respect to the mean and standard deviation is shown in **Figure 2**. It shows that 68.2% of the dataset lies within one standard deviation of the mean, and 95.4% of the dataset lies within two standard deviations of the mean.

Figure 2 Mean and Standard Deviation of a Normally Distributed Dataset

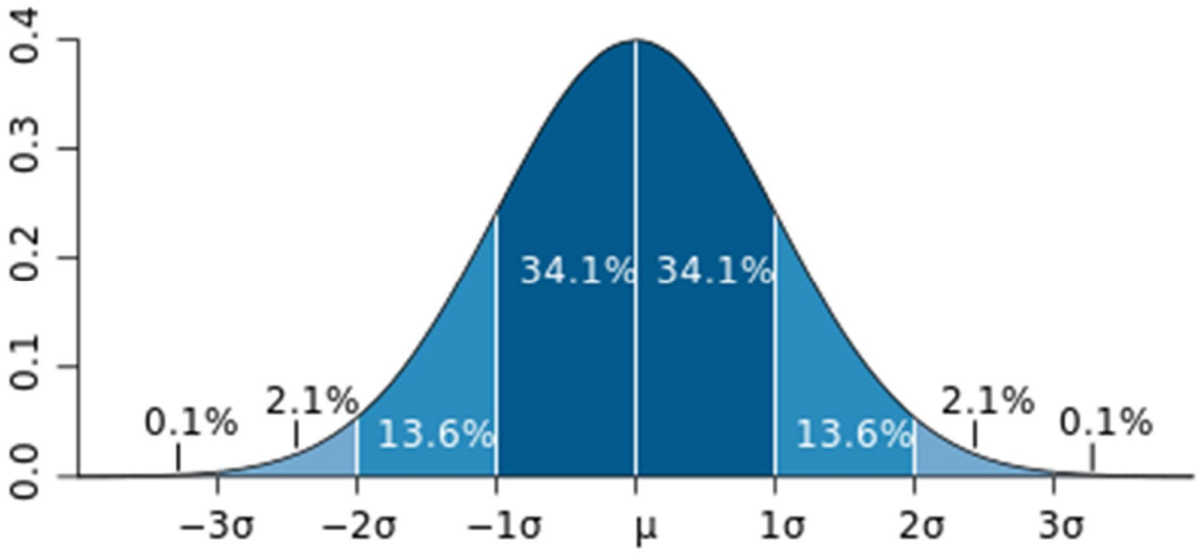


Image source: en.wikipedia.org

A summary of measured data is shown in **Table 21**.

Table 21 Ship Noise Characteristics Statistical Analysis

Statistic	-2σ	-1σ	μ	1σ	2σ
Percentile	2.1st	15.7th	50th	84.3rd	97.9th
Nomenclature	best	quieter	typical	louder	worst
DWP Ships					
Sound Power Level, dB(A)	98	101	103	106	108
L_{Ceq} - L_{Aeq}, dB	7.4	11.6	15.9	20.1	24.4
CPR Ships					
Sound Power Level, dB(A)	98	100	103	105	108
L_{Ceq} - L_{Aeq}, dB	9.1	13.4	17.6	21.9	26.1

As such, to determine the potential impacts from ships when at berth, an assessment has been undertaken looking at ships that are 1 standard deviation either side of the mean, to give an indication of the typical impacts that might be expected when a ship is in berth.

4.2 Methodology

4.2.1 General Modelling Assumptions

Noise levels due to the operational activities shown in **Section 4.2.5** have been predicted to nearby noise sensitive receivers using SoundPLAN 7.3 (industry standard) noise modelling software.

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

Noting that the closest receptors in the vicinity of the proposed Facility are at least 500 m from the site, the CONCAWE environmental noise prediction method is an appropriate method for predicting the noise propagation.

The modelling includes:

- Ground topography;
- Buildings and structures;
- All sources behave as point, or moving point sources;
- Ground Absorption (set at hard ground for the Hunter River and 60% elsewhere); and
- Representative operational noise sources as required.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment.

4.2.2 Meteorological Conditions Modelled

Meteorological conditions such as the presence of a temperature inversion or light to moderate winds can have an effect on sound propagation.

Temperature inversions (i.e. when the normal temperature profile of the atmosphere is reversed such that the air temperature increases with increasing height above ground) typically occur at night and tend to assist the propagation of noise.

Likewise, a light to moderate wind (i.e. 1 to 3 m/s) from the source to the receiver tends to assist the propagation of noise to the receiver, while the impact of noise for any receivers in the opposite direction would be reduced. At wind speeds above approximately 5 m/s the wind becomes too turbulent to effectively assist the propagation of noise, and background noise levels tend to increase, masking any increases in noise level due to wind assisted propagation.

4.2.3 Meteorological Conditions

Data used to perform the meteorological assessment was sourced from the EPA Newcastle Automatic Weather Station (AWS) which is approximately 4.5 km south of the Facility. The time period used was from the 1 January 2009 to 29 December 2009.

4.2.3.1 Temperature Inversion

The occurrence of F and G class inversions was determined in accordance with Appendix E of the INP and assessed individually and together for the total night-time period during the winter months (June, July and August) of these years. It was concluded that class F and G inversions occurred more than 30% of the total winter night-time period, with an overall average of **51%** combined occurrence of both F and G class inversions.

As a result and in accordance with the INP guidelines, a default F Class inversion has been included in the predictions of noise levels at nearby residential receiver locations as they occur often enough to be considered significant and warrant inclusion in the assessment as part of the prevailing meteorological environment.

It is noted in the INP that in the case of assessment under temperature inversion conditions *"...for residents downhill from the source a drainage-wind-flow wind speed of 2 m/s also applies."(INP, 2000).* In this assessment the area surrounding the site is relatively flat and no residential receiver locations are located at an elevation lower than the subject site. As a result, drainage wind associated with a temperature inversion has not been included in the assessment.

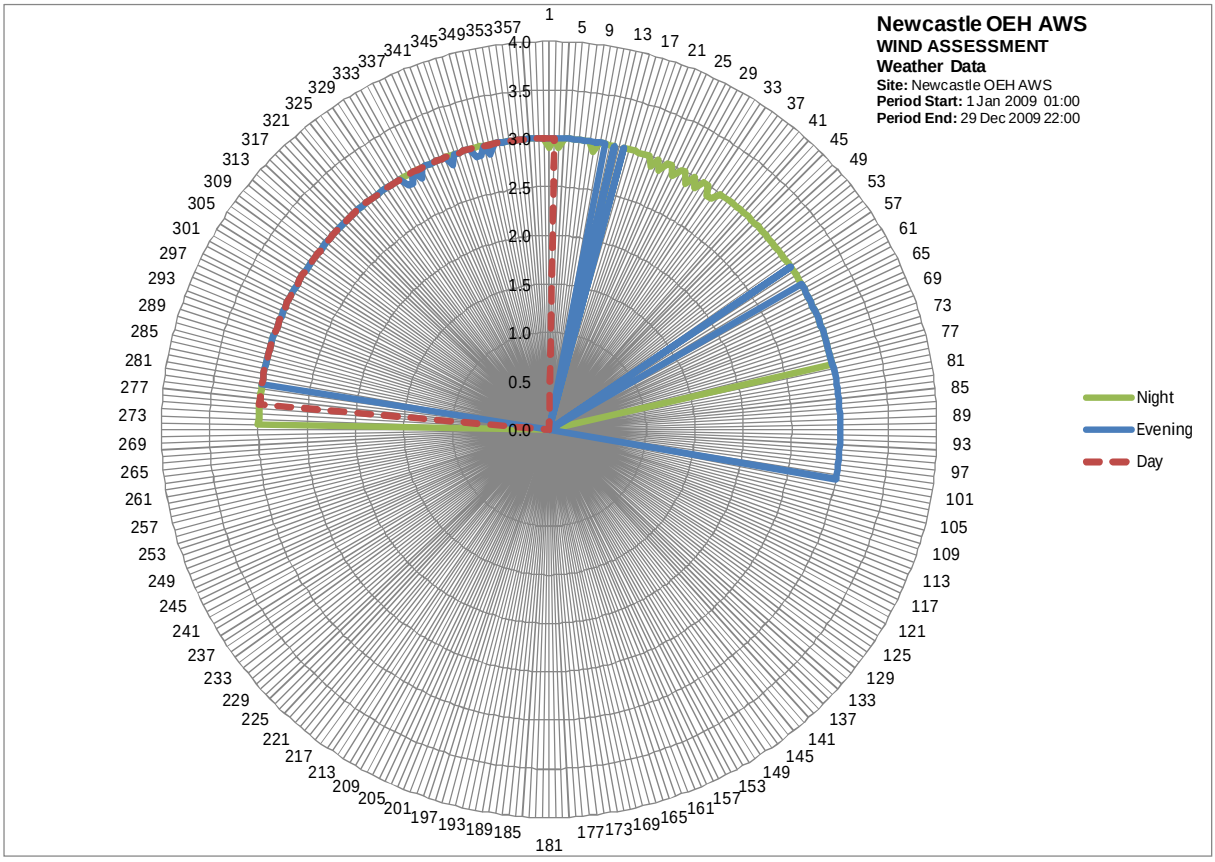
4.2.3.2 Prevailing Wind Conditions

The INP considers wind effects to be assessed when source-to-receiver wind speeds of 3 m/s or below occur for at least 30% of the assessment period in any season. The assessment of wind affected receivers has been done in accordance with *"Procedure to estimate the frequency of wind conditions that enhance noise levels",* produced by EPA October 2009.

The INP requires wind effects to be modelled at the highest measured wind speed. For all locations, receivers that are wind affected have been modelled at 3 m/s, this represents a conservative approach. A summary of the modelling requirements is provided graphically in **Figure 3**. **Appendix E** presents the results of the worst case wind assessment for the Facility site. It presents the directions for which receivers have to be assessed as wind affected. **Appendix E** presents the direction that the wind will come from, and so only residents that lie 180 degrees from this wind direction are required to be assessed as wind affected. It can be noted that based on

the location of the receivers in Carrington and Mayfield they would be considered wind affected based upon the prevailing meteorological conditions.

Figure 3 INP Wind Assessment for Weather Data from EPA Newcastle AWS



4.2.4 Assessment Conditions

Noise levels have been predicted at the noise sensitive receptors based on:

1) Neutral atmospheric conditions i.e. relatively calm, no temperature inversion;
2) Adverse atmospheric conditions i.e. F-Class temperature inversion (3˚C/100 m); and
3) Adverse wind conditions i.e. 3 m/s source to receiver wind.

4.2.5 Modelled Operational Scenarios

4.2.6 Reasonable Worst Case Intrusiveness Scenarios (15 minute period)

The following are the modelled reasonable worst case intrusiveness scenarios (15 minute period). It is expected that these scenarios could occur during the day, evening or night.

4.2.6.1 Scenario 1 – All trucks filling throughout the 15 minute period

1) Four B-Double trucks in the facility (Day/Evening period), three B-Double trucks in the facility (Night period);
2) Maximum of six motor/pumps combinations operating throughout the period during the filling operations;
3) Each tank takes approximately 7 minutes to fill (i.e. assume 15 minutes per B-Double truck during period);
4) Two trucks move down the approach road at approximately 40 km/h and arrive at the site, stop with airbrake release, and idle for 5 minutes at the entrance gate of the Facility. Consideration for the onsite speed and the usage of airbrakes at the Facility has been included in the modelling;

5) Compressor shed operating with compressor 1 and 3, and gas discharge operating throughout period; and

6) Office plant are operating throughout period, 5 condenser units were noted on the south-western façade of the office building.

4.2.6.2 Scenario 2 (Evening) - One truck filling during 15 minute period, three trucks arrive and three leave the facility

1) One B-Double truck in the facility filling throughout the 15 minute period;

2) Each tank takes approximately 7 minutes to fill (i.e. assume 15 minutes per B-Double truck during period);

3) Two pumps operating for 15 minutes each during period;

4) Three B-Double trucks pump for 5 minutes and then leave the Facility. Three sets (six pumps in total) of pumps operating for 5 minutes each during the period;

5) Two trucks move down the approach road at approximately40 km/h and arrive at the site, and idle for 5 minutes at the entrance gate of the Facility, then enter facility, with associated gate beeper and airbrakes;

6) Two trucks leave the facility, with associated gate beeper, and leave down the facility access road at approximately 40 km/h;

7) Consideration for the onsite speed and the usage of airbrakes at the Facility has been included in the modelling;

8) Compressor shed operating with Compressor 1 and 3 operating, and gas discharge operating throughout period; and

9) Office plant are operating throughout period, 5 condenser units operating on the south-western façade of the office building.

4.2.6.3 Scenario 2 (Night) - One truck filling during 15 minute period, two trucks arrive and two leave the facility

1) One B-Double truck in the facility filling throughout the 15 minute period;

2) Each tank takes approximately 7 minutes to fill (i.e. assume 15 minutes per B-Double truck during period);

3) Two pumps operating for 15 minutes each during period;

4) Two B-Double trucks pump for 5 minutes and then leave the Facility. Four pumps operating for 5 minutes each during period;

5) Two trucks move down the approach road at approximately40 km/h and arrive at the site, and idle for 5 minutes at the entrance gate of the Facility, then enter facility, with associated gate beeper and airbrakes;

6) Two trucks leave the facility, with associated gate beeper, and leave down the facility access road at approximately 40 km/h;

7) Consideration for the onsite speed and the usage of airbrakes at the Facility has been included in the modelling;

8) Compressor shed operating with Compressor 1 and 3 operating, and gas discharge operating throughout period; and

9) Office plant are operating throughout period, 5 condenser units operating on the south-western façade of the office building.

4.2.7 Reasonable Worst Case Amenity Scenarios

The following are the modelled whole of period scenarios based upon on-site observations. All noise sources in the model were assumed to operate as per the points below:

1) Each truck using the facility is a B-Double;

2) Two motor/pumps combinations are used to fill each tank;

3) Each B-Double tank takes 6 minutes to fill (i.e. 12 minutes per B-Double truck);

4) Each truck idles for a total of 5 minutes on site;

5) Trucks move down the approach road at approximately 40 km/h and arrive at the site;

6) The operation of the entrance and exit gate is associated with each truck movement through the Facility;

7) Consideration for the onsite speed and the usage of airbrakes at the Facility has been included in the modelling; and

8) The proposed maximum truck movements are presented in **Table 22**, these were included in the modelling considering the above assumptions;

Table 22 Trucks Movements (SSD_6664 MOD 1)

Trucks Movements	DAY (7am-6pm)	EVENING (6pm-10pm)	NIGHT (10pm-7am)	TOTAL
Trucks through the facility in each period	**176**	**64**	**60**	**300**

9) Usage of the pump/motors is distributed throughout available pumps;

10) Compressor shed operating with Compressor 1 and 3 operating, and gas discharge operating throughout period; and

10) Office plant are operating throughout period, 5 condenser units operating on the south-western façade of the office building.

4.3 Operational Noise Assessment

The results of the environmental noise emissions during normal operations, temperature inversion and prevailing wind conditions, from the Facility have been predicted to nearby representative receiver locations.

The predicted noise levels presented in **Table 23** - **Table 25** have been assessed against the INP amenity criteria and the predicted noise levels presented in **Table 26** and **Table 27** have been assessed against the INP intrusiveness criteria. Noise contour maps for both assessments showing the impacts with neutral meteorological conditions and the worst case prevailing meteorological conditions are presented in **Appendix D**.

4.3.1 Predicted Operational Noise Levels

4.3.1.1 Reasonable Worst Case Amenity Scenario – Daytime

Table 23 Noise Contribution at Representative Receiver Locations during Night-time Operational Conditions – Amenity Criteria - Daytime

Receiver	Criterion	Neutral		Temperature Inversion (F-Class, 3˚C/100 m)		3 m/s Source to Receiver Wind	
		Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance	Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance	Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance
R1	60	29	-	32	-	33	-
R2	60	32	-	34	-	35	-
R3	60	31	-	34	-	35	-
R4	60	38	-	41	-	42	-
R5	60	37	-	40	-	41	-
R6	60	38	-	41	-	42	-
R7	60	30	-	33	-	34	-
R8	57	22	-	25	-	26	-

Receiver	Criterion	Neutral		Temperature Inversion (F-Class, 3˚C/100 m)		3 m/s Source to Receiver Wind	
		Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance	Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance	Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance
R9	52	19	-	24	-	23	-
R10[1,2]	45	35	-	38	-	38	-
R11	65	36	-	40	-	40	-
R12	70	41	-	44	-	45	-

Notes:

1) In the INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

2) The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night-time noise levels at the school have been assessed against the school criteria to determine the noise impact.

4.3.1.2 Reasonable Worst Case Amenity Scenario – Evening

Table 24 Noise Contribution at Representative Receiver Locations during Night-time Operational Conditions – Amenity Criteria - Evening

Receiver	Criterion	Neutral		Temperature Inversion (F-Class, 3˚C/100 m)		3 m/s Source to Receiver Wind	
		Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance	Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance	Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance
R1	47	29	-	33	-	34	-
R2	47	32	-	35	-	36	-
R3	47	31	-	35	-	35	-
R4	55	38	-	42	-	42	-
R5	55	37	-	41	-	42	-
R6	55	38	-	41	-	42	-
R7	47	30	-	34	-	35	-
R8	44	22	-	27	-	28	-
R9	42	19	-	25	-	25	-
R10[1,2]	-	35	-	39	-	39	-
R11	65	36	-	40	-	41	-
R12	70	41	-	44	-	45	-

Notes:

1) In the INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

2) The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night-time noise levels at the school have been assessed against the school criteria to determine the noise impact.

4.3.1.3 Reasonable Worst Case Amenity Scenario – Night

Table 25 Noise Contribution at Representative Receiver Locations during Night-time Operational Conditions – Amenity Criteria - Night

Receiver	Criterion	Neutral		Temperature Inversion (F-Class, 3˚C/100 m)		3 m/s Source to Receiver Wind	
		Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance	Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance	Predicted Noise Level, $L_{Aeq\ (Period)}$, dB(A)	Exceedance
R1	37	26	-	30	-	30	-
R2	37	28	-	31	-	32	-
R3	37	28	-	31	-	32	-
R4	52	34	-	38	-	39	-
R5	52	33	-	37	-	38	-
R6	52	34	-	38	-	38	-
R7	37	27	-	30	-	31	-
R8	37	18	-	24	-	24	-
R9	42	15	-	22	-	21	-
R10[1,2]	-	31	-	35	-	36	-
R11	65	32	-	37	-	37	-
R12	70	37	-	41	-	41	-

Notes:

1) In the INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

2) The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night-time noise levels at the school have been assessed against the school criteria to determine the noise impact.

4.3.1.4 Reasonable Worst Case Intrusiveness Scenarios

Table 26 Reasonable Worst Case Night-time Intrusiveness Scenario (15 minute period) - Scenario 1 - Three trucks filling during 15 minute period

Assessed Meteorological Condition	Neutral					3 m/s Source to Receiver Wind					Temperature Inversion (F-Class, 3˚C/100 m)				
Receiver	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Day Criteria dB(A)	Evening Criteria dB(A)	Night Criteria dB(A)	Exceedance, dB(A)	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Day Criteria dB(A)	Evening Criteria dB(A)	Night Criteria dB(A)	Exceedance, dB(A)	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Day Criteria dB(A)	Evening Criteria dB(A)	Night Criteria dB(A)	Exceedance, dB(A)
R1	26	48	43	42	-	30	48	43	42	-	30	48	43	42	-
R2	27	48	43	42	-	31	48	43	42	-	31	48	43	42	-
R3	27	48	43	42	-	31	48	43	42	-	30	48	43	42	-
R4	36	48	43	42	-	41	48	43	42	-	40	48	43	42	-
R5	35	48	43	42	-	41	48	43	42	-	40	48	43	42	-
R6	35	48	43	42	-	40	48	43	42	-	39	48	43	42	-
R7	28	48	43	42	-	33	48	43	42	-	32	48	43	42	-
R8	20	49	48	44	-	25	49	48	44	-	25	49	48	44	-
R9	16	52	51	51	-	22	52	51	51	-	22	52	51	51	-
R10	32	45	-	-	-	37	45	-	-	-	37	45	-	-	-
R11	34	65	65	65	-	40	65	65	65	-	39	65	65	65	-
R12	40	70	70	70	-	44	70	70	70	-	43	70	70	70	-

Notes:

1) In the INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

2) The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night-time noise levels at the school have been assessed against the school criteria to determine the noise impact.

Table 27 Reasonable Worst Case Day/Evening-time Intrusiveness Scenario (15 minute period) - Scenario 2 - One trucks filling during 15 minute period, three trucks arrive and three leave the facility –Worst Meteorological Conditions

Assessed Meteorological Condition	Neutral				3 m/s Source to Receiver Wind				Temperature Inversion (F-Class, 3˚C/100 m)			
Receiver	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Day Criteria dB(A)	Evening Criteria dB(A)	Exceedance, dB(A)	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Day Criteria dB(A)	Evening Criteria dB(A)	Exceedance, dB(A)	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Day Criteria dB(A)	Evening Criteria dB(A)	Exceedance, dB(A)
R1	28	48	43	-	32	48	43	-	33	48	43	-
R2	30	48	43	-	34	48	43	-	34	48	43	-
R3	30	48	43	-	33	48	43	-	34	48	43	-
R4	36	48	43	-	39	48	43	-	40	48	43	-
R5	35	48	43	-	39	48	43	-	40	48	43	-
R6	36	48	43	-	39	48	43	-	40	48	43	-
R7	29	48	43	-	33	48	43	-	33	48	43	-
R8	21	49	48	-	26	49	48	-	26	49	48	-
R9	18	52	51	-	24	52	51	-	24	52	51	-
R10	33	45[1]	-	-	37	45[1]	-	-	37	45[1]	-	-
R11	34	65	65	-	38	65	65	-	39	65	65	-
R12	38	70	70	-	42	70	70	-	42	70	70	-

Notes:

1) In the INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

2) The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night-time noise levels at the school have been assessed against the school criteria to determine the noise impact.

Table 28 Reasonable Worst Case Night-time Intrusiveness Scenario (15 minute period) - Scenario 2 - One trucks filling during 15 minute period, two trucks arrive and two leave the facility –Worst Meteorological Conditions

Assessed Meteorological Condition	Neutral			3 m/s Source to Receiver Wind			Temperature Inversion (F-Class, 3˚C/100 m)		
Receiver	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Night Criteria dB(A)	Exceedance, dB(A)	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Night Criteria dB(A)	Exceedance, dB(A)	Predicted noise level, $L_{Aeq\ (15\ min)}$, dB(A)	Night Criteria dB(A)	Exceedance, dB(A)
R1	27	42	-	31	42	-	31	42	-
R2	29	42	-	32	42	-	33	42	-
R3	28	42	-	32	42	-	32	42	-
R4	34	42	-	38	42	-	39	42	-
R5	34	42	-	38	42	-	38	42	-
R6	34	42	-	38	42	-	39	42	-
R7	28	42	-	31	42	-	32	42	-
R8	19	44	-	25	44	-	25	44	-
R9	16	51	-	23	51	-	22	51	-
R10[1]	32	-	-	36	-	-	36	-	-
R11	33	65	-	37	65	-	38	65	-
R12	37	70	-	40	70	-	41	70	-

Notes:

1) The noise impacts on schools are to be assessed during school hours, and so noise impacts are shown but no criterion associated.

4.3.2 Tonality and INP Modifying Factors

4.3.2.1 Tonality

The two potential sources of tonal noise from operations at the site are the fuel pump/motor operations and the gate opening and closing alarms.

A screening test has been applied to fuel pump/motor source level, which is presented in **Appendix F**. The measured levels presented in **Appendix F** show that the fuel/pump motor is not tonal at the source, and as such they will not be tonal when the noise propagates to nearby receiver locations.

While the gate opening and closing alarms were measured by AECOM on 28 July 2014. The gate operates at 3.15 kHz with a sound power level of 108 dB(A), as presented in **Table 20**.

Reviewing the predicted noise levels from the gate alarm to the receiver with the highest contribution from the alarm (2 Crebert St, Mayfield), it is found that over an intrusive assessment period the contribution is less than 5 dB(A), while the maximum instantaneous contribution is 9 dB(A) (i.e. 10 dB unweighted). As shown in **Appendix F**, the existing background noise level at the 3.15 kHz third-octave band at 2 Crebert St, Mayfield is 18 dB. As such, this will meet the tonality requirements of the INP.

4.3.2.2 Impulsiveness/Intermittent

The compressor discharge located in the compressor shed on the south-west side of the site is a potential source of impulsiveness and intermittent noise.

Its noise source level and on/off intervals was measured by AECOM on 28 July 2014.

Reviewing the predicted noise levels from the compressor discharge the contribution at nearest receiver locations in Mayfield is 22/23 dB(A), with the maximum instantaneous contribution being 25/26 dB(A). As such, these predicted noise levels are more than 10 dB(A) below the existing background noise levels as presented in **Table 11**. The resulting noise level at the receiver locations would meet the impulsiveness and intermittent requirements of the INP.

None of the other proposed noise sources to be operated at the Facility contain characteristics that may results in impulsiveness, intermittency, irregularity or dominant low-frequency content noise levels in accordance with the INP.

It should be again noted that as a result of the design of the Facility, at no stage are t trucks required to reverse, and as such are not a potential source of tonal noise from typical operations at the site.

4.3.3 Results of the Operational Noise Assessment

The predicted operational industrial noise levels presented in **Table 23** - **Table 27** indicate that compliance is predicted under neutral and prevailing meteorological conditions at all assessment locations during all assessment periods against the INP requirements.

4.4 Sleep Disturbance

The application notes for the EPA *Industrial Noise Policy* (2000) recommend that sleep disturbance is assessed based on the emergence of the $L_{A1\ (1\ minute)}$ noise level over the corresponding $L_{A90\ (15\ minute)}$ noise level.

The following screening criterion for sleep disturbance is recommended for the assessment of sleep disturbance:

$$L_{A1\ (1\ minute)} < L_{A90\ (15\ minute)} + 15\ dB(A)$$

The noise sources with the greatest potential for causing sleep disturbance are the operations of the trucks airbrakes when they entering the site and the gate opening alarm.

The predicted $L_{A1\ (1\ minute)}$ noise levels have been based upon attended measurements undertaken by AECOM at the site in July 2014.

It should be noted that due to the design of the facility, trucks are not required to reverse as part of any of the fuel terminal operations, and as such are not required to use a reversing beeper at the fuel terminal.

The results of this assessment are shown in **Table 29**, and show that the recommended noise criterion is not exceeded at any residential receiver location.

The night-time sleep disturbance assessment has been undertaken against the most stringent meteorological condition. As such predicted noise levels for 3 m/s source to receiver winds and F-Class temperature inversion has been predicted for all receiver locations and as the noise levels are generally higher for the 3 m/s source to receiver winds situation, only these results have been presented. The results are presented in Table 29. Noise contour maps are provided in **Appendix D**.

The 900 m separation between the site and the nearest residential receivers means that the maximum external noise levels are not predicted to exceed 51 dB(A) due to the night-time operations of the Facility. Therefore, the assessment indicates compliance with the sleep disturbance screening criterion at all assessment locations during the night-time period.

Table 29 $L_{A1\ (1\ minute)}$ Noise Contribution at Representative Sensitive Receiver Locations during Night-time Operational Conditions

Receiver	Criterion	Predicted $L_{A1\ (1\ minute)}$ with 3 m/s Source to Receiver Winds	Exceedance
R1	52	44	-
R2	52	48	-
R3	52	49	-
R4	52	49	-
R5	52	47	-
R6	52	51	-
R7	52	48	-
R8	54	33	-
R9	61	30	-

Notes:

1) Only residential receivers require assessment for sleep disturbance.

4.5 Cumulative Noise Impacts of Concurrent Operational Activities

The following section presents an assessment of the cumulative noise impacts associated with the operation of the project and other approved nearby port and industrial operations.

Table 30 presents that addition of existing industrial noise levels along with known approved nearby developments to consider the overall cumulative industrial noise level at nearby receiver locations during the night period. The night period has been assessed, as it is has the most stringent criterion.

Table 30 Predicted Noise Levels due to Concurrent Industrial Noise Emissions and Operations of the Facility – Night period

Receiver Location	Existing Industrial Ambient Noise Level[1]	Predicted Operational Noise Levels from the Facility (Worst Case Meteorological, L_{Aeq} Intrusive Scenario)	Cumulative Noise Level including the Facility
R1	45	31	45
R2	45	32	45
R3	45	32	45
R4	45[2]	41	46
R5	45[2]	41	46
R6	45[2]	40	46
R7	45	33	45
R8	47	25	47
R9	47[2]	23	47
R10	45	37	46
R11	45	40	46
R12	-	44	-

Notes:

1) Existing industrial noise levels presented in **Table 11** have been adopted using the associated receiver areas presented in **Table 1**.

2) The existing measured levels presented in **Table 7** show that at Stockton and Mayfield (ie. 2 Crebert St, Mayfield) the industrial contribution is higher than the above, however, for consistency with previous assessments, the same industrial contribution has been used in the cumulative assessment as a conservative approach.

It is noted that the Independent Cement and Lime Pty Ltd (ICL) cement terminal has been approved, and is located within the Mayfield Concept Plan land area. However, it is understood that the proponent is not planning to proceed with the development at this point in time. As such, this has not been included in the cumulative noise impacts presented in **Table 30**.

Table 30, presents the predicted operational noise levels from the Facility at nearby receiver locations, and shows that the maximum increase as a result of the facility is 1 dB(A) at some receiver locations in Mayfield, and less than 1 dB(A) at all other locations.

As presented in **Table 7**, the existing industrial contributions can be at least 5 dB(A) higher at some of the Mayfield receiver locations, and so the industrial contributions used for this assessment are considered conservative. Additionally, it should be noted that predicted results presented in **Table 30** are under worst case meteorological conditions, and under neutral meteorological conditions the predicted noise impacts are 4-5 dB(A) less than those presented in **Table 30**.

As such, these increases presented in **Table 30** can be considered worst case and conservative. It is noted that a 1 dB(A) increase can be considered negligible noting that 3 dB(A) is typically a “just-noticeable” change in noise level, and as such this increase would not result in any noticeable increase in noise level.

As such the Facility noise emissions are predicted not to noticeably increase the existing industrial noise levels at nearby receiver locations.

It should be noted that separately the Mayfield Concept Plan Approval aims to address cumulative noise impacts from the entire Mayfield Concept Plan area as it is developed over time, see **Section 4.7** below.

4.6 Fuel Ship/Tanker Assessment

Ship/tankers operating in association with the bulk fuel facility will be docked at Mayfield Berth No.4 and pump fuel via the pipeline into storage tanks at the Facility.

A as part of the NSW Planning and Environment Secretary's Environmental Assessment Requirements, Stolthaven Fuel Terminal, Mayfield (SSD-6664), dated 19 September 2014, noise levels from associated shipping operations is to be assessed. As such, ship/tankers operations have been assessed as part of this assessment separately. This assessment of ship noise has been kept in this assessment for consistency with the original SSD approval.

It is assumed that ship will be at berth for an extended period of time when operating, and as such the noise levels have not been corrected for duration for any of the time periods.

The predicted operational noise levels from fuel/ship tankers when at berth are presented in **Table 31**.

The results indicate that the predicted noise levels from the ship alone will comply with criteria under neutral and prevailing meteorological conditions at all assessment locations during all assessment periods.

4.6.1.1 Fuel Ship/Tanker Assessment

Table 31 Fuel Ship/Tanker Assessment

Receiver	Predicted ship noise level (Quieter, -1σ) , $L_{Aeq\ (15\ min)}$, dB(A)	Predicted ship noise level (Louder, 1σ) , $L_{Aeq\ (15\ min)}$, dB(A)	Day Intrusive Criteria dB(A)	Evening Intrusive Criteria dB(A)	Night Intrusive Criteria dB(A)	Day Amenity Criteria dB(A)	Evening Amenity Criteria dB(A)	Night Amenity Criteria dB(A)	Exceedance, dB(A)
Assessed Meteorological Condition - Neutral									
R1	17	24	48	43	42	60	47	37	-
R2	19	25	48	43	42	60	47	37	-
R3	20	26	48	43	42	60	47	37	-
R4	22	28	48	43	42	60	55	52	-
R5	21	28	48	43	42	60	55	52	-
R6	21	28	48	43	42	60	55	52	-
R7	18	25	48	43	42	60	47	37	-
R8	20	27	49	48	44	57	44	37	-
R9	18	25	52	51	51	52	42	42	-
R10	17	24	45	-	-	45	-	-	-
R11	21	27	65	65	65	65	65	65	-
R12	17	23	70	70	70	70	70	70	-

Receiver	Predicted ship noise level (Quieter, -1σ), $L_{Aeq\ (15\ min)}$, dB(A)	Predicted ship noise level (Louder, 1σ), $L_{Aeq\ (15\ min)}$, dB(A)	Day Intrusive Criteria dB(A)	Evening Intrusive Criteria dB(A)	Night Intrusive Criteria dB(A)	Day Amenity Criteria dB(A)	Evening Amenity Criteria dB(A)	Night Amenity Criteria dB(A)	Exceedance, dB(A)
Assessed Meteorological Condition - Worst metrological condition (3 m/s source to receiver wind)									
R1	23	30	48	43	42	60	47	37	-
R2	24	30	48	43	42	60	47	37	-
R3	25	32	48	43	42	60	47	37	-
R4	26	33	48	43	42	60	55	52	-
R5	26	32	48	43	42	60	55	52	-
R6	26	33	48	43	42	60	55	52	-
R7	23	30	48	43	42	60	47	37	-
R8	25	32	49	48	44	57	44	37	-
R9	24	30	52	51	51	52	42	42	-
R10	22	29	45	-	-	45	-	-	-
R11	26	32	65	65	65	65	65	65	-
R12	22	28	70	70	70	70	70	70	-

Notes:

1) In the INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

2) The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night-time noise levels at the school have been assessed against the school criteria to determine the noise impact.

4.7 Mayfield Concept Plan Noise Management Framework Contribution

As outlined in **Section 3.2**, the Project lies within the Mayfield Concept Plan (MCP) site and the current site approval requires that the site meet the requirements of the MCP approval. The MCP approval aims to address cumulative noise impacts from all sites that make up the entire MCP area, with a purpose of addressing cumulative noise impacts as the concept area is developed over time. PON is in the process of developing and implementing a Cumulative Environmental Noise Management Tool (CENMT) for the MCP, as such no quotas have been issued for this assessment.

It is envisaged that this system will involve, that for any proposed development within the MCP area, the available noise criteria for the entire MCP area will be proportionally distributed (i.e. noise quotas) amongst all future developments. When lodgement or notification of a new development is received by PON, a noise quota allocation will be provided to the proposed development site that will become the cumulative amenity noise quota that they should meet. As such, following the submission of this assessment the noise impacts will be reviewed by PON and recommendations provided to meet the requirements of the MCP CENMT.

Upon completion and approval of a methodology for assessing cumulative noise impacts from the MCP area, the Cumulative Environmental Noise Management Tool (CENMT), input from the predicted noise levels of this assessment are to be provided so that the noise contribution from the Facility can be included in the MCP cumulative noise map.

Presented in **Table 32** are the noise levels that are to be included in the assessment of suitability within the Mayfield Concept Plan, which are to be reviewed by PON. No predicted noise level in this assessment exceeds the overall MCP Amenity Noise Goals presented in Table 14.

It should be noted that these noise levels do not include shipping operations, as in accordance with the Mayfield Concept Plan approval MP 09_0096.

These results have been reported with the worst case meteorological conditions as required by the Concept Plan approval MP 09_0096.

Table 32 Predicted MCP Cumulative Noise Impact – Stolthaven Mayfield Terminal

Receiver	Predicted Noise Impact, $L_{Aeq, period}$ dB(A)		
	Day	Evening	Night
A - 1 Arthur St, Mayfield	33	34	30
B - 2 Crebert St, Mayfield	42	42	39
C – 32 Elizabeth Street, Carrington	24	26	22
D – Stockton	23	25	21

4.8 Operational Road Traffic Noise Assessment

The existing traffic flows were determined from Roads and Maritime Services on NSW (Roads and Maritime) permanent count station, Station No. 05.953, located Mayfield West, west of Woodstock Street. It is proposed that the site will generate a maximum of 300 truck movements per day as a result of the proposed throughput increase. Potential maximum traffic generation from the site is presented in **Table 38**, while the existing traffic movements on Industrial Drive, Mayfield are presented in **Table 34**. Traffic on surrounding roads would be altered as detailed in **Table 36** as a result of the Facility.

Table 33 Potential Traffic Generation

Bulk Fuel Facility	Adopted Rates and Movements
Road delivery movements	SSD (MOD 1) TOTAL: 300 tanker movements per day
Staff/Visitor movements	SSD (MOD 1) 14 light vehicle movements per day
Project trip total	SSD (MOD 1) 314 vehicle movements per day

Table 34 Roads and Maritime Traffic Count for Industrial Drive, Mayfield (RMS, 2005)

Station Number	Location	1995	1998	2001	2004
05.953	Mayfield Nth-West Of Woodstock St	29,746	29,549	30,334	30,717

The existing traffic flows were determined from the most recent published Roads and Maritime Service permanent count station data for Station No. 05.953, located Mayfield West, west of Woodstock Street which is located 1.4 km to the west of the location of the access road at the intersection of Industrial Drive and Ingall Street. It is proposed that the site will generate 314 movements per day as a direct result of the project. The impacts of the resulting traffic on surrounding roads are as detailed in **Table 35**.

To breakdown the existing traffic numbers into 15 hour (7:00 am – 10:00 pm) and 9 hour (10:00 pm – 7:00 am) periods, a breakdown traffic counts provided by the Roads and Maritime has been used, and is presented in **Table 35**. The traffic counts were undertaken by Roads and Maritime at Industrial Drive, Mayfield, 150 m North of George Street between the period of 2 September 2011 and 20 September 2011. The total average weekday (Monday – Friday) traffic count over this measurement period was 29,856 vehicles.

Table 35 Industrial Drive, Mayfield Day/Night Traffic Breakdown, Roads and Maritime, period of 2 September 2011 and 20 September 2011

Period	Average Period Weekday Traffic Count	Percentage of Daily Traffic Number, %
150 m North Of George St, Industrial Drive, Mayfield		
Day (7:00 am – 10:00 pm)	26,238	87.9
Night (10:00 pm – 7:00 am)	3,618	12.1

Table 36 Summary of Traffic Flow Increase

Location	Existing Traffic Numbers[1]	Existing Traffic Noise Levels[3]	Calculated Existing Traffic Numbers Breakdown[5]	Nett Increase	% Increase	Increase in Noise Levels, dB(A)
Industrial drive, Mayfield Station No. 05.953	30,717	70 dB(A) $L_{Aeq\ (15hr)}$	27,000	166[2]	0.6	<1
		66 dB(A) $L_{Aeq\ (9hr)}$	3,717	48[2]	1.3	<1

Notes:

1) Traffic numbers are based upon the Traffic Volume Data for Hunter and Northern Regions 2004, produced by the Roads and Maritime.

2) This is the worst case scenario where all traffic movements from the site head in the same direction from the site along Industrial Drive, Mayfield, and this is based upon the lowest annual average traffic flow numbers on Industrial Drive in proximity of the site.

3) Measured by AECOM at 118 Woodstock Street, Mayfield between 29 July 2014 and 4 August 2014.

4) It is assumed that all light vehicle movements occur during 7:00 am – 10:00 pm.

5) Breakdown calculated based upon the percentages presented in **Table 35**.

Predicted traffic noise increases on roads surrounding the proposed development have been predicted to be less than 1 dB(A) for the completed Facility following the increase in throughput based upon the estimated daily vehicle movements presented in **Table 41**. The existing traffic noise levels along Industrial Drive, Mayfield were measured by AECOM at 118 Woodstock Street, Mayfield between 29 July 2014 and 4 August 2014. Even though the existing traffic noise levels exceed the recommended traffic noise criteria in accordance with the RNP, the increase in traffic noise as a result of traffic from the project site would not have a noticeable impact on sensitive receivers adjacent to Industrial Drive, Mayfield, and it would not be reasonable or feasible to provide noise mitigation measures as the worst case traffic noise increase from the project site would not be noticeable to nearby receiver locations.

5.0 Conclusion

This report presents the results of an assessment of the potential noise and vibration impacts of the proposed increase in annual throughput from 1,010 ML to 1,300 ML at the Facility operated by Stolthaven at the Port of Newcastle, NSW.

AECOM has prepared this noise and vibration impact assessment to support the SEE prepared on behalf of Stolthaven for the State Significant Development (SSD) 6664 (MOD 1) application for the Facility at Mayfield, NSW. The Site is seeking approval to increase its capacity to receive, store and distribute diesel and biodiesel for customers throughout the Hunter Region.

The following outlines the findings of this assessment.

Operational Noise and Vibration

The operational environmental noise emission criteria for the development are quantified in **Section 3.0** of this report and have been established to comply with the EPA's Industrial Noise Policy (INP, 2000).

The operational noise impact assessment indicates compliance under neutral and prevailing meteorological conditions at all assessment locations during the daytime, evening and night-time periods.

The results of this assessment assume that the equipment installed produce noise levels similar or less than those shown in **Section 4.0.**

The operations of associated fuel ships/tanker have been assessed separately as these operations fall under a separate approval condition. The individual impacts from fuel ship/tanker operations have been show compliance under neutral and prevailing meteorological conditions at all assessment locations during the daytime, evening and night-time periods.

No items of plant and equipment used in operation of the project site are expected to generate significant levels of vibration and the nearest residential (vibration sensitive) receivers are located approximately 900 m from the Facility, therefore, operational vibration impacts are consequently expected to be negligible.

Sleep Disturbance

A sleep disturbance assessment has been conducted, and indicates compliance at all assessment locations during the night-time period.

Cumulative Noise Impacts

An assessment of the cumulative operational noise impacts from other industrial sites nearby to the project site in addition to the project site was undertaken to determine the total noise exposure of nearby receivers. The assessment has found that based upon the predicted noise levels the Facility noise emissions are predicted not to noticeably increase the existing industrial noise levels at nearby receiver locations.

Mayfield Concept Plan Noise Management Framework Contribution

The Project lies within the Mayfield Concept Plan (MCP) site and the current site approval requires that the site meet the requirements of the MCP Approval. The MCP site requires the consideration of all future development when assessing noise impacts.

PON is in the process of developing and implementing a Cumulative Environmental Noise Management Tool (CENMT), which includes the development of a Site Noise Model as required by Condition 2.16 of the Mayfield Concept Plan approval, to take into consideration all existing and future development to determine the applicable noise quotas for individual sites within the MCP area. These overall noise criteria for the entire MCP site are presented in **Table 14**. No specific quotas have been provided to Stolthaven for assessment of the current proposal. Predicted amenity noise emission levels have been as presented in **Section 4.7** for review and recommendation by PON following the finalisation of the CENMT.

Upon finalisation of the CENMT, noise levels from the operations of the Facility which are presented in **Table 32,** are to be reviewed by PON. Following this review, and any recommendations, noise contributions from the Facility will then be included in the MCP cumulative noise map, and compliance with the allocated noise limits for the Facility determined.

Road Traffic Noise

The operational road traffic noise assessment was conducted in accordance with EPA's RNP guideline.

The road traffic noise assessment associated with operations of the Facility indicates compliance with RNP acoustic criteria.

Appendix A

Acoustic Terminology

Appendix A Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	Sound power level is the total sound energy produced by a sound source.
Sound pressure level	Sound pressure level is the portion of sound energy at a point a distance from the sound source.
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:
	0dB(A) Threshold of human hearing
	30dB(A) A quiet country park
	40dB(A) Whisper in a library
	50dB(A) Open office space
	70dB(A) Inside a car on a freeway
	80dB(A) Outboard motor
	90dB(A) Heavy truck pass-by
	100dB(A) Jackhammer/Subway train
	110 dB(A) Rock Concert
	115dB(A) Limit of sound permitted in industry
	120dB(A) 747 take off at 250 metres
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
L_{max}	The maximum sound pressure level measured over the measurement period
L_{min}	The minimum sound pressure level measured over the measurement period
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.
L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.

Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L90 sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 “Acoustics – Glossary of terms and related symbols”, the EPA’s NSW Industrial Noise Policy and the EPA’s Road Noise Policy.

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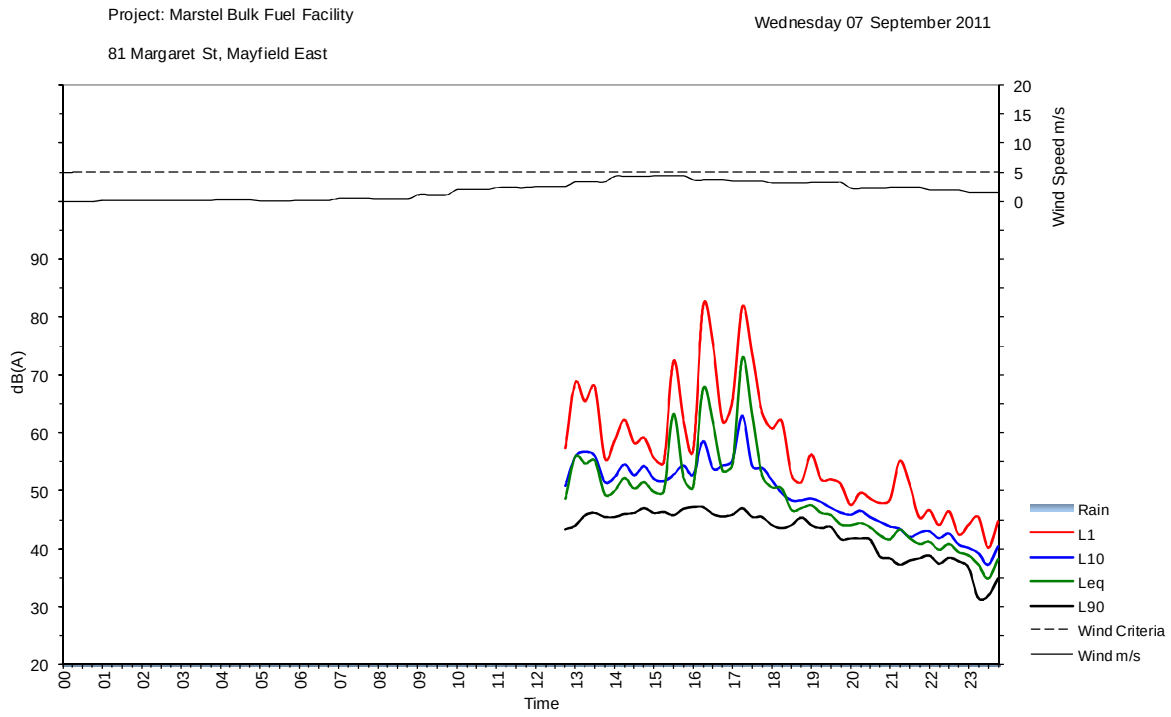
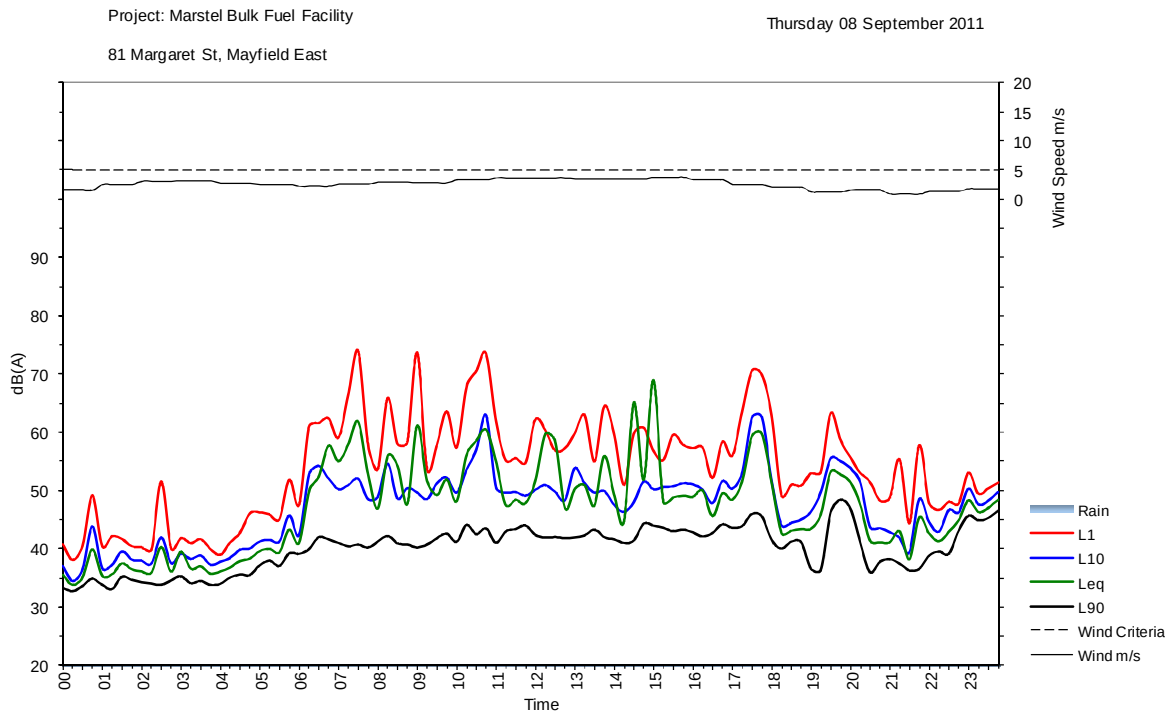
Appendix B

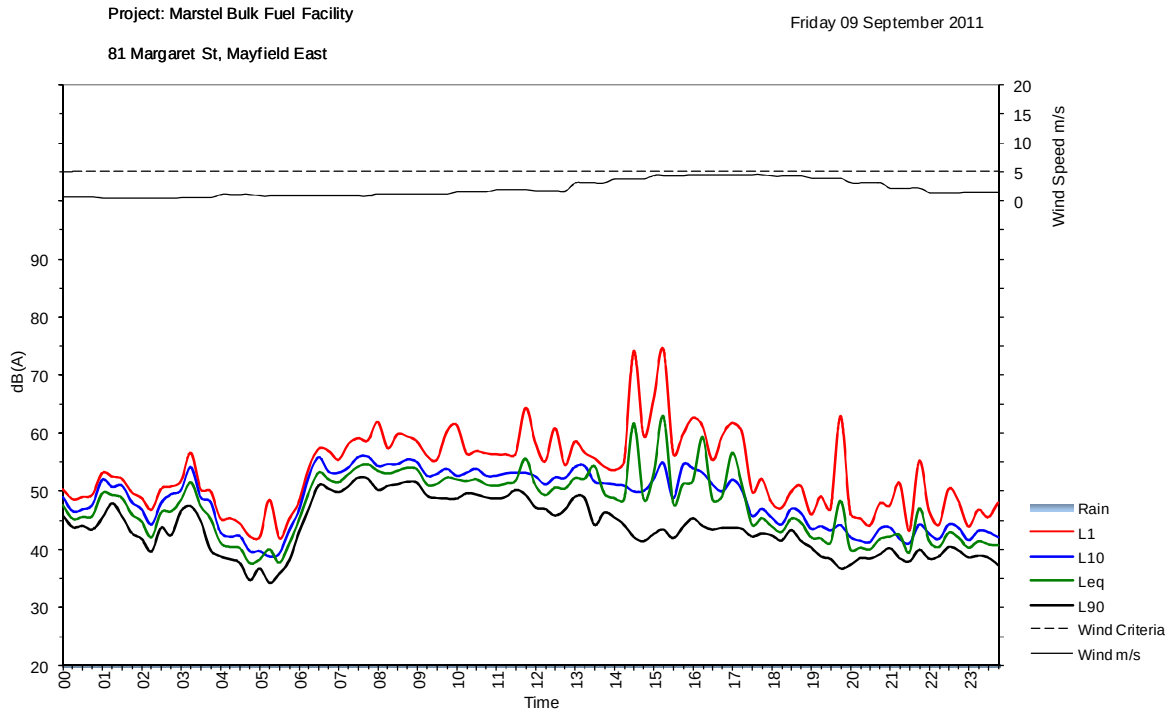
Long Term Noise Monitoring Graphs

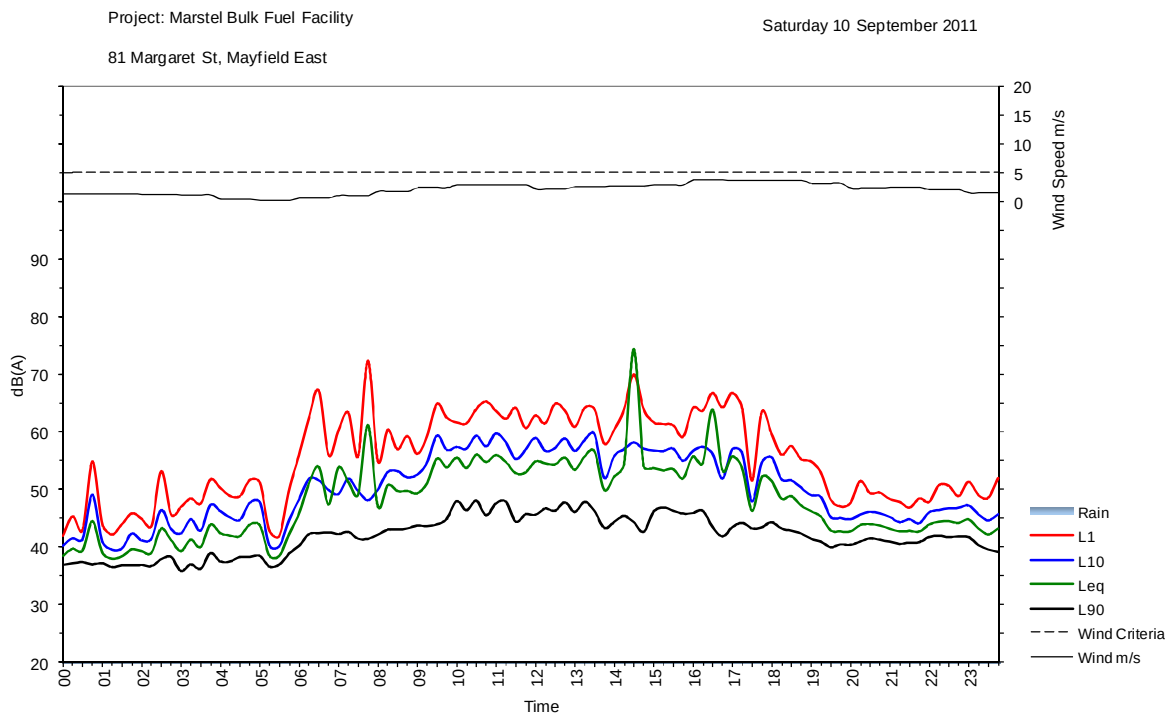
Appendix B Long Term Noise Monitoring Graphs

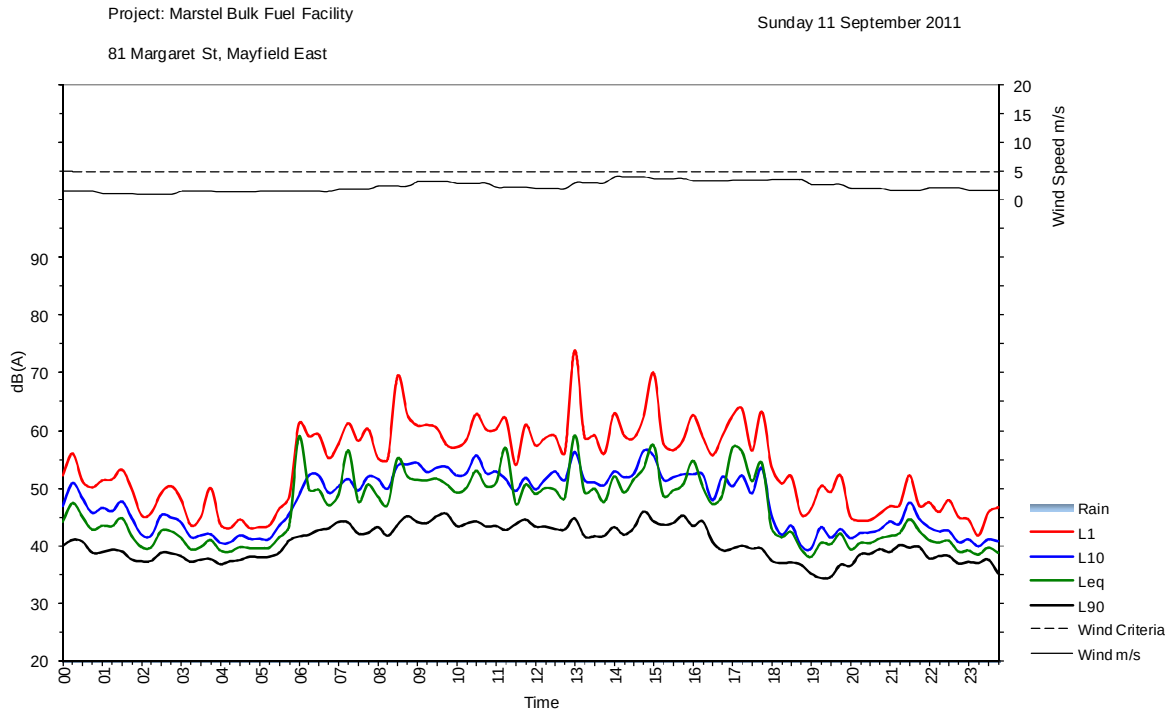
81 Margaret St, Mayfield East

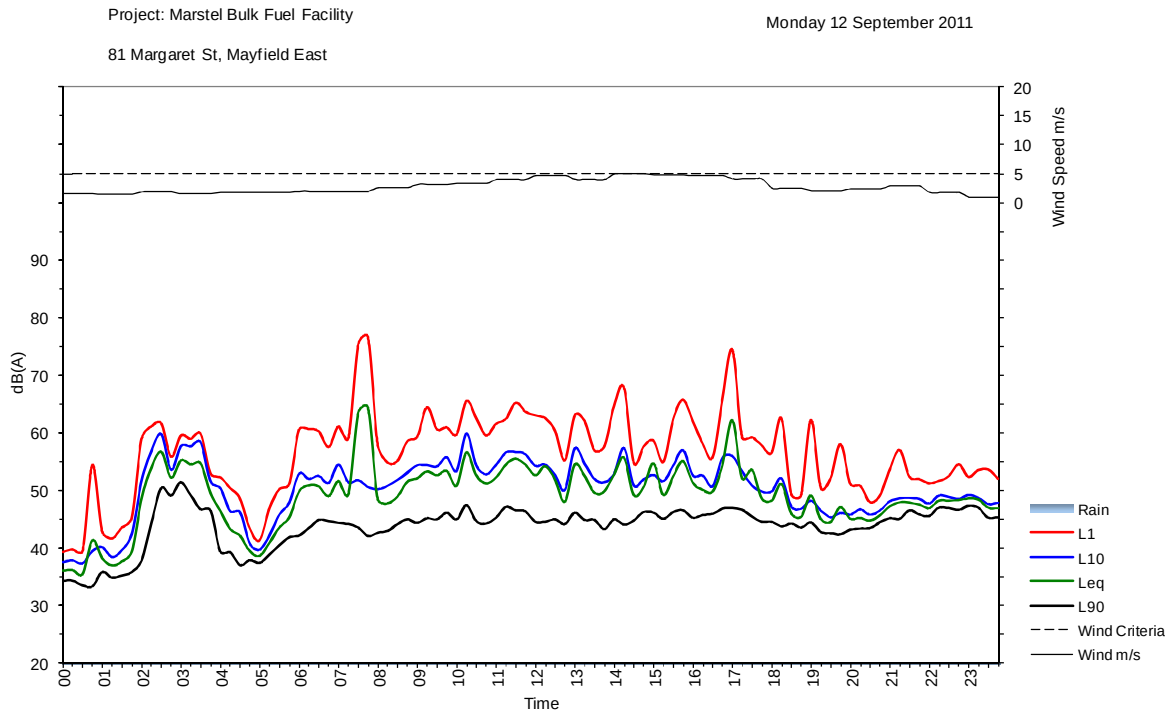


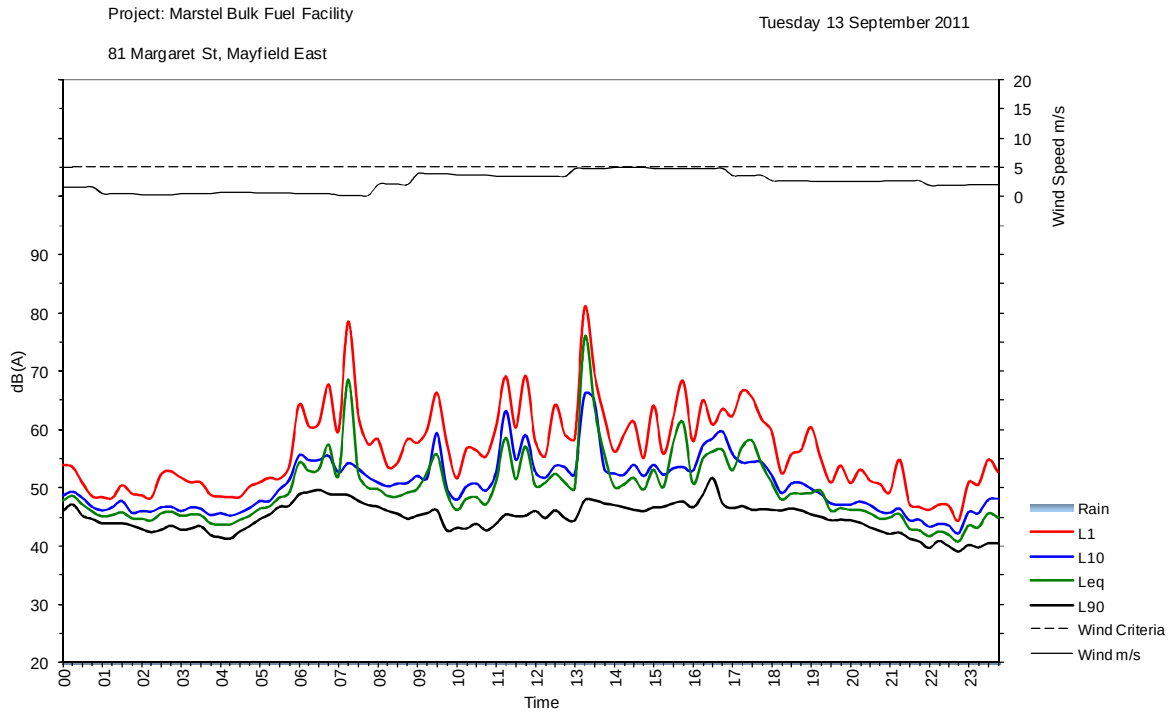


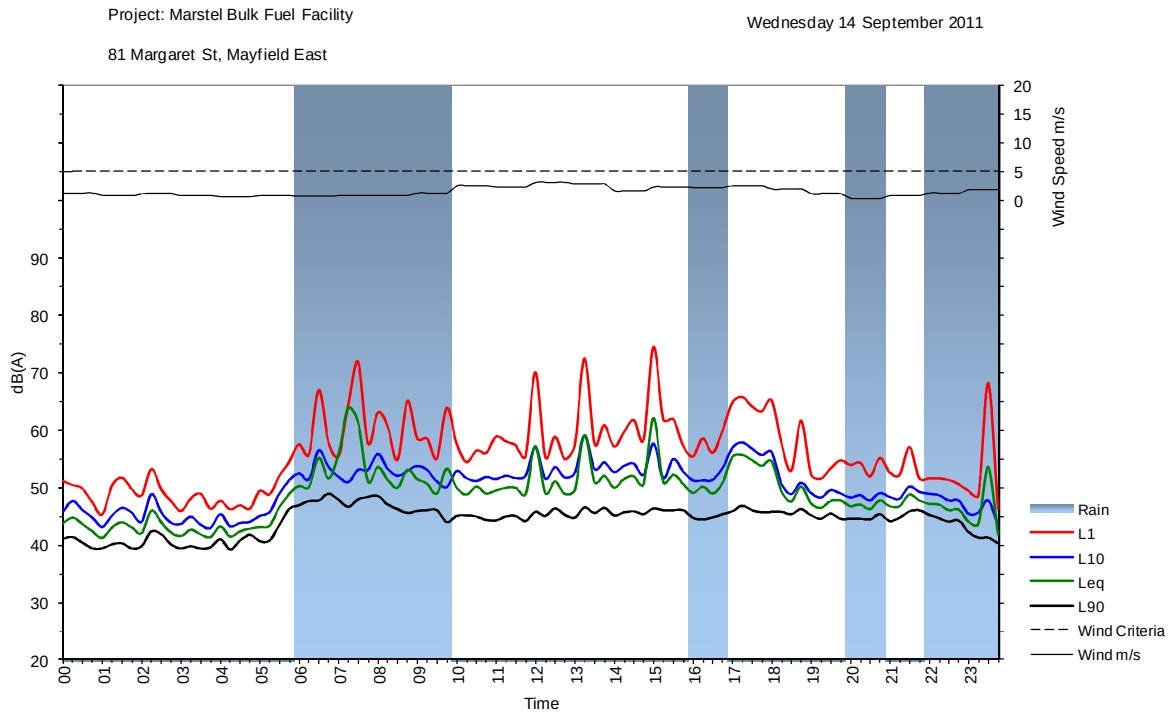

Project: Marstel Bulk Fuel Facility
81 Margaret St, Mayfield East
Friday 09 September 2011
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

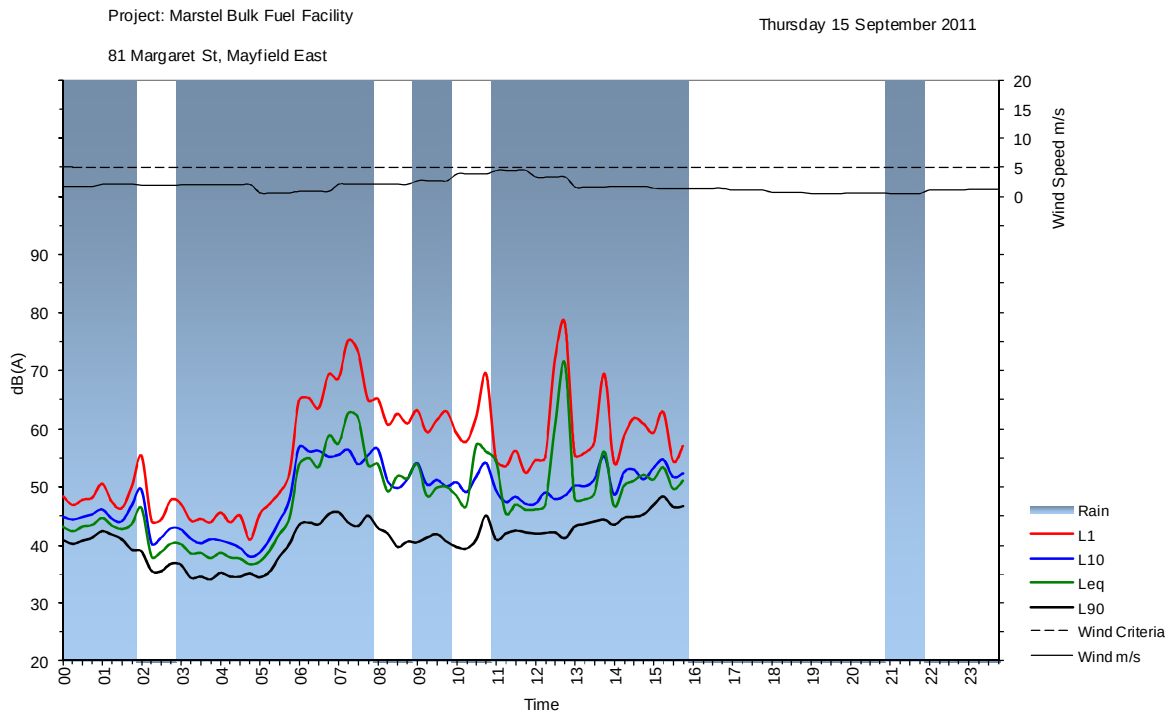

Project: Marstel Bulk Fuel Facility
81 Margaret St, Mayfield East
Saturday 10 September 2011
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Project: Marstel Bulk Fuel Facility
81 Margaret St, Mayfield East
Sunday 11 September 2011
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

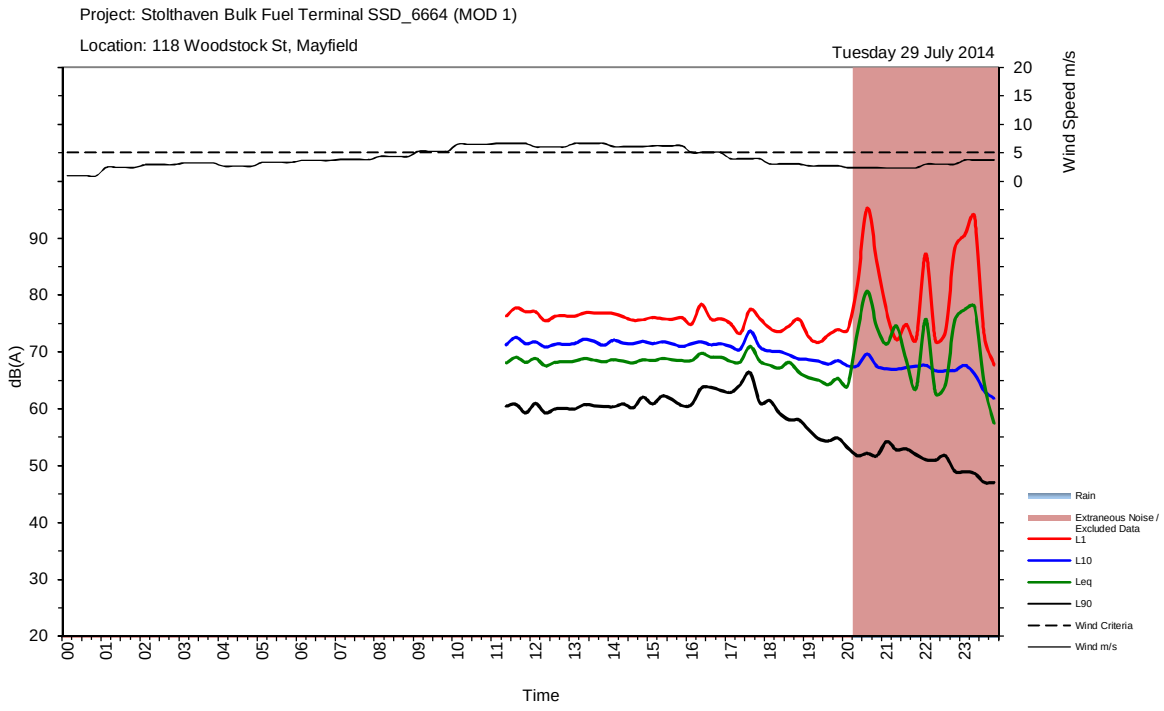

Project: Marstel Bulk Fuel Facility
81 Margaret St, Mayfield East
Monday 12 September 2011
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

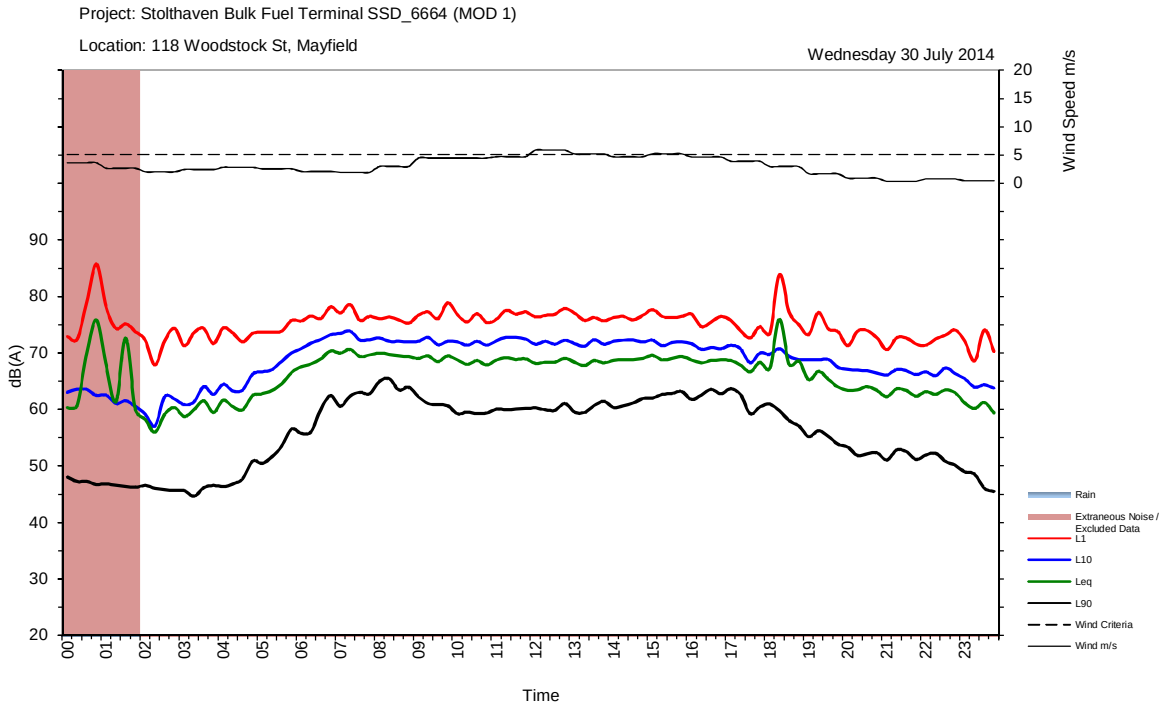

Project: Marstel Bulk Fuel Facility
81 Margaret St, Mayfield East
Tuesday 13 September 2011
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

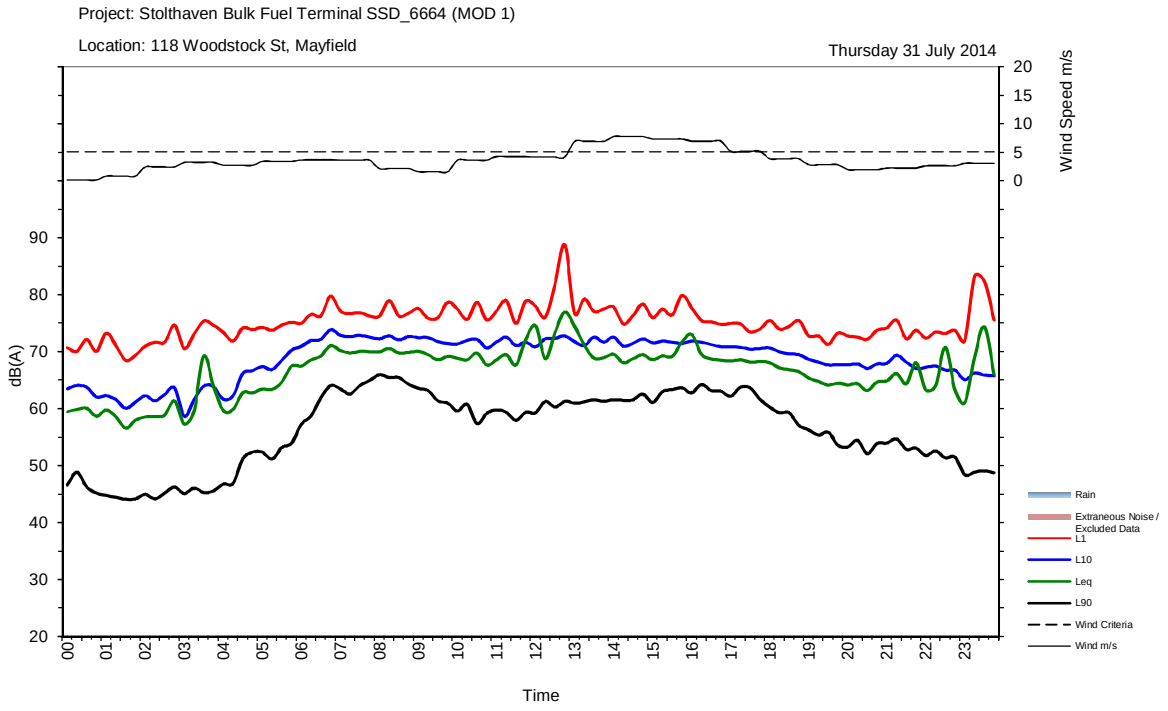

Project: Marstel Bulk Fuel Facility
81 Margaret St, Mayfield East
Wednesday 14 September 2011
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

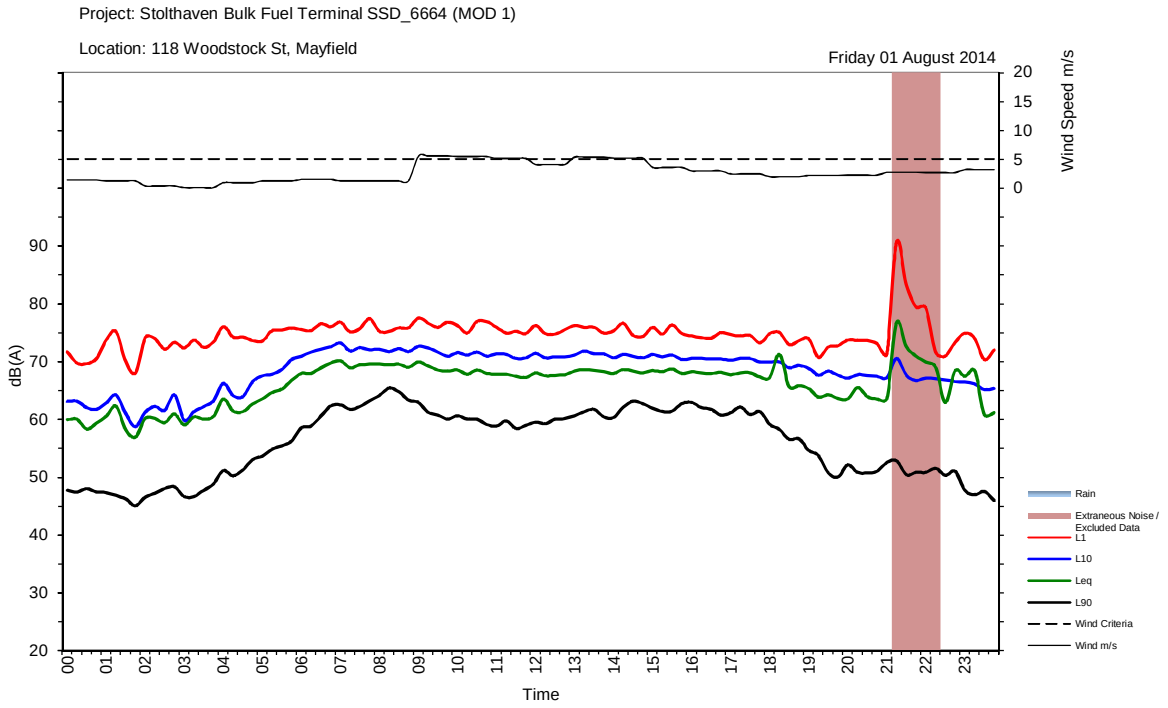

Project: Marstel Bulk Fuel Facility
81 Margaret St, Mayfield East
Thursday 15 September 2011
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

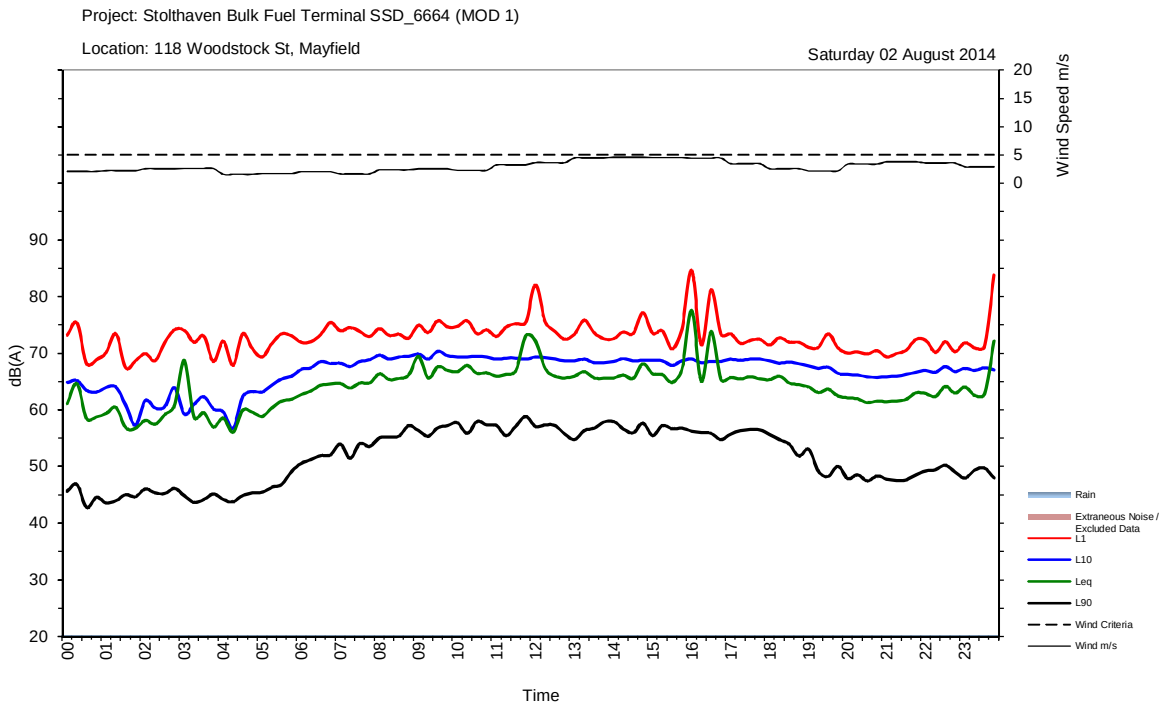
118 Woodstock St, Mayfield

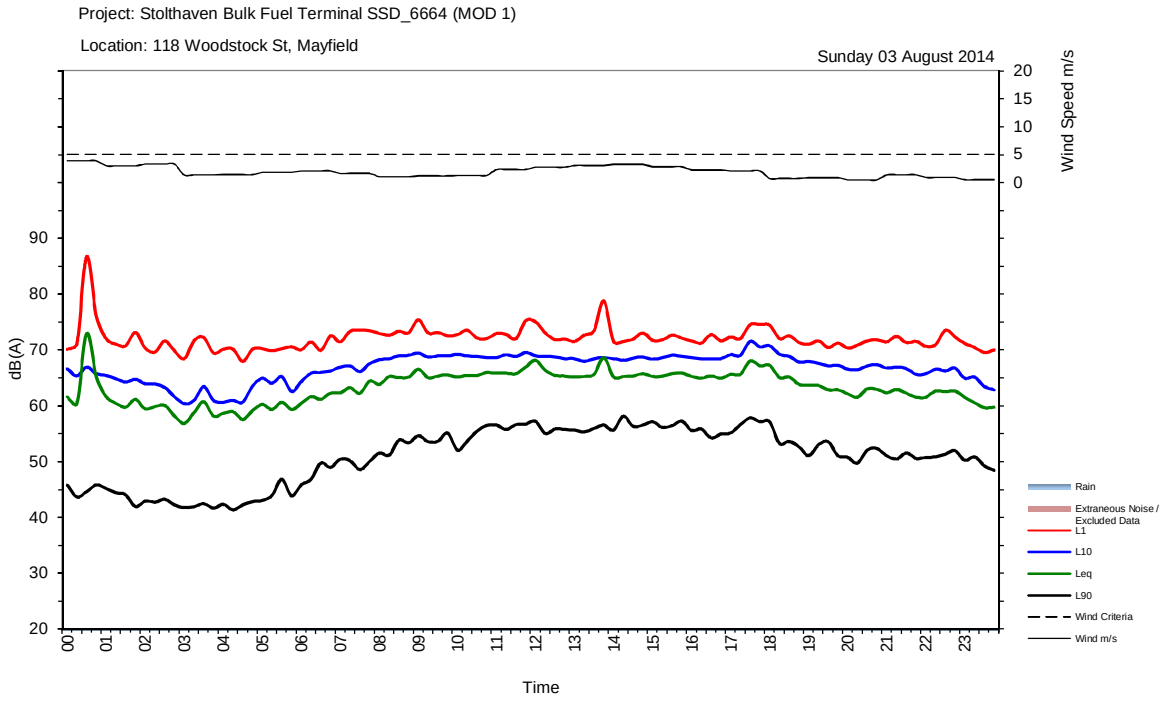


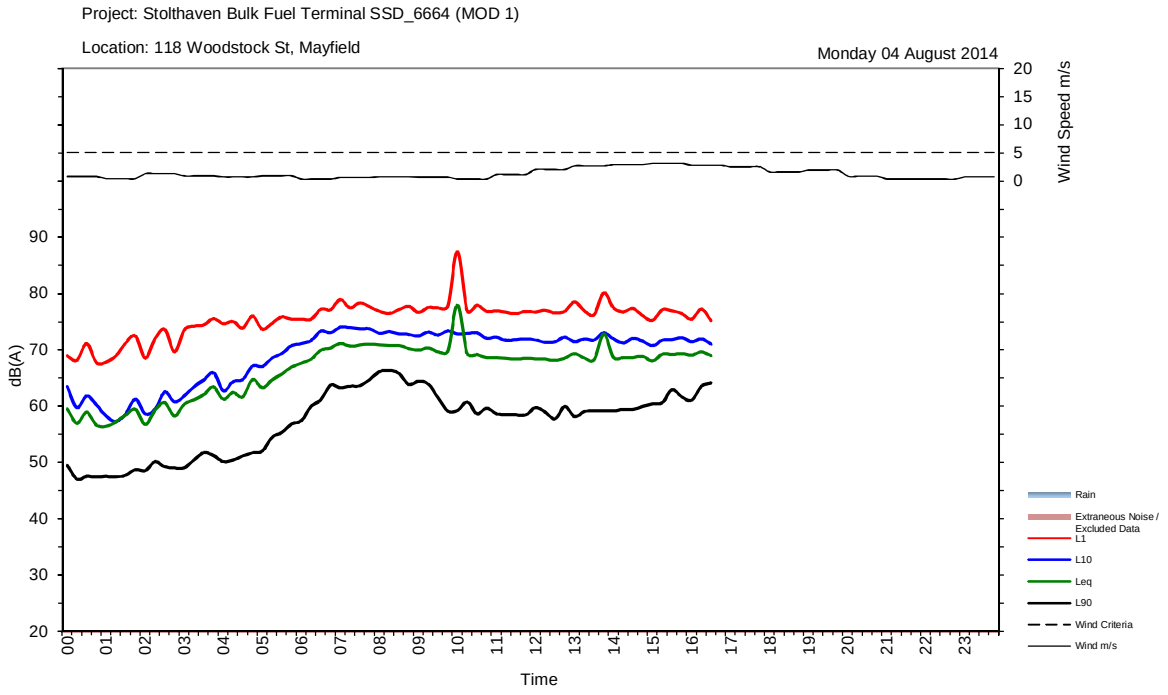



Project: Stolthaven Bulk Fuel Terminal SSD_6664 (MOD 1)
Location: 118 Woodstock St, Mayfield
Thursday 31 July 2014
Wind Speed m/s
dB(A)
Time
Rain
Extraneous Noise / Excluded Data
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Project: Stolthaven Bulk Fuel Terminal SSD_6664 (MOD 1)
Location: 118 Woodstock St, Mayfield
Friday 01 August 2014
Wind Speed m/s
dB(A)
Time
Rain
Extraneous Noise / Excluded Data
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Project: Stolthaven Bulk Fuel Terminal SSD_6664 (MOD 1)
Location: 118 Woodstock St, Mayfield
Saturday 02 August 2014
dB(A)
Wind Speed m/s
Time
Rain
Extraneous Noise / Excluded Data
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Project: Stolthaven Bulk Fuel Terminal SSD_6664 (MOD 1)
Location: 118 Woodstock St, Mayfield
Sunday 03 August 2014
dB(A)
Wind Speed m/s
Time
Rain
Extraneous Noise / Excluded Data
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Project: Stolthaven Bulk Fuel Terminal SSD_6664 (MOD 1)
Location: 118 Woodstock St, Mayfield
Monday 04 August 2014
dB(A)
Wind Speed m/s
Time
Rain
Extraneous Noise / Excluded Data
L1
L10
Leq
L90
Wind Criteria
Wind m/s

Appendix C

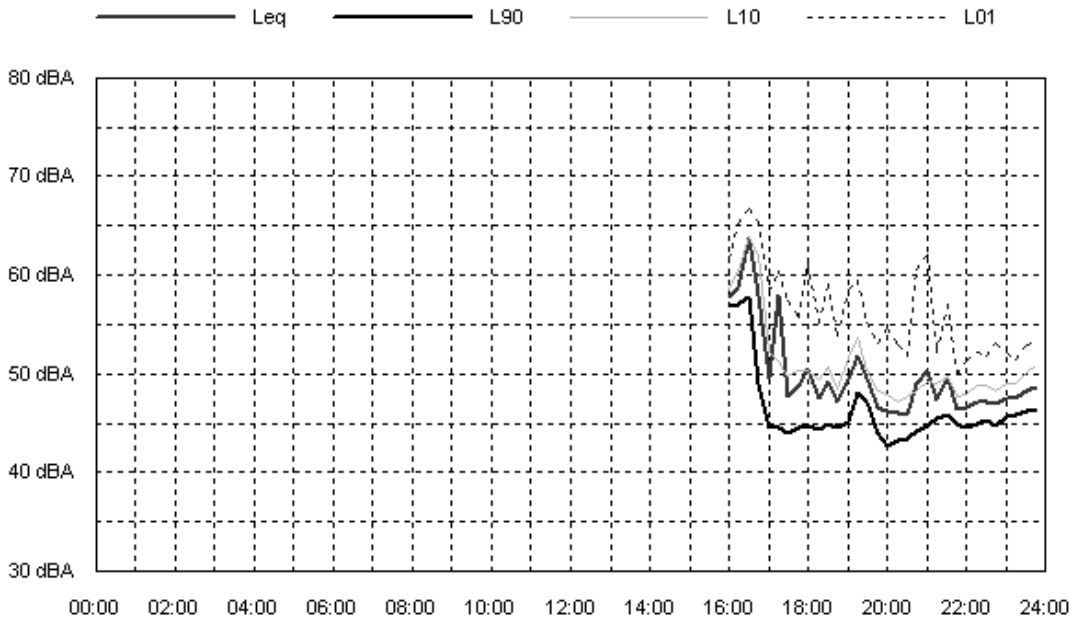
Noise Logging Graphs -

Mayfield Site Port-Related Activities Concept Plan EA - Wilkinson Murray, Report No. 09077, Version F, July 2010

Appendix C Noise Logging Graphs - Mayfield Site Port-Related Activities Concept Plan EA - Wilkinson Murray, Report No. 09077, Version F, July 2010

Location: 32 Elizabeth Street Carrington

Wed 18 Mar 09



Location: 32 Elizabeth Street Carrington

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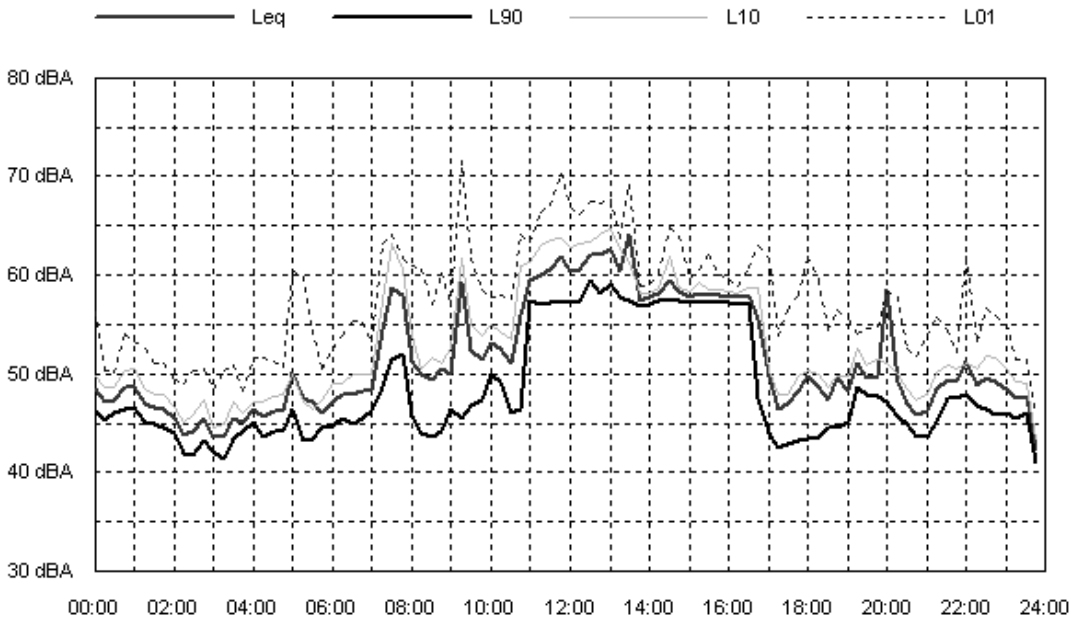

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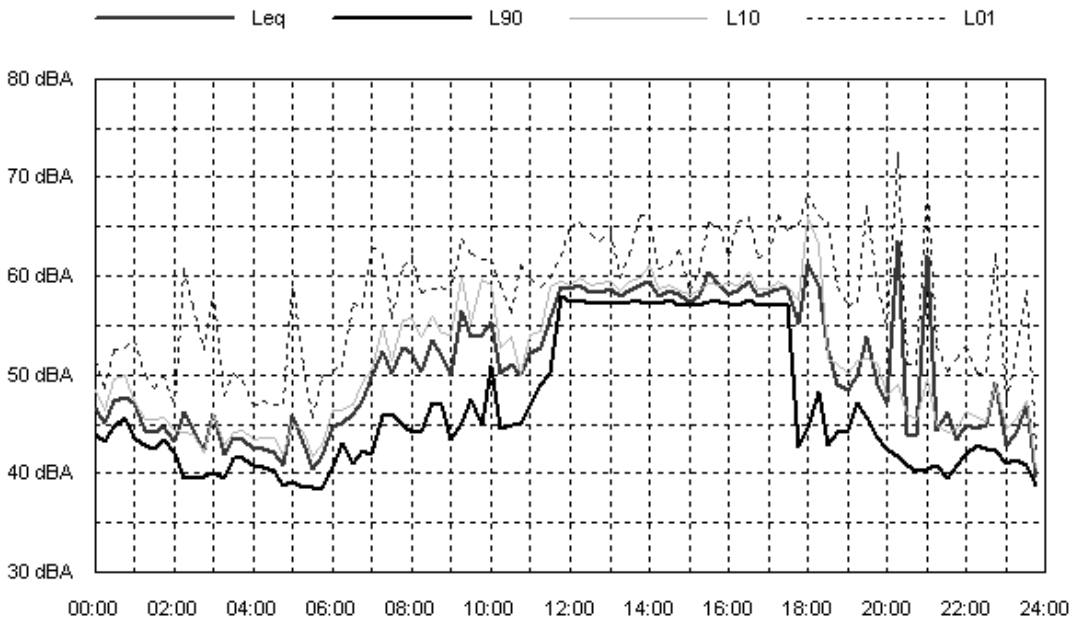

Location: 32 Elizabeth Street Carrington

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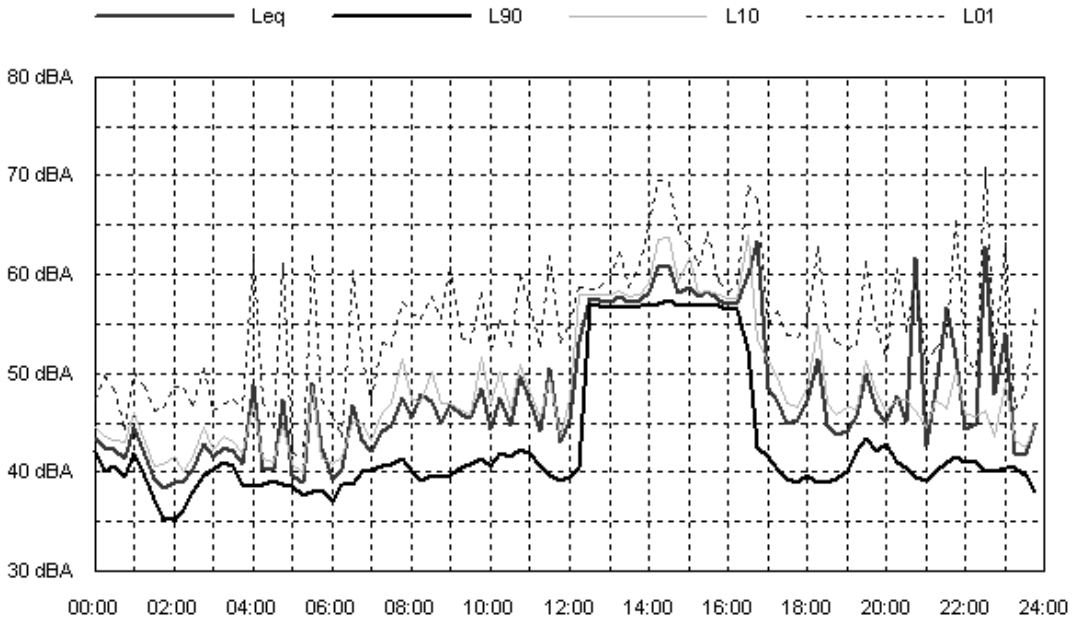

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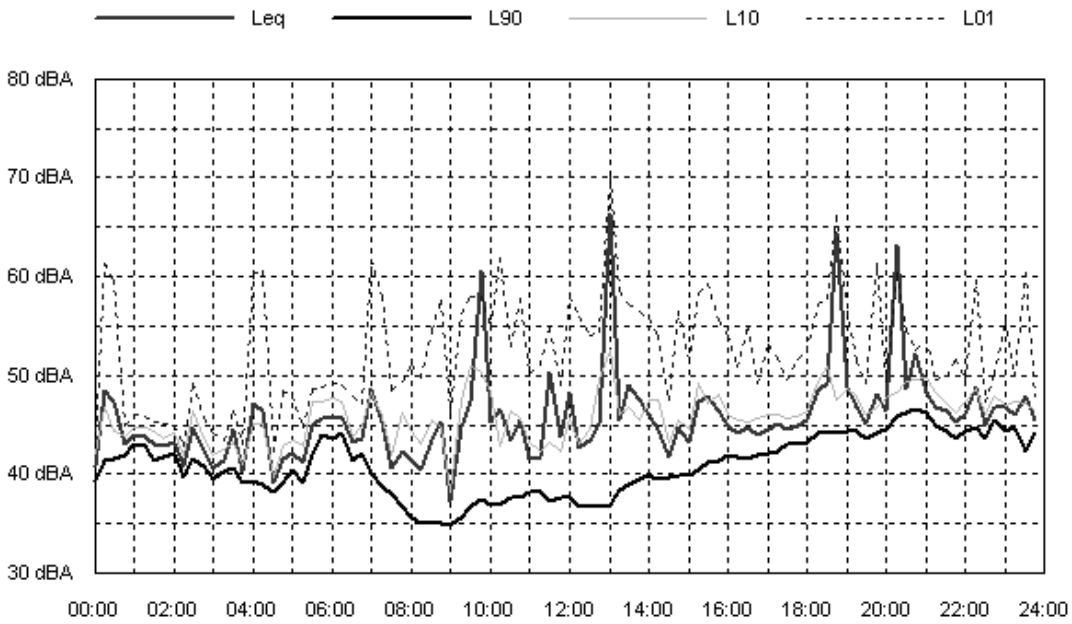

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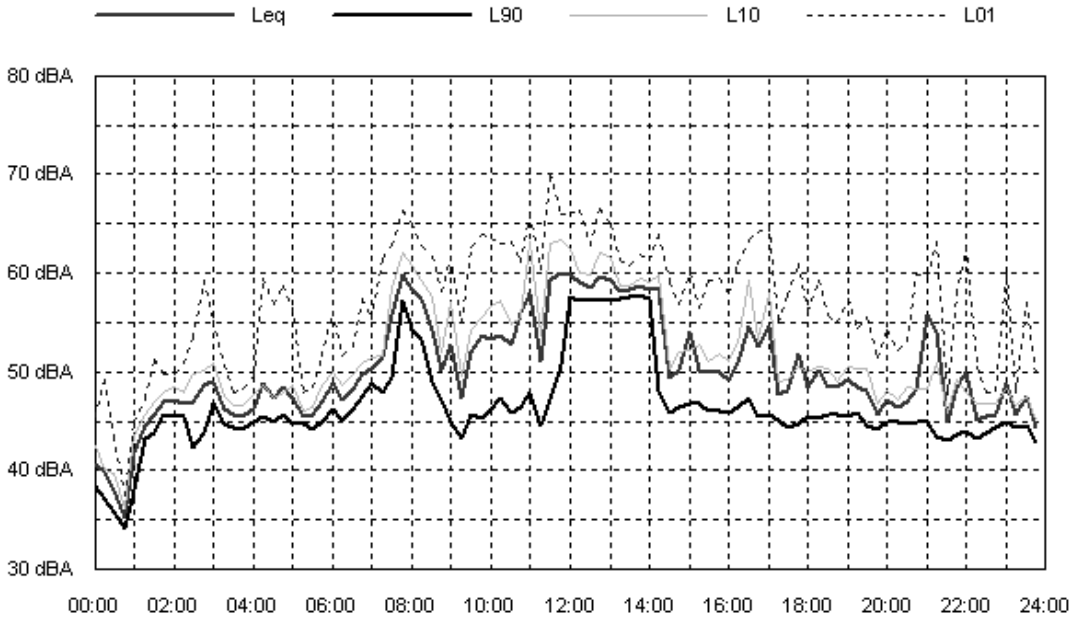

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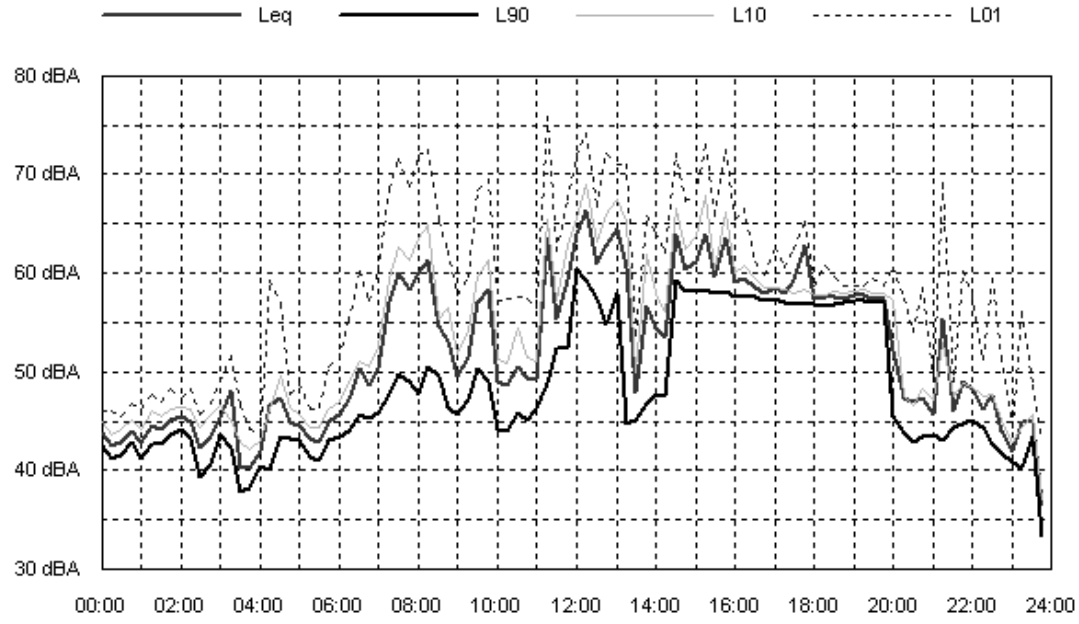

Location: 32 Elizabeth Street Carrington

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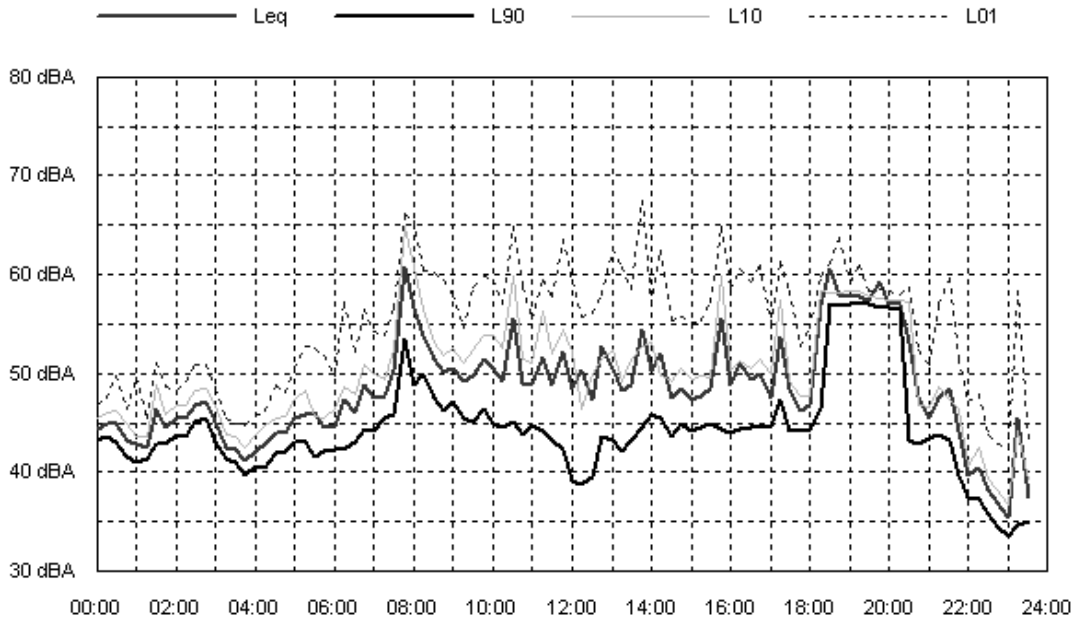

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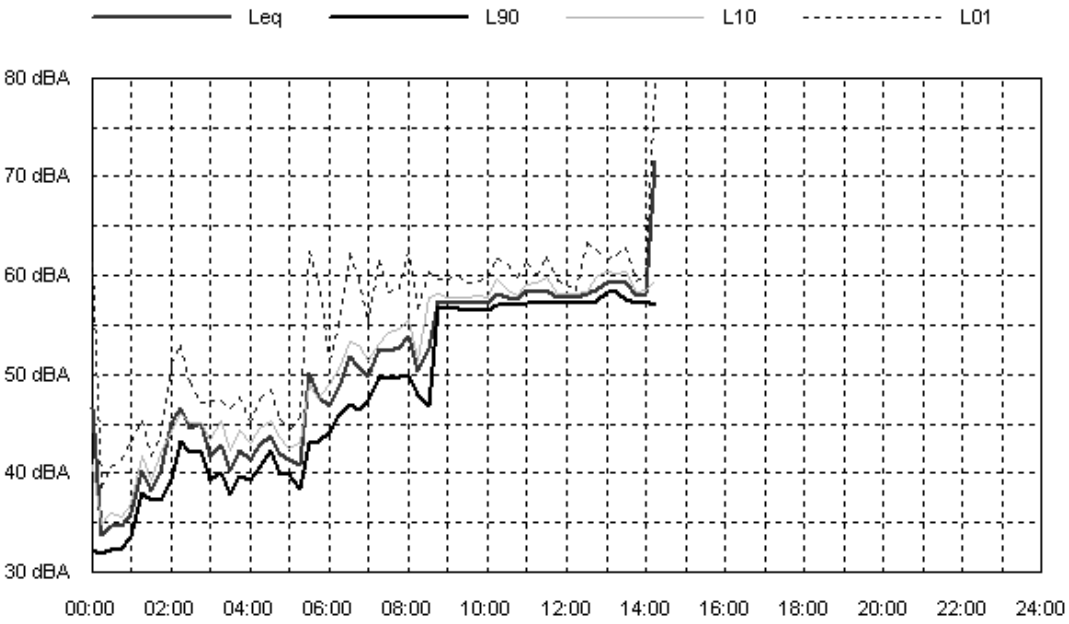


Appendix D

Operational Noise Contour Maps

Appendix D Operational Noise Contour Maps

Stolthaven Mayfield Terminal - State Significant Development

OPERATIONAL NOISE - NEUTRAL CONDITIONS - INTRUSIVENESS CRITERIA -SCENARIO 1

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-1

Stolthaven Mayfield Terminal - State Significant Development

OPERATIONAL NOISE - NEUTRAL CONDITIONS - INTRUSIVENESS CRITERIA -SCENARIO 2

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-2

Stolthaven Mayfield Terminal - State Significant Development

OPERATIONAL NOISE - TEMPERATURE INVERSION - INTRUSIVENESS CRITERIA -SCENARIO 1

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-3

Stolthaven Mayfield Terminal - State Significant Development

OPERATIONAL NOISE - TEMPERATURE INVERSION - INTRUSIVENESS CRITERIA -SCENARIO 2

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-4

Stolthaven Mayfield Terminal - State Significant Development

OPERATIONAL NOISE - 3m/s SOURCE TO RECEIVER WIND - INTRUSIVENESS CRITERIA -SCENARIO 1

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-5

Stolthaven Mayfield Terminal - State Significant Development

OPERATIONAL NOISE - 3m/s SOURCE TO RECEIVER WIND - INTRUSIVENESS CRITERIA -SCENARIO 2

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-6

Stolthaven Mayfield Terminal - State Significant Development

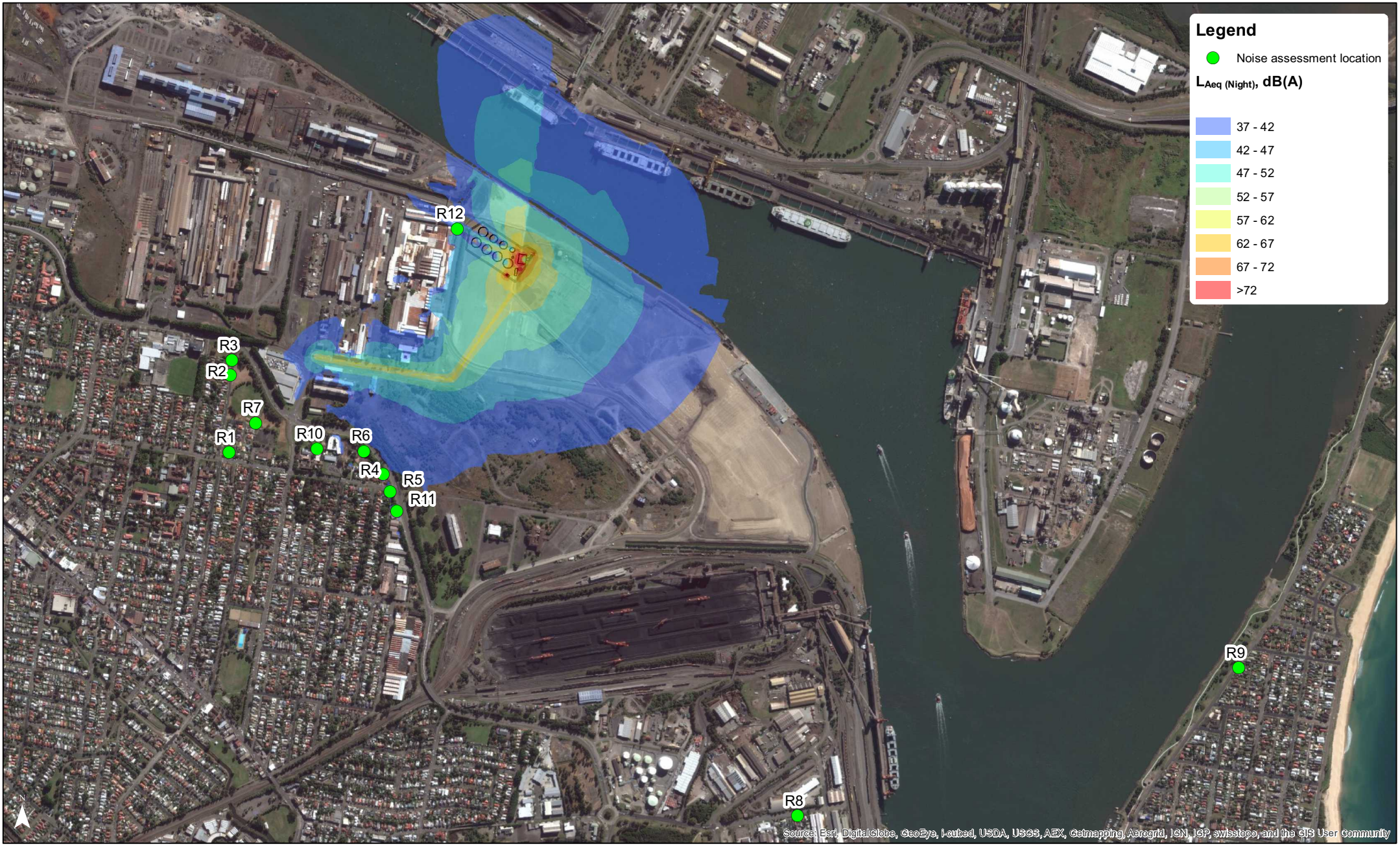
OPERATIONAL NOISE - NIGHT - NEUTRAL CONDITIONS - AMENITY CRITERIA

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-7



Stolthaven Mayfield Terminal - State Significant Development

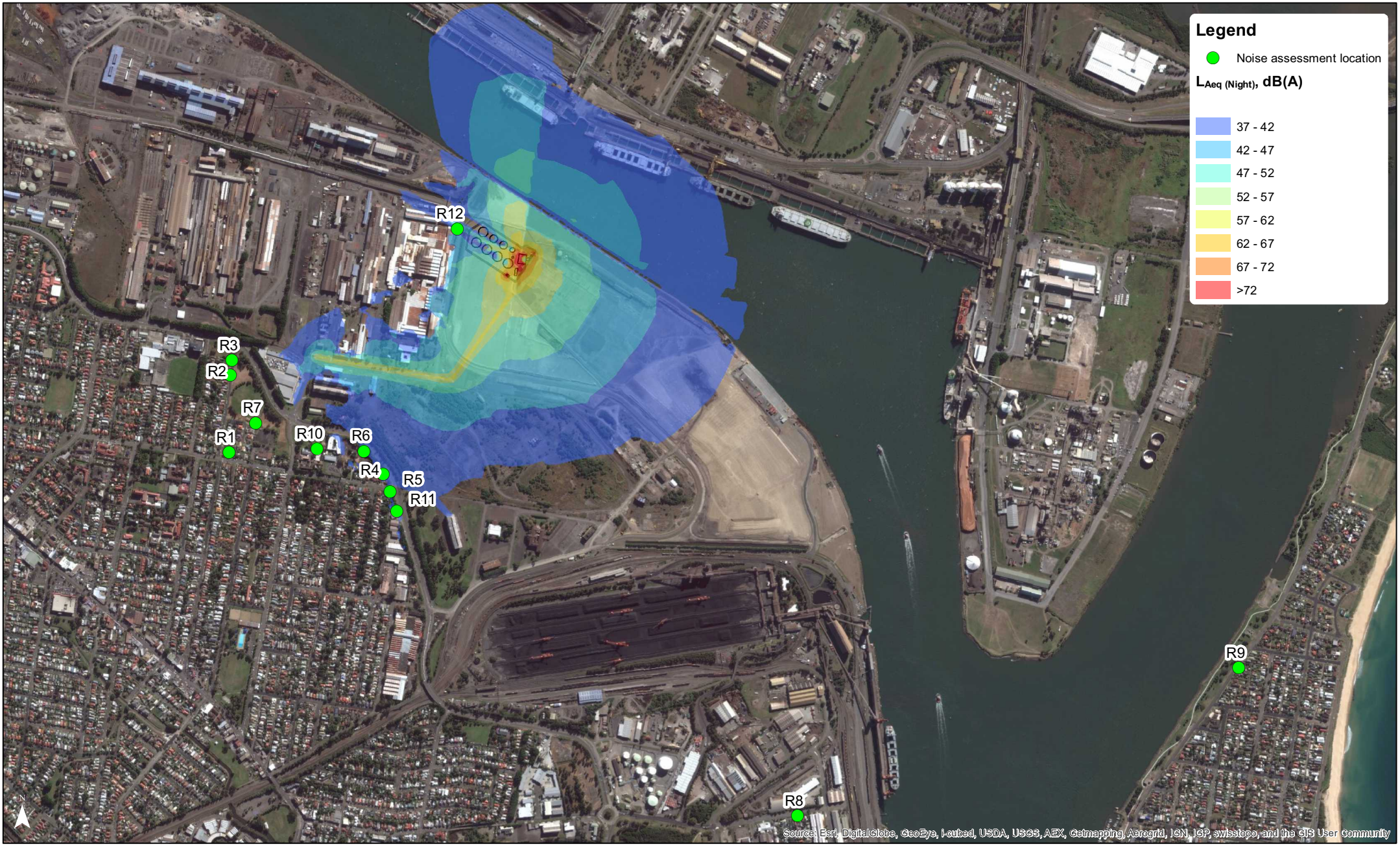
OPERATIONAL NOISE - NIGHT - TEMPERATURE INVERSION - AMENITY CRITERIA

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-8



Stolthaven Mayfield Terminal - State Significant Development

OPERATIONAL NOISE - NIGHT - 3m/s SOURCE TO RECEIVER WIND - AMENITY CRITERIA

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-9

Stolthaven Mayfield Terminal - State Significant Development

OPERATIONAL NOISE - NIGHT - 3m/s SOURCE TO RECEIVER WIND - SLEEP DISTURBANCE ASSESSMENT

Oct 2014

60311678

0 500 1,000 2,000 m

Fig. D-10

Stolthaven Mayfield Terminal - State Significant Development

CONSTRUCTION NOISE - NEUTRAL CONDITIONS - SCENARIO 1

0 500 1,000 2,000 m

Oct 2014

60311678

Fig. D-11

Stolthaven Mayfield Terminal - State Significant Development

CONSTRUCTION NOISE - NEUTRAL CONDITIONS - SCENARIO 2

0 500 1,000 2,000 m

Oct 2014

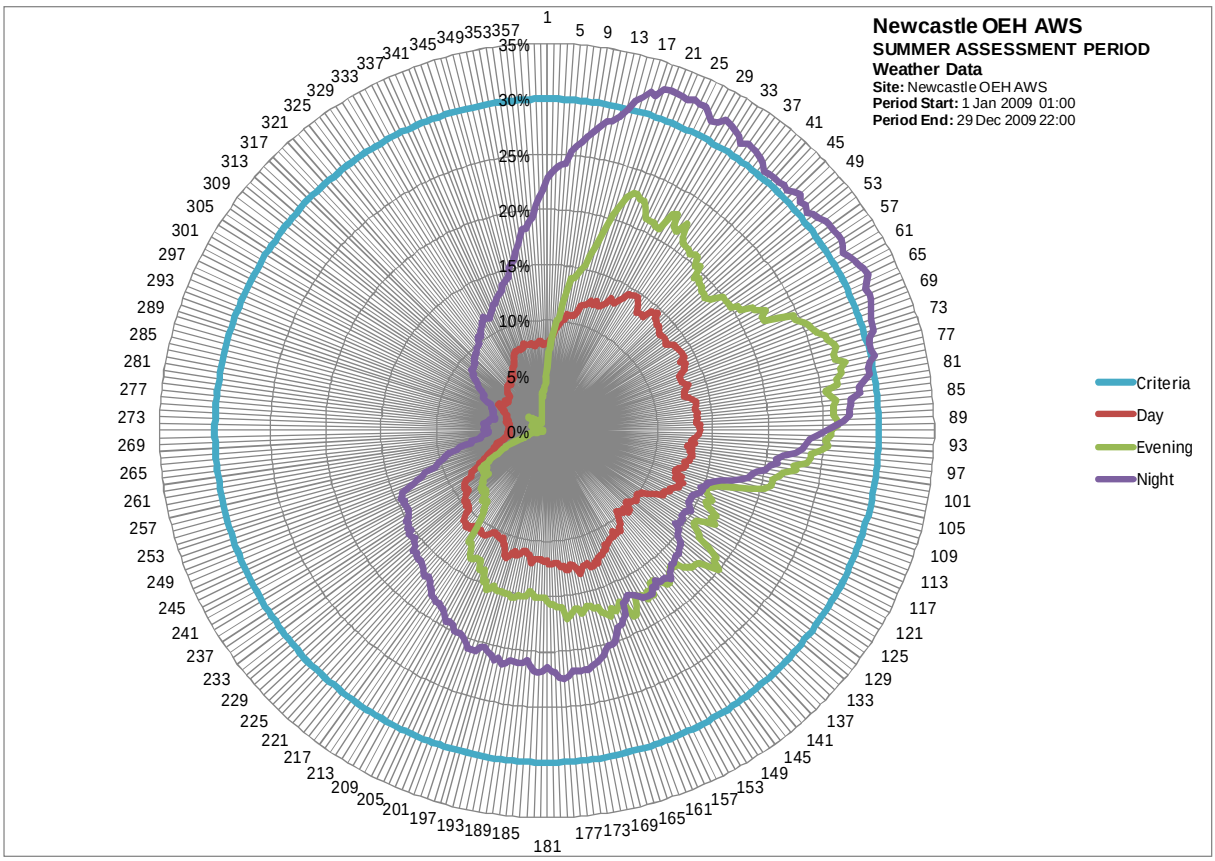
60311678

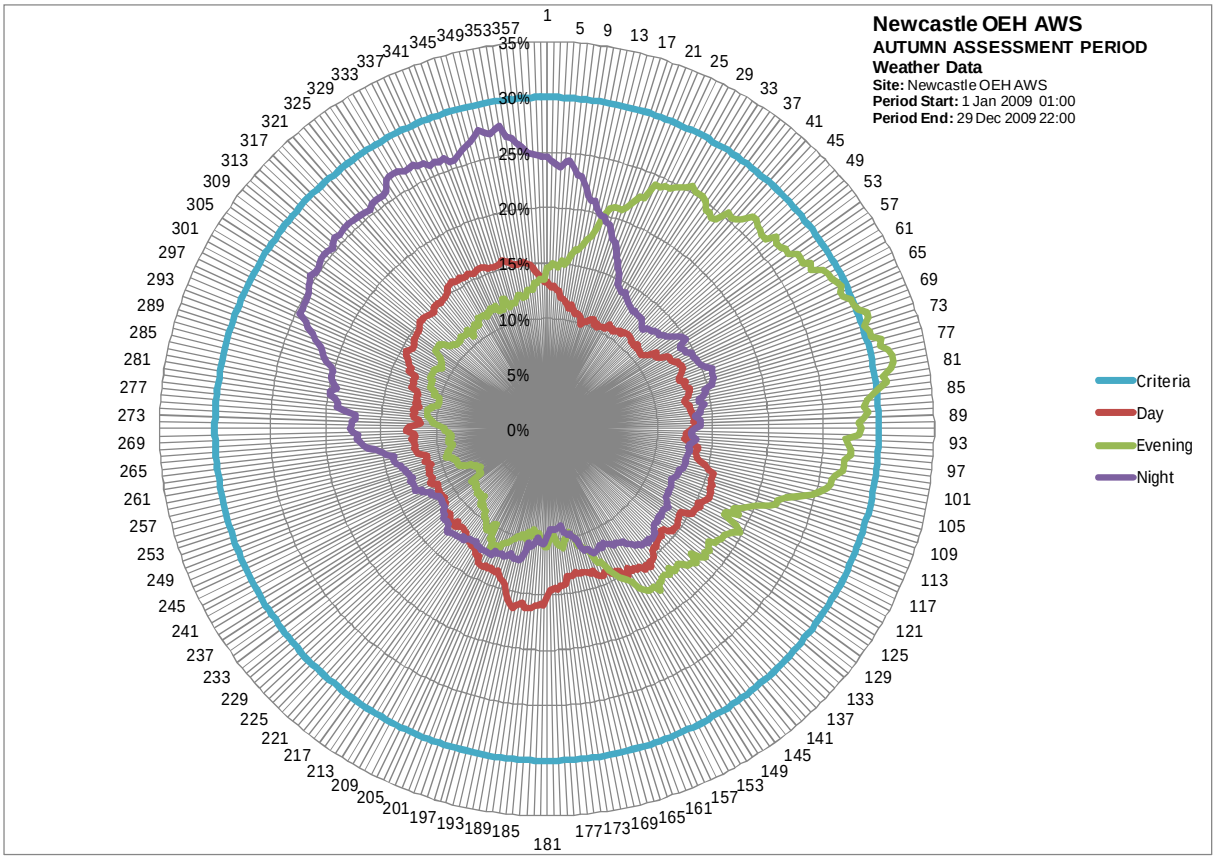
Fig. D-12

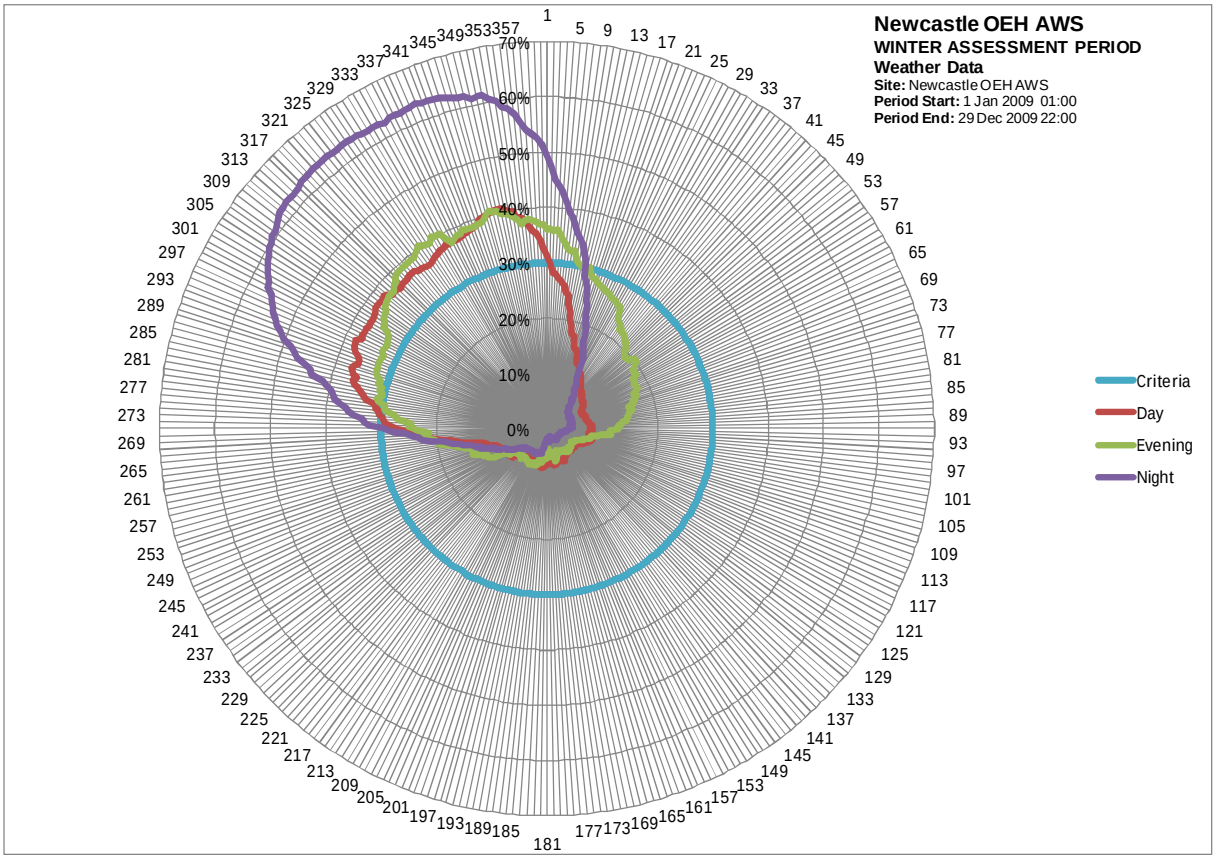
Appendix E

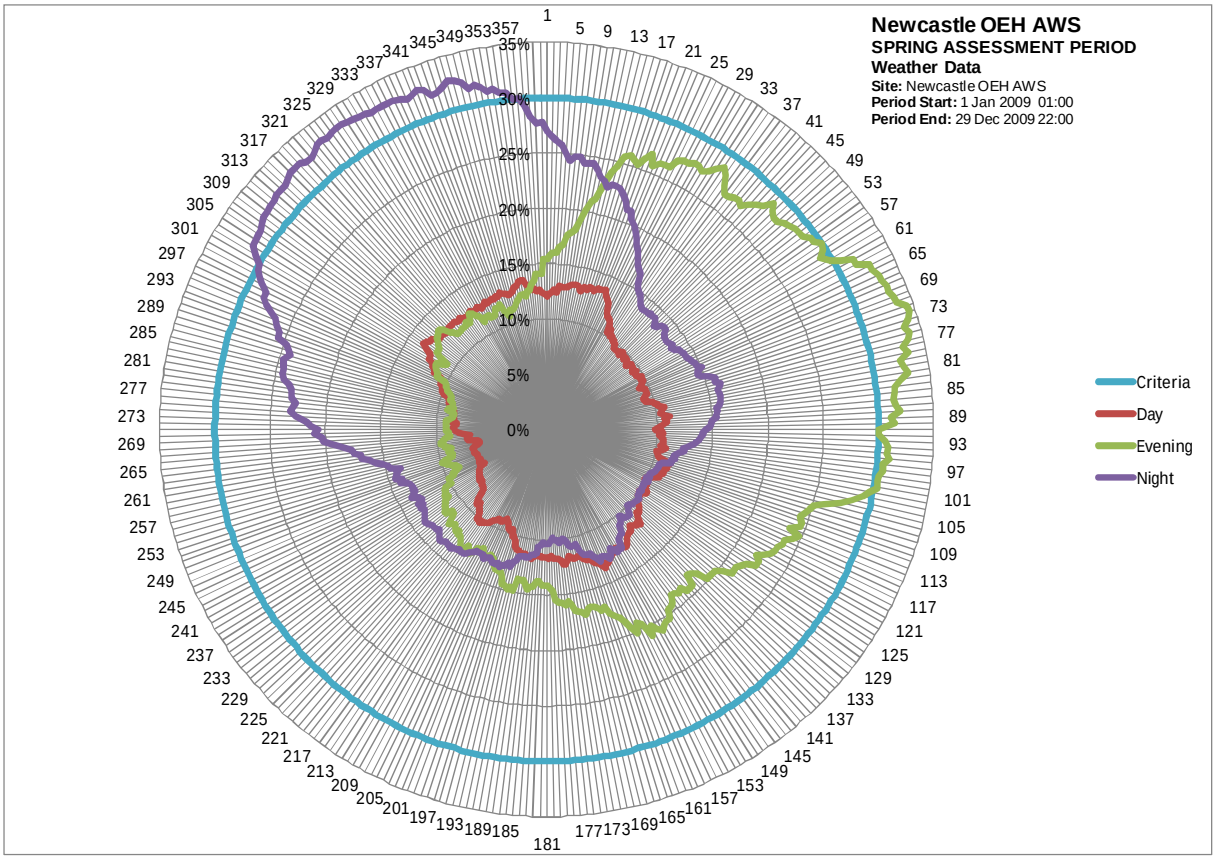
INP Wind Assessment

Appendix E INP Wind Assessment




Newcastle OEH AWS
AUTUMN ASSESSMENT PERIOD
Weather Data
Site: Newcastle OEH AWS
Period Start: 1 Jan 2009 01:00
Period End: 29 Dec 2009 22:00
Criteria
Day
Evening
Night


Newcastle OEH AWS
WINTER ASSESSMENT PERIOD
Weather Data
Site: Newcastle OEH AWS
Period Start: 1 Jan 2009 01:00
Period End: 29 Dec 2009 22:00
Criteria
Day
Evening
Night


Newcastle OEH AWS
SPRING ASSESSMENT PERIOD
Weather Data
Site: Newcastle OEH AWS
Period Start: 1 Jan 2009 01:00
Period End: 29 Dec 2009 22:00
Criteria
Day
Evening
Night
35%
30%
25%
20%
15%
10%
5%
0%

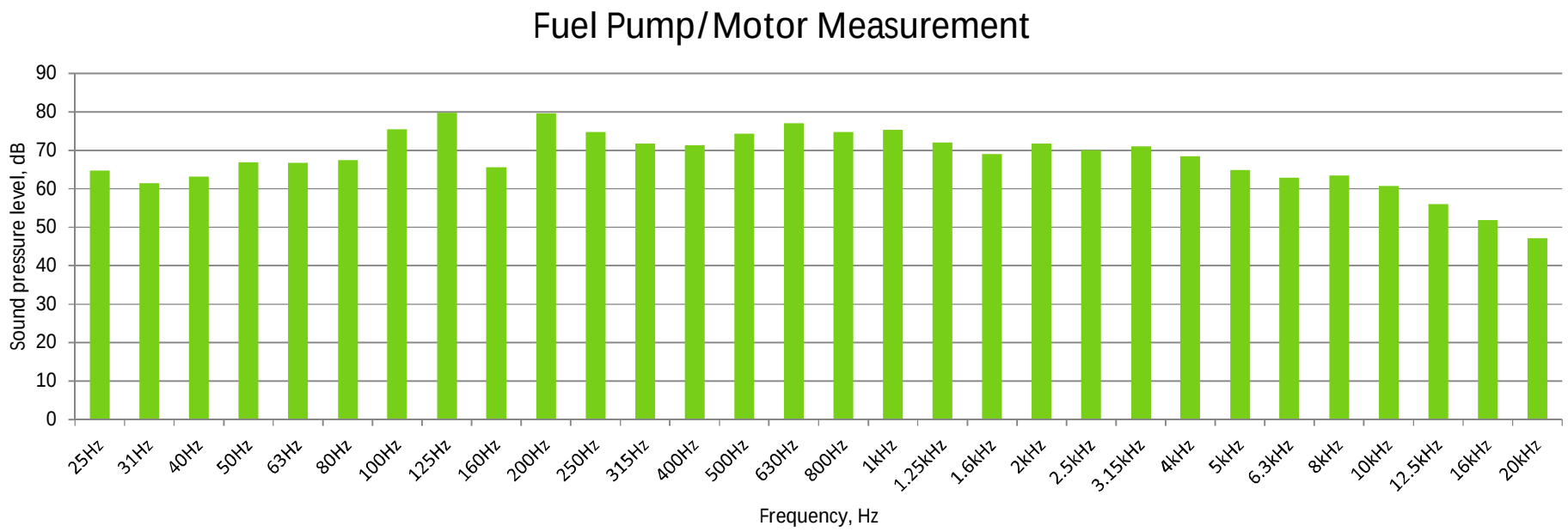
Appendix F

Tonality Screening Test

Appendix F Tonality Screening Test

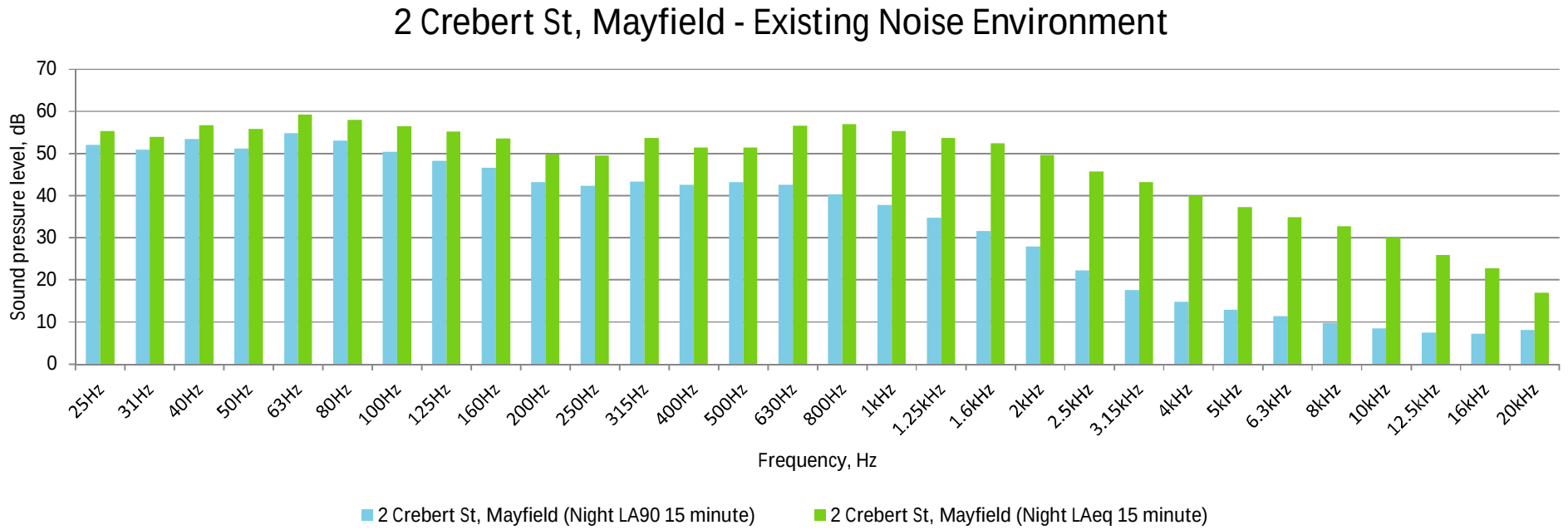
Measured Fuel Pump/Motor sound pressure levels – One-third octave spectrums

Source	1/3 Octave Frequency Band (Hz) – Sound Pressure Level, dB																										Overall	
	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k	dB	dB(A)
Fuel Pump/Motor	65	61	63	67	67	68	76	80	66	80	75	72	71	74	77	75	75	72	69	72	70	71	69	65	63	63	61	83	87



Existing noise level at 2 Crebert Street, Mayfield – One-third octave spectrums

Source	1/3 Octave Frequency Band (Hz) – Sound Pressure Level, dB																										Overall	
	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k	dB	dB(A)
$L_{Aeq\ 15\ minute}$	55	54	57	56	59	58	56	55	54	50	50	54	51	51	57	57	55	54	52	50	46	43	40	37	35	33	30	68	63
$L_{A90\ 15\ minute}$	52	51	53	51	55	53	50	48	47	43	42	43	43	43	43	40	38	35	32	28	22	18	15	13	11	10	8	62	48



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