



ABN: 73 254 053 305

78 Woodglenn Close
P.O. Box 61
PATERSON NSW 2421

Phone: 02 4938 5866

Mobile: 0407 38 5866

E-mail: bridgesacoustics@bigpond.com

AGL UPSTREAM INVESTMENTS PTY LTD

WAUKIVORY PILOT PROJECT

AUGUST 2015 NOISE COMPLIANCE SURVEY

REPORT J0215-06-R1

8 SEPTEMBER 2015

Prepared for:

AGL Upstream Investments Pty Ltd

P.O. Box 335

GLOUCESTER NSW 2422

Prepared by:

Mark Bridges BE Mech (Hons) MAAS

Principal Consultant

TABLE OF CONTENTS

1. INTRODUCTION	2
1.1. Glossary	2
2. EPL CONDITIONS.....	3
3. RECEPTORS.....	5
4. NOISE CRITERIA	6
5. SURVEY METHODOLOGY.....	6
5.1. Determining Project Noise Contribution	7
6. ASSESSMENT	9
6.1. Project Operating Conditions.....	9
6.2. Weather Conditions	9
6.3. Receptor R2	10
6.4. Receptor R3	12
6.5. Maximum Project Noise Levels.....	13
7. CONCLUSION	14
APPENDIX A – PLANS	15
APPENDIX B – MEASURED NOISE LEVELS, RECEPTOR R2.....	17
APPENDIX C – MEASURED NOISE LEVELS, RECEPTOR R3	36

1. INTRODUCTION

This report presents results from a noise compliance survey at specified receptors in the vicinity of the Waukivory Pilot Project (the project) which is part of the Gloucester Gas Project being developed by AGL Energy Limited. The project includes construction and operation of the following infrastructure:

- Gas collection equipment fitted to four existing gas wells known as WK11, WK12, WK13 and WK14 located approximately 2 km south of Gloucester, NSW;
- Trenching and installation of gas collection pipelines (gathering lines) between the four wells (completed in 2014);
- Trenching and installation of a water transfer pipeline between the southern well (WK13) to two surface dams located approximately 1 km and 2.5 km south of the wells (completed in 2014);
- Directional drilling to install gathering lines and the water transfer pipeline under the Avon River, Waukivory Creek and Fairbairns Road (completed in 2014);
- Gravel hardstand areas around each well, security fences and other ancillary infrastructure;
- Fracture stimulation of the coal seam around each well to increase gas flow (completed in 2014); and
- Ongoing monitoring of gas production from the wells over the life of the project.

Diesel powered hydraulic units located at each of the four gas well sites and three gas flare units adjacent to WK12 were operational 24 hours per day during the noise survey. Regular access to and from the well sites by AGL staff and contractors for maintenance works, fuelling, inspections and security during daylight hours were typical of normal operating conditions.

The project is subject to Environment Protection Licence (EPL) 20358 issued by the Environment Protection Authority (EPA). This report has been commissioned by AGL Energy Limited (AGL) to address Condition M10.1 of the EPL which requires a noise compliance survey at specified receptors during each six month period. The noise survey occurred from 18 to 21 August 2015 and was similar to the previous noise compliance survey completed in February 2015.

1.1. Glossary

The following acoustical terms are used in this report:

Sound Pressure	Small air pressure variations above and below normal atmospheric pressure that are perceived by human ears as sound.
Frequency	The rate of sound pressure fluctuations per second, expressed as cycles per second or hertz (Hz). Human ears in good condition can typically detect sound in the frequency range 20 Hz to 20,000 Hz (20 kHz), depending on sound level.
Decibels, dB	A noise level unit based on a logarithmic scale of pascals of sound pressure above and below atmospheric pressure. Expressing a sound pressure level in decibels implies root-mean-squared (RMS) sound pressure unless explicitly stated otherwise. Human ears in good condition can typically detect sound pressures from the threshold of perception at 0 dB (20 uPa) to the threshold of pain at 140 dB (200 Pa), depending on frequency. An increase of 10 dB is perceived as an approximate doubling of sound level by a human ear.
dBL	Linear decibels, the same as dB but used to explicitly define a decibel scale in the absence of any frequency weighting.
dBA	A-weighted decibels, where the A weighting means frequencies below 500Hz and above 10kHz are artificially reduced to approximate the frequency response of an average human ear. Most sound monitoring instruments include an A-weighting option, enabling direct measurement of noise levels in dBA.

LA90	The A-weighted noise level exceeded 90% of the time (which can be thought of as the quietest 10% of the time) over a defined measurement period, usually 15 minutes or one hour, and widely accepted as the background noise level.
LA90,15min	Same as LA90 with the measurement period specifically stated.
LAeq	The A-weighted equivalent continuous, or logarithmic average, noise level over a defined time period either measured or predicted at a specific location.
LAeq,15min	Same as LAeq with the measurement period specifically stated.
Background Level	see LA90.

2. EPL CONDITIONS

Relevant conditions from EPL 20358 dated 1 July 2015 are reproduced below:

L6 Noise limits

L6.1 Noise generated at the premises must not exceed the noise limits in the table below:

Locality and Location	Day – LAeq(15 minute)	Evening – LAeq(15 minute)	Night – LAeq(15 minute)	Night – LAI(1 minute)
<i>All privately owned residences not subject to a private negotiated agreement</i>	35dB(A)	35dB(A)	35dB(A)	45dB(A)

L6.2 For the purpose of Condition L6.1:

- a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;*
- b) Evening is defined as the period 6pm to 10pm Monday to Sunday and Public Holidays; and*
- c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.*

L6.3 The noise limits set out in the Noise Limits table under Condition L6.1 apply all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or*
- b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or*
- c) Stability category G temperature inversion conditions.*

L6.4 For the purposes of condition L6.3:

- a) Data recorded by the meteorological station identified as EPA Identification Point 26 must be used to determine meteorological conditions; and*
- b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.*

L6.5 *To determine compliance:*

- a) *with the LAeq(15 minute) noise limits in condition L6.1, the noise measurement equipment must be located:*
- *approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or*
 - *within 30 metres of a dwelling facade, but not closer than 3 metres, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or*
 - *where applicable, within approximately 50 metres of the boundary of a National Park or a Nature Reserve.*
 - *where there is no land access agreement, and the licensee is unable to undertake monitoring as a result of limitations imposed by the resident, noise monitoring equipment must be located at an equivalent monitoring location that will be representative of monitoring conditions at the residence.*
- b) *with the LA1(1 minute) noise limits in condition L6.1, the noise measurement equipment must be located within 1 metre of a dwelling facade;*
- c) *with the noise limits in condition L6.1, the noise measurements equipment must be located:*
- *at the most affected point at a location where there is no dwelling at the location; or*
 - *at the most affected point within an area at a location prescribed by Condition L6.5(a) or L6.5(b).*

L6.6 *A non-compliance of condition L6.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:*

- *at a location other than an area prescribed by conditions L6.5(a) and L6.5(b); and/or*
- *at a point other than the most affected point at a location.*

L6.7 *For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.*

L6.8 *The limits contained in Condition L6.1 do not apply to fracture stimulation, well workover or other planned maintenance activities undertaken during the following times:*

- a) *between 7:00 am and 6:00 pm Monday to Friday; or*
- b) *between 8:00 am and 1:00 pm Saturdays.*
- c) *At no time on Sundays or Public Holidays.*

Note: Rehabilitation works may form part of Plug and Abandonment works.

L6.9 *For the purpose of Condition L6.8, fracture stimulation includes any activity required to enable fracture stimulation to be undertaken, but does not include any earthworks, drilling or casing construction.*

M10 **Noise monitoring**

M10.1 *To assess compliance with the noise limits specified in this licence, attended noise monitoring must be undertaken in accordance with Conditions L6.5 and:*

- a) *at each one of the locations identified in the table below, as shown on:*
- Map titled 'AGL Gloucester Gas Project - Waukivory Area', EPA reference DOC14/20568.*
- b) *occur every 6 months in a reporting period;*

- c) occur during each day, evening and night period as defined in the NSW Industrial Noise Policy for a minimum of:
- 1.5 hours during the day;
 - 30 minutes during the evening; and
 - 1 hour during the night.
- d) occur for three consecutive operating days.

Location	Frequency
Lot 2, DP 795361	Every 6 Months
The premises marked NWK2 on DOC14/20568 immediately south of railway on the eastern side of Fairbairns Road	Every 6 Months

Noise Compliance Assessment Report

- R5.4 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of each noise monitoring event. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:
- a) an assessment of compliance with noise limits presented in Condition L6.1; and
 - b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L6.1.

3. RECEPTORS

AGL previously commissioned the *Waukivory Pilot Project Construction Noise Management Plan* (CNMP) (EMGA Mitchell McLennan, 6 August 2014) to manage construction noise levels at receptors in response to Condition G2.2 of the EPL. The CNMP identified potentially sensitive receptors and assigned identification numbers R1 to R10 as described in Table 1 and shown on the plan reproduced in Appendix A.

Table 1: Identified Residential Receptors (from Table 1.2 in the CNMP).

Location	Address	Coordinates (MGA Zone 56)
R1 ¹	20 Grantham Road, Forbesdale (Lot 11 DP 841445)	402023, 6453041
R2	Intersection of Fairbairns Lane and North Coast Railway	401824, 6452610
R3	176 Fairbairns Road, Forbesdale (Lot 2 DP 795361)	402095, 6452080
R4 ¹	237 Fairbairns Road, Forbesdale	402510, 6451653
R5 ¹	197 Fairbairns Road, Forbesdale	403184, 6452184
R6	114 Maslens Lane, Gloucester	402747, 6453425
R7	304 Fairbairns Road, Forbesdale	402282, 6451332
R8	305 Fairbairns Road, Forbesdale	402822, 6450969
R9	Lot 881 Fairbairns Road, Forbesdale	402942, 6450475
R10	384 Fairbairns Road, Forbesdale	403012, 6450236

¹ Receivers R1, R4 and R5 are owned by a mining company.

Condition M10.1a identifies two receptor locations for inclusion in the noise compliance survey and refers to a map showing the location of the two receptors R2 (EPA noise monitoring site NWK2) and R3 (EPA noise monitoring site NWK3).

4. NOISE CRITERIA

Noise criteria for the assessment are sourced from EPL conditions L6.1 and L6.5 which specify the following noise limits and measurement locations:

- 35 LAeq,15min measured at the most affected point within 30 m of a residence during the day, evening and night; and
- 45 LA1,1min measured 1 m from the most affected bedroom window during the night only.

According to EPL condition L6.3, the noise limits apply under the following weather conditions:

- Stability categories A to E and wind speeds of 3 m/s or less at 10 m above ground level; and
- Stability category F and wind speeds of 2 m/s or less at 10 m above the ground.

The noise limits do not apply under higher wind speed or stability category G conditions as the strong noise enhancement and potentially higher noise levels at receptors caused by such conditions are considered atypical for this area.

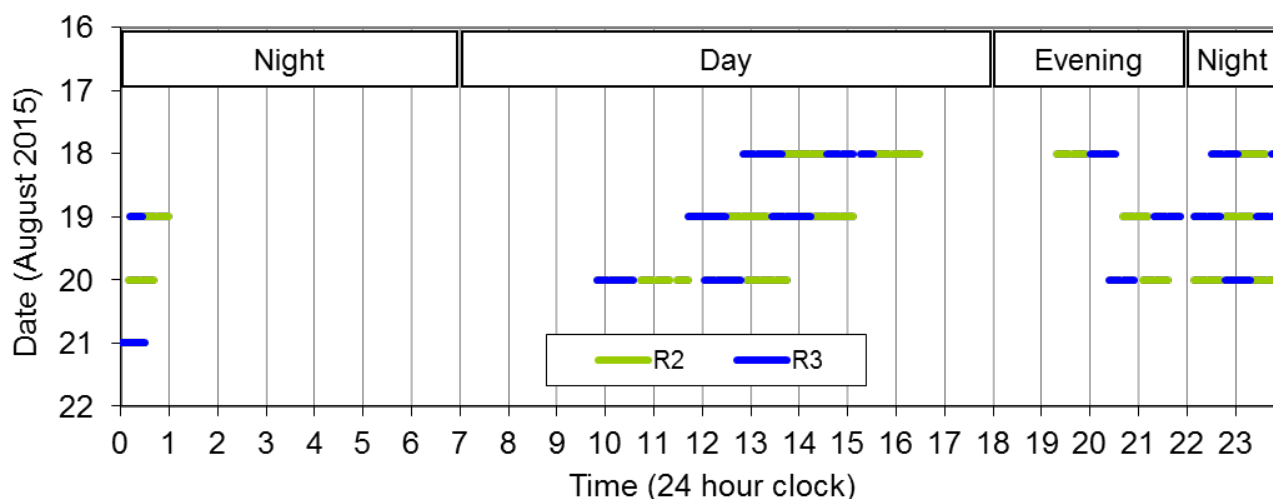
5. SURVEY METHODOLOGY

The noise survey was designed to satisfy all relevant EPL conditions including condition M10.1 which requires operator attended noise measurements to be taken:

- a minimum of 1.5 hours during the day, 30 minutes during the evening and 1 hour during the night; and
- for three consecutive days.

Figure 1 presents the noise survey schedule which indicates the date and time of noise measurements at each receptor.

Figure 1: Noise Survey Schedule, August 2015.



The noise survey was consistent with relevant recommendations in the *NSW Industrial Noise Policy* (EPA, 1999) (INP). The survey was programmed to occur from Tuesday 18 August to Friday 21 August 2015, representing typical operating days. Noise measurements were taken using a Svantek 957 sound level analyser programmed to measure and store one second 1/3 octave Leq data in each 15 minute period, with results subsequently processed to determine 15 minute average and percentile noise levels. Instrument calibration was checked at the beginning and end of each day using an 01dB Cal-01 acoustic calibrator which produces 94 dB at 1kHz. Copies of current calibration certificates for these instruments, from a NATA-accredited laboratory, have not been attached to this report but are available upon request.

The analyser microphone was mounted on a pole projecting approximately 1 m above the front of a vehicle and 2.3 m above the ground. While this microphone height is above the usual range of 1.2 to 1.5 m above the ground as recommended in Australian Standard 1055, the noise level difference from a remote and line of sight source is not significant. If anything, noise levels from insects and other local extraneous sources would be generally higher and noise levels from operating plant associated with the project would be slightly lower if the microphone were located at the standard height, therefore the results of this assessment are slightly conservative.

The separate noise contribution from the project was estimated from the 1/3 octave percentile spectra and from observations and notes compiled during each 15 minute period. Where the project was inaudible or barely audible, the project noise contribution could not be directly measured and an upper limiting noise level or a less accurate estimated noise level is generally reported.

5.1. Determining Project Noise Contribution

Project related noise was not significantly louder or more dominant than other non-project sources at any time during the noise survey and therefore could not be directly measured. Indirect methods to estimate the project noise contribution were therefore required.

Measured total dBA noise levels indicate the level of noise heard by a human ear from all noise sources, including project related and non-project sources, operating at the time. The ear can detect and differentiate sound frequencies generally in the range 20 Hz to 20 kHz and noise from various sources can often be quantified by separately attributing noise levels depending on frequency, even in cases where noise from a specific source is not clearly audible.

Instruments used in the survey returned noise measurement data in 1/3 octave bands from 20 Hz to 20 kHz. Prior noise monitoring experience and detailed analysis of the results obtained for this noise survey indicates the following frequency bands are significant:

- Insect noise is primarily produced in the frequency range 2500 to 5000 Hz;
- Noise from frogs and similar animals tends to be produced in the frequency range 1600 to 2500 Hz;
- Noise from birds varies considerably, however most bird noise is produced at frequencies above 1000 Hz; and
- The project's diesel generators produce a dominant frequency of 50 Hz and measured noise levels consistently show a peak at 50 Hz with a smaller peak at 100 Hz, generally in the LA90 and LAmin spectra which indicate noise from constant rather than intermittent sources.

Other sources such as road and rail traffic generally produce noise at a wide range of frequencies, with dominant frequencies often changing for each vehicle passby event, therefore these sources cannot be separately identified by frequency in any reliable manner.

Noise from the project can therefore be generally identified in the 50 Hz and 100 Hz frequency bands. Project noise was also produced at other frequencies, however cannot reliably be identified and separately quantified at those frequencies. The following strategy has therefore been adopted to estimate the project noise contribution in each 15 minute noise measurement period:

- Estimate the total dBA project noise level in 15 minute periods where project noise is most audible;
- Note the magnitude of the noise level peaks at 50 Hz and 100 Hz and correlate these peaks to total dBA project noise levels;
- Use the 50 Hz and 100 Hz peaks to estimate total dBA noise levels for all 15 minute measurement periods.

Project noise was generally most audible at both receptors during the evening and night and was audible to a lesser extent during the day in the absence of rural irrigation equipment. Project related sources operate

continuously and are therefore more likely to be represented by the LA90 percentile (the quietest 10% of the time) in each 15 minute period. Figures 2 and 3 show the various LA90 noise level spectra measured at R2 and R3 respectively during the evening and night (in black) and the median noise level from the project excluding noise from insects and frogs (in red).

Figure 2: Measured Noise Level Spectra and Estimated Project Noise, R2 Evening and Night LA90.

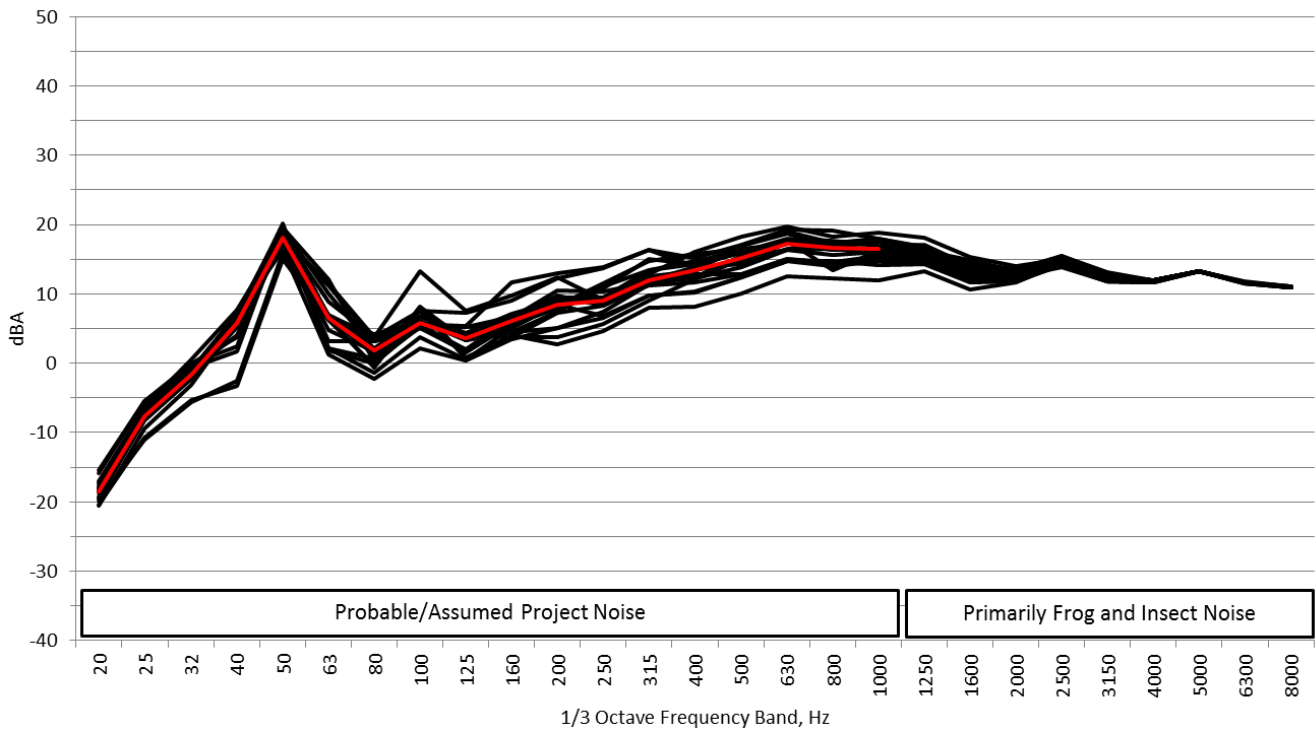
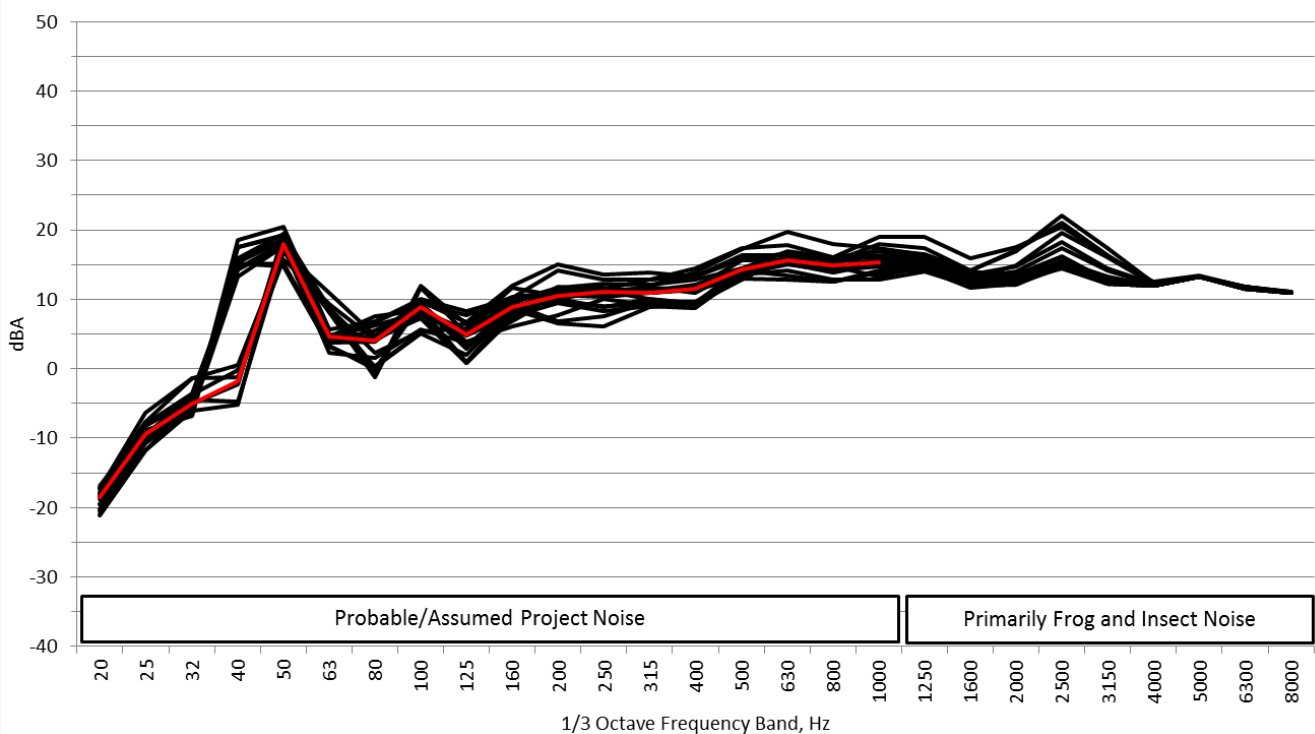


Figure 3: Measured Noise Level Spectra and Estimated Project Noise, R3 Evening and Night LA90.



Figures 2 and 3 indicate measured noise in the 20 Hz to 1000 Hz frequency bands is most likely due to the project while noise in frequency bands above 1000 Hz is primarily due to other sources such as insects and frogs. Noise levels in the 4000 Hz band and above are below the noise floor of the instrument. The red line in each figure indicates the estimated median noise level excluding insect and frog noise. The very small variation in measured noise levels in the 50 Hz frequency band indicates this band is the most reliable indicator of project noise level.

A total project noise level of 25 dBA has been calculated by summing noise levels in all frequency bands for the red median line, which is 7 dBA above the measured median noise level of 18 dBA in the 50 Hz frequency band. These results indicate the project noise level can be estimated by adding 7 dBA to the measured noise level in the 50 Hz band for all 15 minute periods. This strategy provides only approximate results, however no other reliable method is available to determine project noise levels that are well below the background level.

The 7 dBA correction factor adopted for this assessment differs from the 9 dBA factor adopted in the previous February 2015 assessment due to the greater occurrence of temperature inversions in winter compared to the summer months.

The median noise spectrum shown in each figure shows A-weighted noise levels and can be converted to C-weighted levels to determine if a 5 dBA low frequency penalty is required, as described in the NSW Industrial Noise Policy (INP) and required by EPL condition L6.7. A total project noise level of 48 dBC is more than 15 dB above the 25 dBA level, therefore a 5 dBA low frequency penalty is required to minimise the intrusiveness of project noise at each receptor. The median spectrum also satisfies the definition of tonal noise as described in Table 4.1 of the INP, however an additional tonal penalty is not required as the tone is in the low frequency range and is therefore covered by the low frequency penalty. Project noise is not impulsive or intermittent, therefore no other modifying factors are required.

6. ASSESSMENT

6.1. Project Operating Conditions

The project currently consists of four gas wells connected by pipelines known as gathering lines. Water is extracted from the wells and directed to a holding tank at WK13 while gas is piped to a set of three flares located adjacent to WK12. Diesel powered generators units at each well and the three flares operated continuously during the three day period.

6.2. Weather Conditions

EPL condition L6.4 requires data from the weather station to be used to determine weather conditions during the noise survey. Weather conditions are continuously monitored by AGL's weather station which is located on the Tiedman property approximately 3.2 km south of Receptor R3 and listed in EPL condition P1.1 as EPA Identification Point 26. Hourly data from the weather station were supplied by AGL for analysis.

Air temperatures ranged from approximately 5 °C during the night to approximately 25 °C during the day, however the weather station data did not return reliable air temperature data during the period of the noise survey.

Figure 4: Weather Conditions, August 2015.

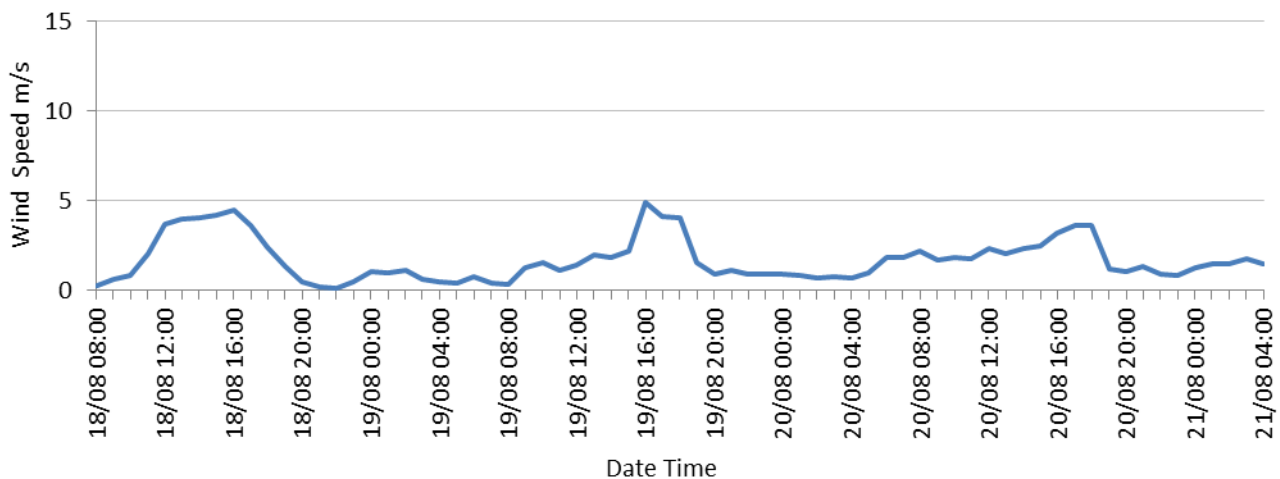


Figure 4 indicates weather conditions were generally acceptable for noise monitoring with wind speeds less than 5 m/s and typically less than 3 m/s at 10 m above the ground.

Received noise levels depend on the noise propagation conditions from source to receiver which are affected by a number of weather related factors including:

- Air temperature;
- Relative humidity;
- Vertical temperature gradient (temperature inversion or lapse); and
- Wind speed and direction.

EPL condition L6.4 requires temperature inversions to be estimated according to the sigma theta method as described in Part E4 of Appendix E of the INP. This method provides an approximate indication of the times inversions are likely to exist based on the variation of wind direction in a measurement period such as one hour, however the inversion strength cannot be reliably estimated from this method. The weather station does not currently report wind sigma-theta therefore this method cannot reasonably be used.

The weather station normally measures and reports the air temperature at two different heights of 2 m and 10 m above the ground. According to a detailed analysis of vertical temperature gradients described in *Discussion Paper – Validation of Inversion Strength Estimation Method* (EPA, March 2014), temperature measurement data over a small height interval such as 8 m cannot be used to directly calculate the inversion or lapse strength expressed in °C/100m, however the data can indicate the presence and relative strength of a temperature inversion during the night or a temperature lapse during the day with an accuracy and reliability at least equal to the more common sigma-theta method.

In the absence of wind sigma-theta data and temperature measurement data, temperature inversions are assumed to occur during the evening and night.

6.3. Receptor R2

Receptor R2 is located adjacent to Fairbairns Road on the southern side of the Main Northern Railway, generally west of the project site. A noise monitoring location on the side of Fairbairns Road approximately 20 m south of the residence was selected for convenient and safe access and to minimise disturbance to residents and dogs at the property.

As this noise monitoring location and the residence itself are a similar distance from the project and similarly exposed to project noise sources, the project noise contribution measured at the monitoring

location would be very similar to the project noise contribution at the residence. No corrections are therefore required to measured project noise levels.

The noise monitoring location is further from the Main Northern Railway and a similar distance from passing traffic on Fairbairns Road, therefore noise levels from extraneous sources including trains, cars and trucks are approximately representative of noise levels at the residence.

Table 2 shows a summary of measured noise levels at R2. Project related noise was not clearly audible or measurable over other sources during the day, however was often one of the most audible sources during the evening and night. The project noise contribution was estimated by adding 7 dBA to the measured LA90 noise level in the 50 Hz frequency band as described in Section 5.1.

Table 2: Measured Noise Level Summary, Receptor R2, August 2015.

Noise Measurement Period				Total Measured Noise Level			Measured Noise Level in 50 Hz Frequency Band	Estimated Total Project Noise Level
Date	Start	End	Period	Lmax	LAeq	LA90	LA90	LAeq
18	13:42	13:57	Day	64	49	41	18	25
18	13:57	14:12		69	49	42	18	25
18	14:14	14:29		70	51	42	18	25
18	15:36	15:51		65	49	42	19	26
18	15:56	16:11		65	47	41	18	25
18	16:13	16:28		82	63	42	19	26
18	19:19	19:34	Evening	60	40	23	15	22
18	19:39	19:54		48	30	25	16	23
18	23:07	23:22	Night	42	32	27	18	25
18	23:22	23:37		46	32	28	18	25
19	00:29	00:44		47	33	29	20	27
19	00:45	01:00		60	38	28	20	27
19	12:33	12:48	Day	65	45	33	17	24
19	12:49	13:04		80	59	32	16	23
19	13:05	13:20		67	47	32	16	23
19	14:19	14:34		67	48	34	17	24
19	14:35	14:50		62	43	34	16	23
19	14:51	15:06		88	65	33	17	24
19	20:40	20:55	Evening	62	44	27	17	24
19	20:56	21:11		48	32	26	18	25
19	22:47	23:02	Night	62	48	28	19	26
19	23:05	23:20		59	44	29	19	26
20	00:09	00:24		55	40	26	19	26
20	00:25	00:40		56	40	27	18	25
20	10:44	10:59	Day	65	45	29	14	21
20	11:04	11:19		85	60	30	14	21
20	11:28	11:43		83	58	30	15	22
20	12:55	13:10		65	45	29	15	22
20	13:12	13:27		64	40	29	15	22
20	13:30	13:45		87	64	32	17	24
20	21:05	21:20	Evening	35	29	27	20	27
20	21:21	21:36		64	40	26	20	27

Noise Measurement Period				Total Measured Noise Level			Measured Noise Level in 50 Hz Frequency Band	Estimated Total Project Noise Level
Date	Start	End	Period	Lmax	LAeq	LA90	LA90	LAeq
20	22:09	22:24	Night	41	30	26	18	25
20	22:26	22:41		41	29	25	16	23
20	23:23	23:38		60	42	27	18	25
20	23:40	23:55		55	41	25	19	26

Table 2 indicates a project noise contribution in the range 21 to 27 LAeq,15min. Noise from the project therefore complies with the 35 LAeq,15min criterion specified in EPL Condition L6.1 at this receptor and would continue to comply with the criterion when a 5 dB low frequency penalty is applied.

6.4. Receptor R3

Receptor R3 is located adjacent to Fairbairns Road generally south west of the project site. A noise monitoring location adjacent to the driveway approximately 50 m east of the residence was selected for convenient and safe access and to minimise disturbance to residents.

The noise monitoring location is approximately 50 m closer to the project, however the project noise level difference between the monitoring location and the residence itself would be insignificant. No corrections are therefore required to measured project noise levels. The noise monitoring location is significantly closer to passing traffic on Fairbairns Road, therefore traffic noise levels would be significantly lower at the residence.

Table 3 shows a summary of measured noise levels at R3. Project related noise was not clearly audible or measurable over other sources during the day, however was often one of the most audible sources during the evening and night. The project noise contribution was estimated by adding 7 dBA to the measured LA90 noise level in the 50 Hz frequency band as described in Section 5.1.

Table 3: Measured Noise Level Summary, Receptor R3, August 2015.

Noise Measurement Period				Total Measured Noise Level			Measured Noise Level in 50 Hz Frequency Band	Estimated Total Project Noise Level
Date	Start	End	Period	Lmax	LAeq	LA90	LA90	LAeq
18	12:50	13:05	Day	71	45	32	16	23
18	13:08	13:23		79	54	34	16	23
18	13:23	13:38		80	55	34	16	23
18	14:34	14:49		76	51	33	15	22
18	14:52	15:07		77	54	33	15	22
18	15:16	15:31		76	52	35	16	23
18	20:00	20:15	Evening	52	36	27	19	26
18	20:16	20:31		39	31	27	19	26
18	22:30	22:45	Night	35	29	25	17	24
18	22:48	23:03		40	32	29	17	24
18	23:46	00:01		70	44	27	16	23
19	00:11	00:26		73	46	28	17	24

Noise Measurement Period				Total Measured Noise Level			Measured Noise Level in 50 Hz Frequency Band	Estimated Total Project Noise Level
Date	Start	End	Period	Lmax	LAeq	LA90	LA90	LAeq
19	11:43	11:58	Day	76	49	31	17	24
19	11:58	12:13		70	44	29	16	23
19	12:14	12:29		75	50	29	17	24
19	13:26	13:41		79	57	31	15	22
19	13:43	13:58		74	51	30	18	25
19	13:59	14:14		66	44	30	17	24
19	21:20	21:35	Evening	59	40	27	18	25
19	21:37	21:52		37	30	27	18	25
19	22:09	22:24	Night	34	28	26	19	26
19	22:26	22:41		74	49	26	19	26
19	23:26	23:41		40	31	28	19	26
19	23:49	00:04		41	29	26	15	22
20	09:49	10:04	Day	75	49	30	16	23
20	10:05	10:20		78	54	29	16	23
20	10:20	10:35		70	45	28	17	24
20	12:02	12:17		69	49	28	15	22
20	12:18	12:33		75	53	29	15	22
20	12:33	12:48		79	56	28	15	22
20	20:23	20:38	Evening	37	31	28	18	25
20	20:40	20:55		38	33	30	18	25
20	22:48	23:03	Night	80	54	28	19	26
20	23:03	23:18		72	46	27	19	26
20	23:59	00:14		39	35	31	15	22
21	00:15	00:30		42	33	30	21	28

Table 3 indicates a project noise contribution in the range 22 to 28 LAeq,15min. Noise from the project therefore complies with the 35 LAeq,15min criterion specified in EPL Condition L6.1 at this receptor and would continue to comply with the criterion when a 5 dB low frequency penalty is applied.

6.5. Maximum Project Noise Levels

EPL condition L6.1 specifies noise limits of 35 LAeq,15min during all time periods which have been assessed in previous sections. The condition also specifies a noise limit of 45 LA1,1min, which is approximately equal to 45 Lmax, at each receptor during the night period only. This part of the condition is intended to minimise the potential for sleep disturbance at residential receptors.

Noise sources associated with the project currently include diesel powered hydraulic units and pumps which operate continuously and have no significant potential to produce short periods of louder noise that may disturb sleep. Maintenance or similar activity may have some potential to produce higher noise levels for brief periods, however maintenance work does not occur during the night and noise from vehicle movements within the project site was no more than barely audible at any time during the noise survey.

Maximum noise levels from the project would therefore remain no more than 5 dBA above average noise levels and would therefore comply with the 45 LA1,1min sleep disturbance criterion at all receptors.

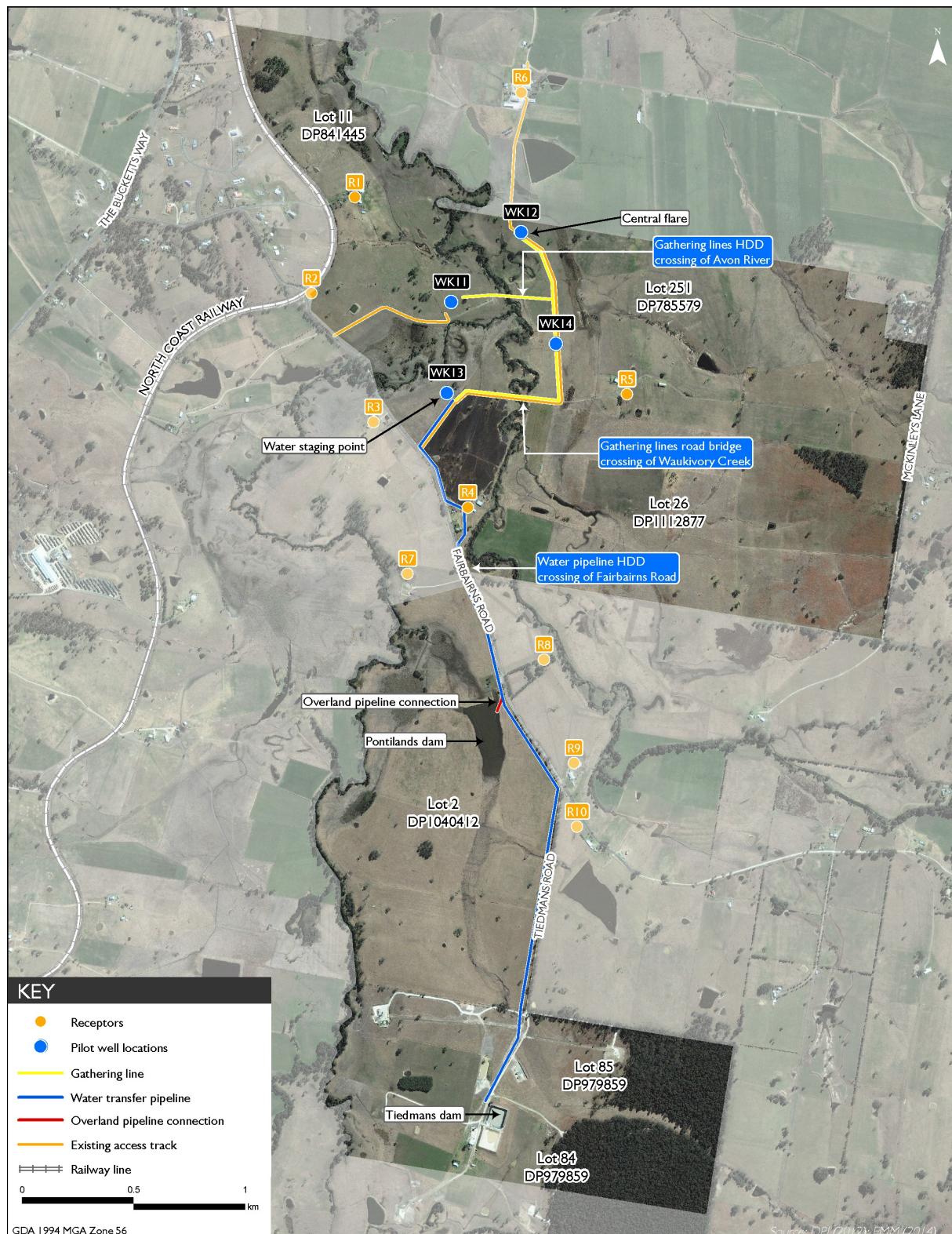
7. CONCLUSION

This report describes results from an assessment of environmental noise levels produced by operation of the Waukivory Pilot Project. Results show noise from the project remains well below relevant Environment Protection Licence (EPL) conditions, particularly condition L6.1 which requires noise levels to meet an intrusive noise limit of 35 LAeq,15min during all time periods and a sleep disturbance limit 45 LA1,1min during the night. Noise from the project meets the NSW Industrial Noise Policy definitions of low frequency and tonal noise, with the tone occurring at 50 Hz. As the tone occurs in the low frequency range, a single 5 dBA penalty is required. Addition of 5 dBA to the estimated project noise contributions results in continued compliance with the noise limits in condition L6.1.

Noise from the project was generally inaudible during the day and was generally audible as a low hum during the evening and night at both receptor locations R2 and R3. Vehicle movements were intermittently visible within the project site during the day, however noise from those vehicles was not clearly audible at any time. Vehicle movements therefore did not appreciably change the estimated project noise contribution at any receptor and have no significant potential for exceeding the 45 LA1,1min sleep disturbance limit.

Based on the results of this assessment, no additional operational noise mitigation or management measures are recommended and no project related noise impacts are occurring at any receptor.

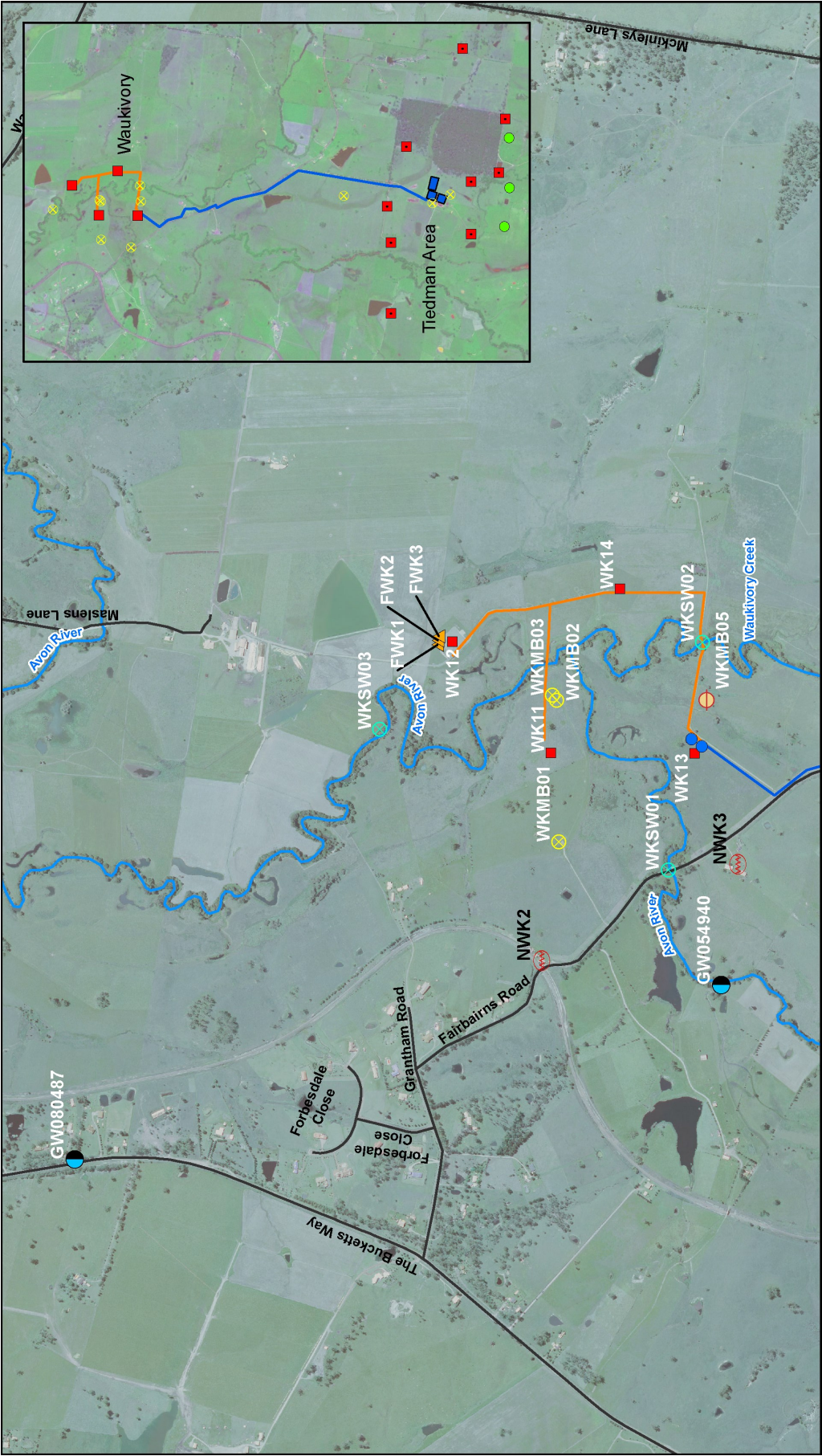
APPENDIX A – PLANS



Proposed work areas
Construction Noise and Vibration Management Plan
Waukivory Pilot Project

Figure 1.1

This plan showing nearest receptors has been reproduced from the CNMP prepared by EMGA Mitchell McLennan.



AGL Upstream Investments Pty Limited
EPL No 20358
AGL Gloucester Gas Project - Waukivory Area
EPA Reference No. Doc14/20568
Date: July 2014

Copyright Environment Protection Authority (NSW) 2014.
This map is not guaranteed to be free from error or omission.
The user of this map is advised to verify the information in the
map and any consequences of such acts or omissions.

Image: main map: ADS Dimgog (8233) 1/4/2012
Image: reference map: SPO15 5m mosaic, 2011

Coordinate System: GDA 1994 MGA Zone 56

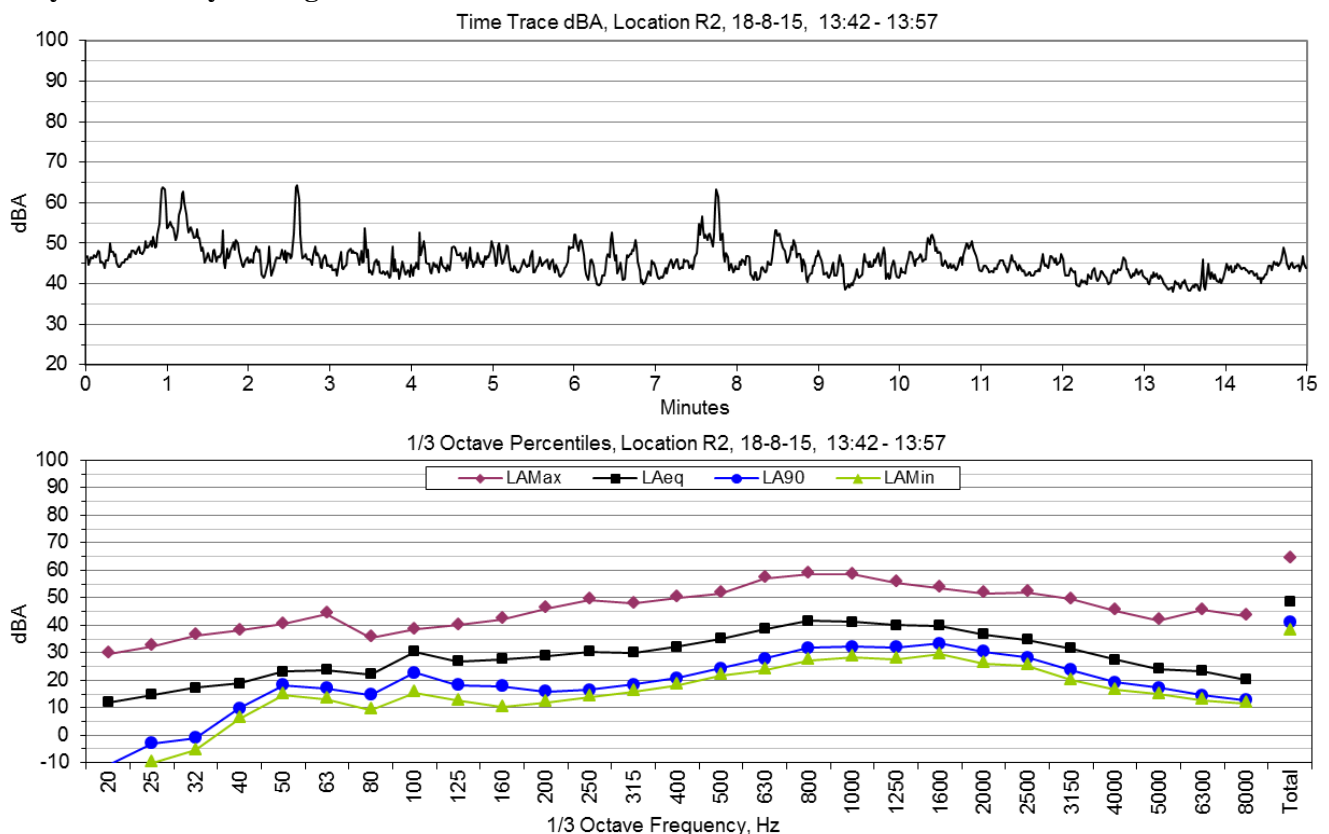


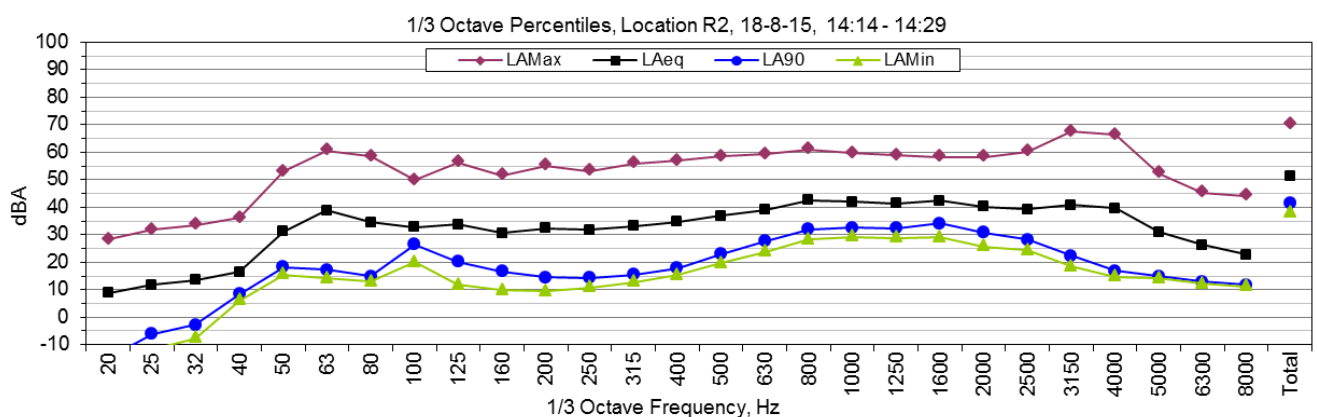
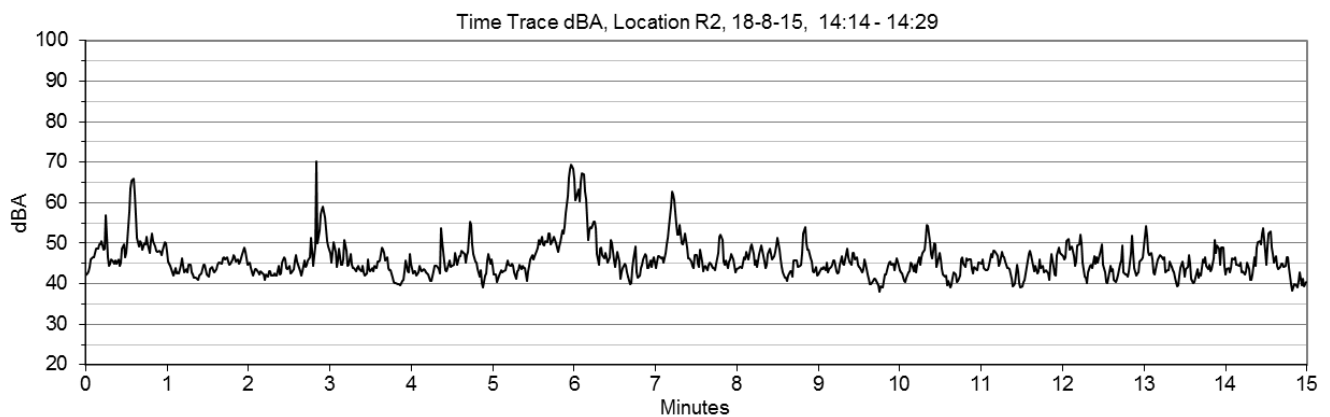
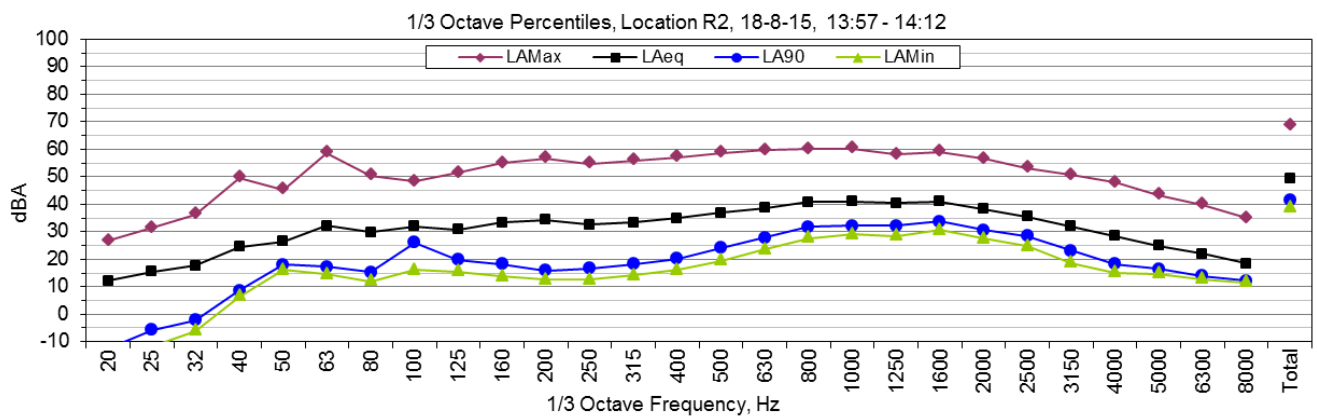
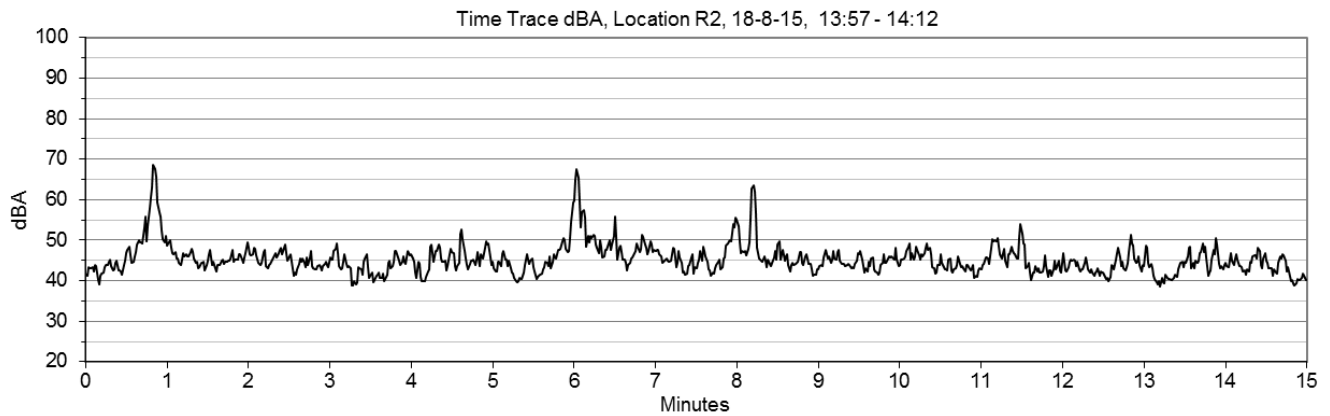
APPENDIX B – MEASURED NOISE LEVELS, RECEPTOR R2

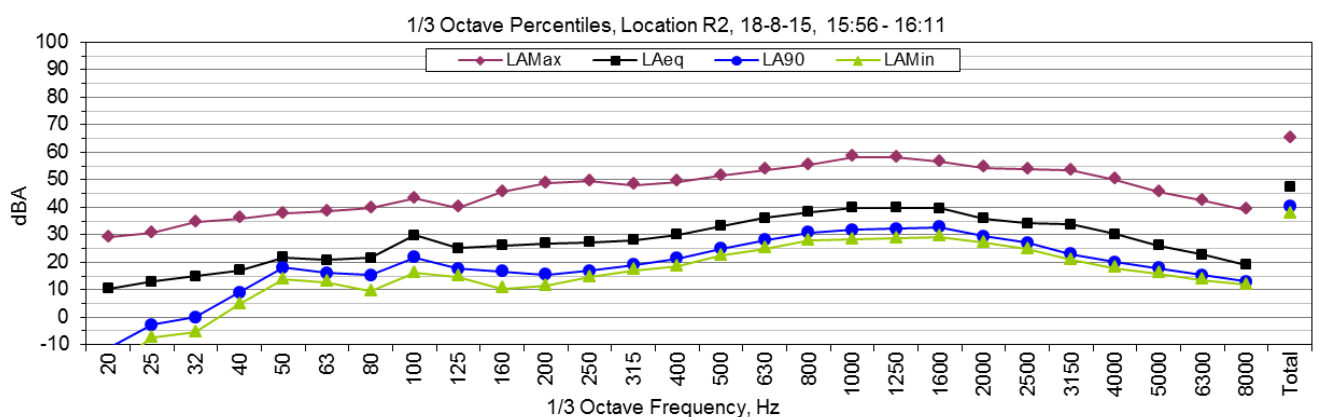
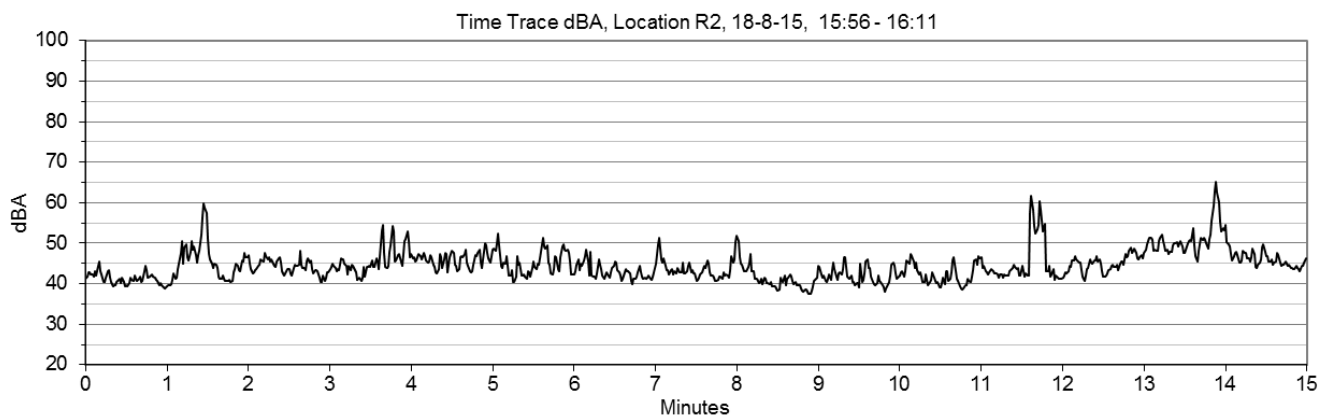
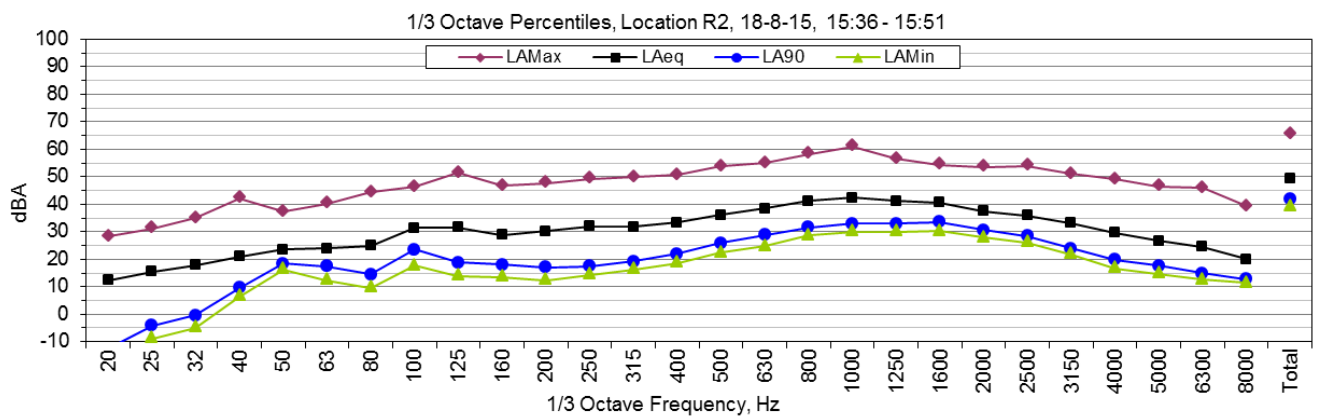
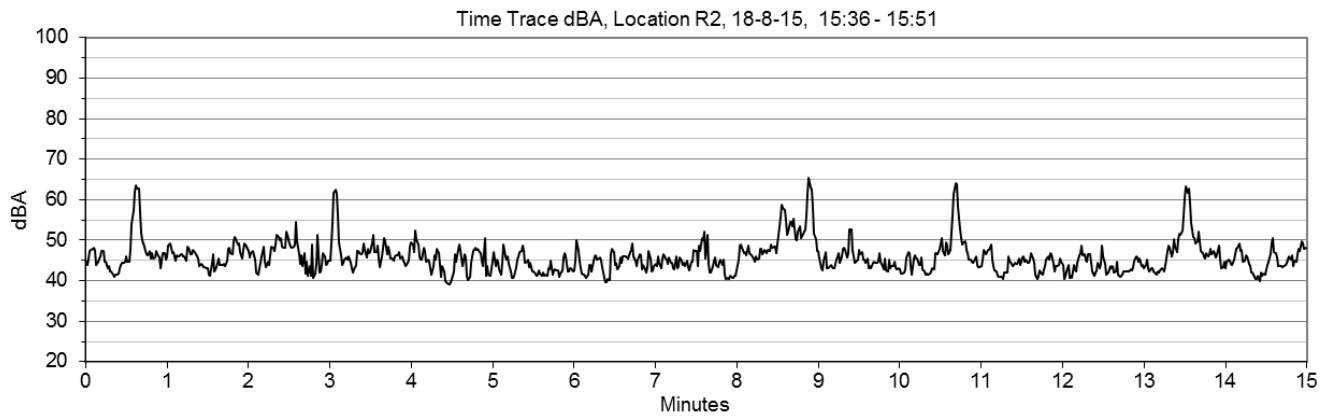
Charts on the following pages show measured noise levels at Receptor R2. Measured noise levels are presented in the order they were measured, with the date and time shown in each figure.

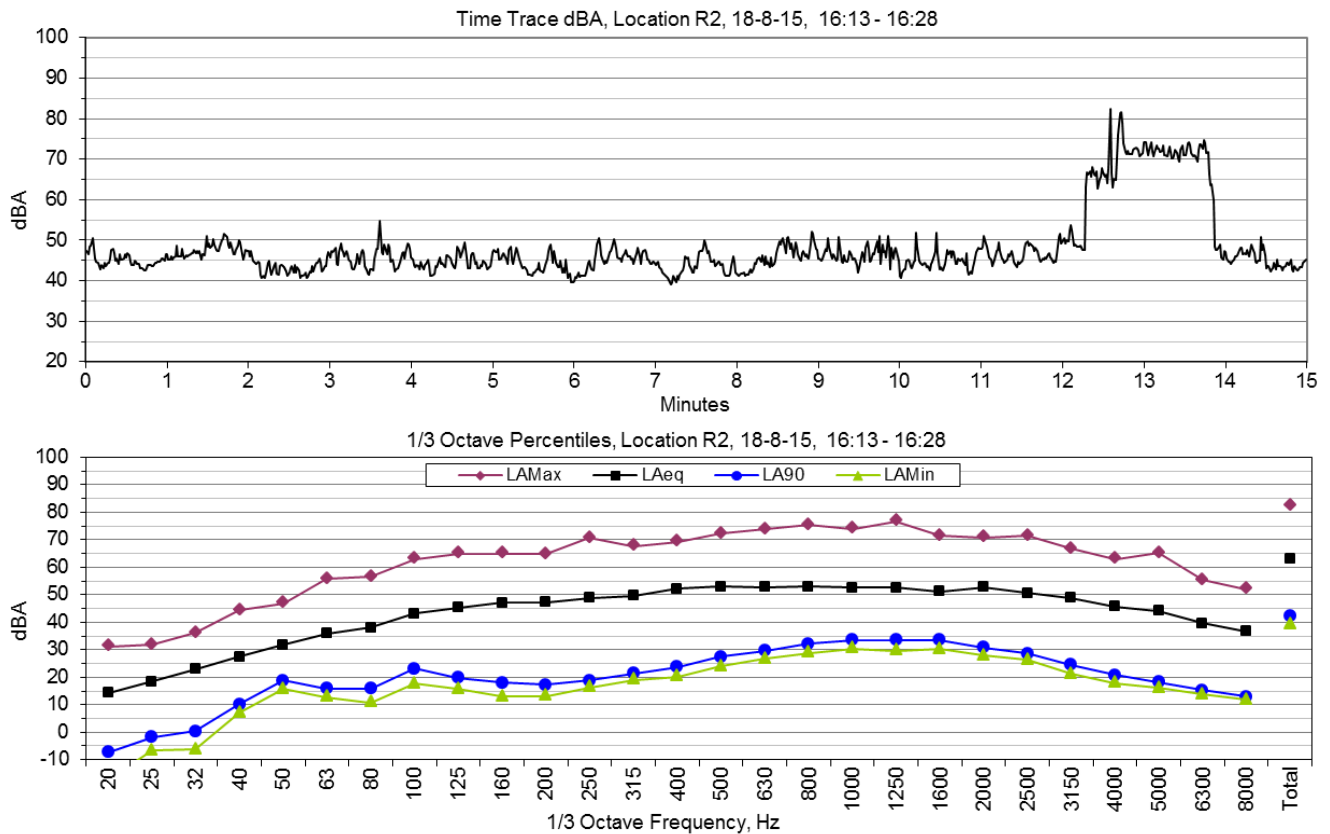
Two charts are shown for each noise measurement. The first chart shows a ‘noise level trace’ for the duration of the noise measurement in one second intervals in dBA. The second chart shows the measured maximum (L_{Amax}), average (L_{Aeq}), background (LA₉₀) and minimum (L_{Amin}) noise levels in 1/3 octave bands from 20 Hz to 8000 Hz and total dBA noise levels.

Day 1 – Tuesday 18 August 2015

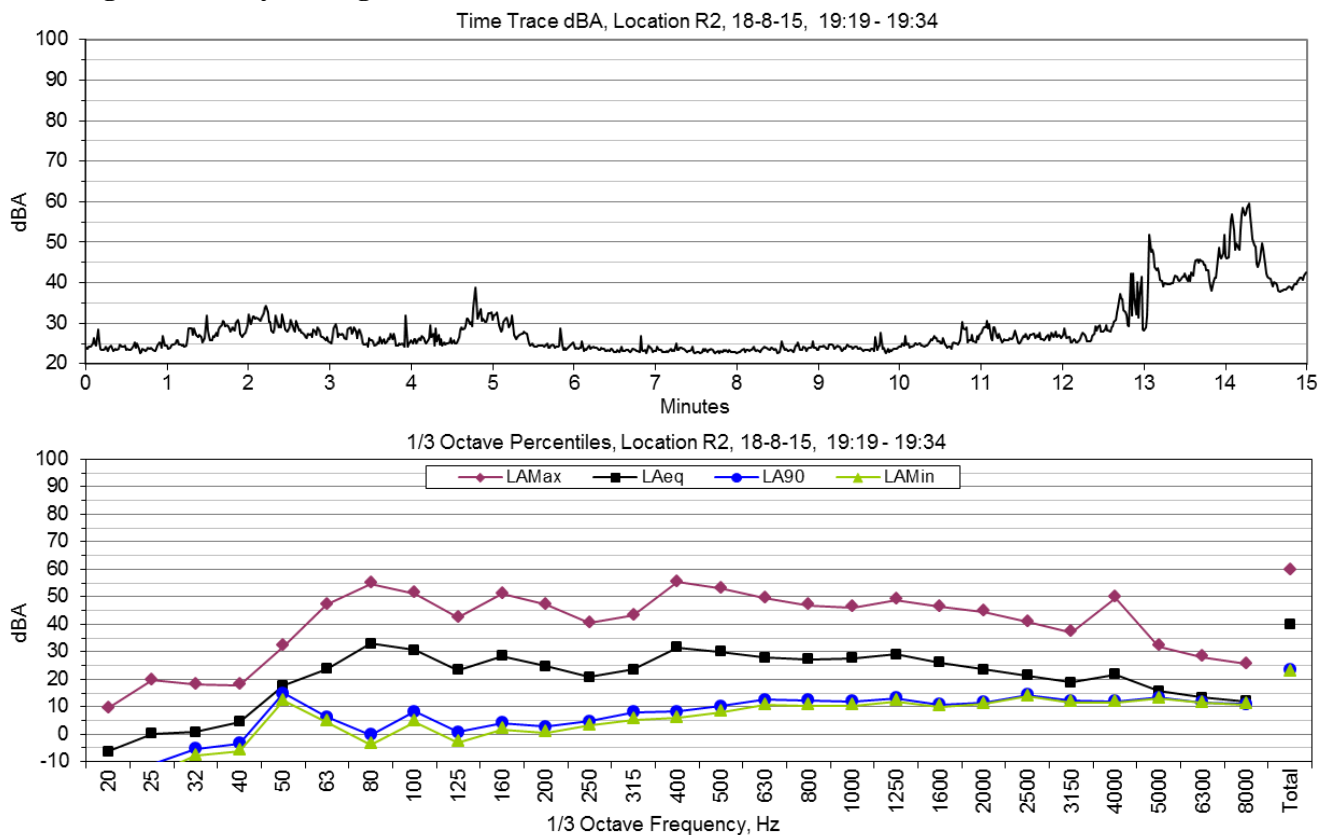


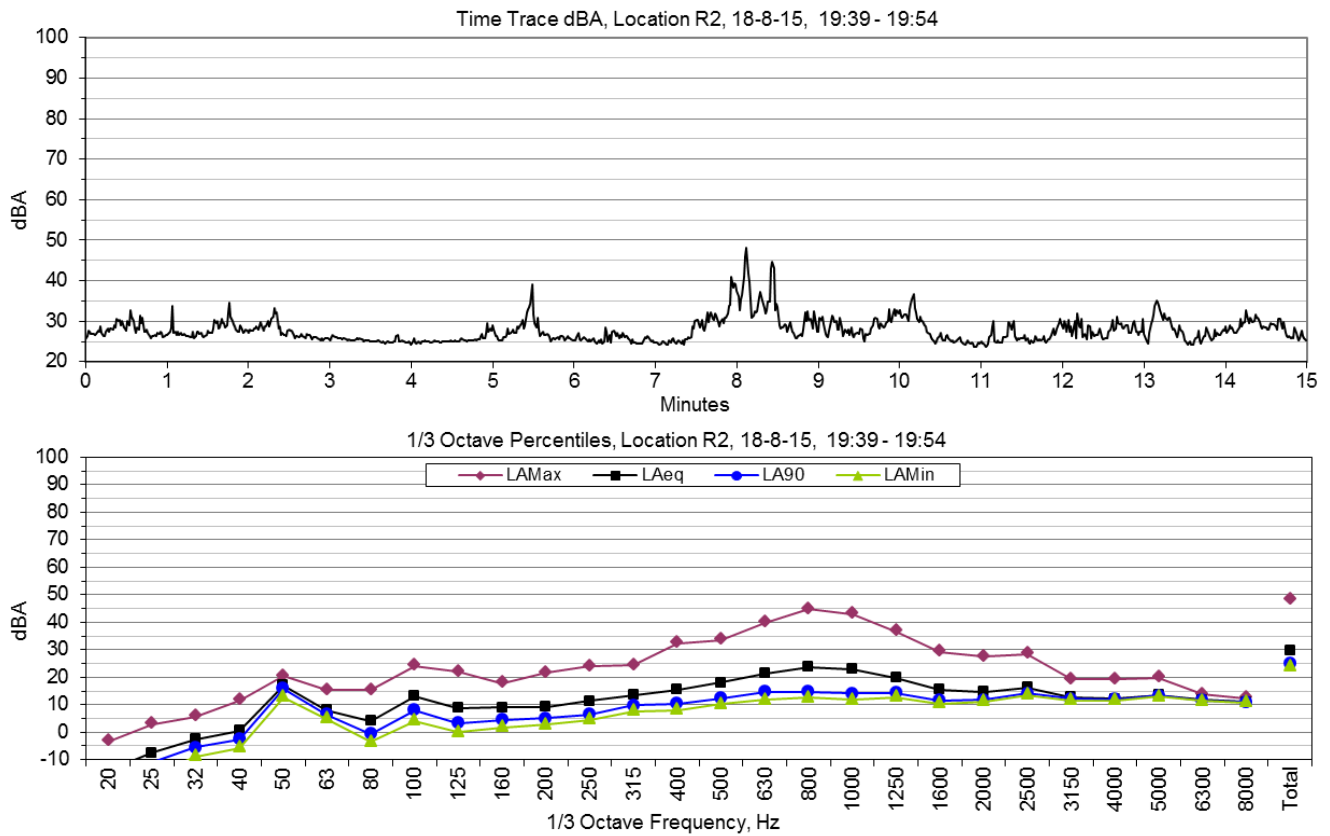




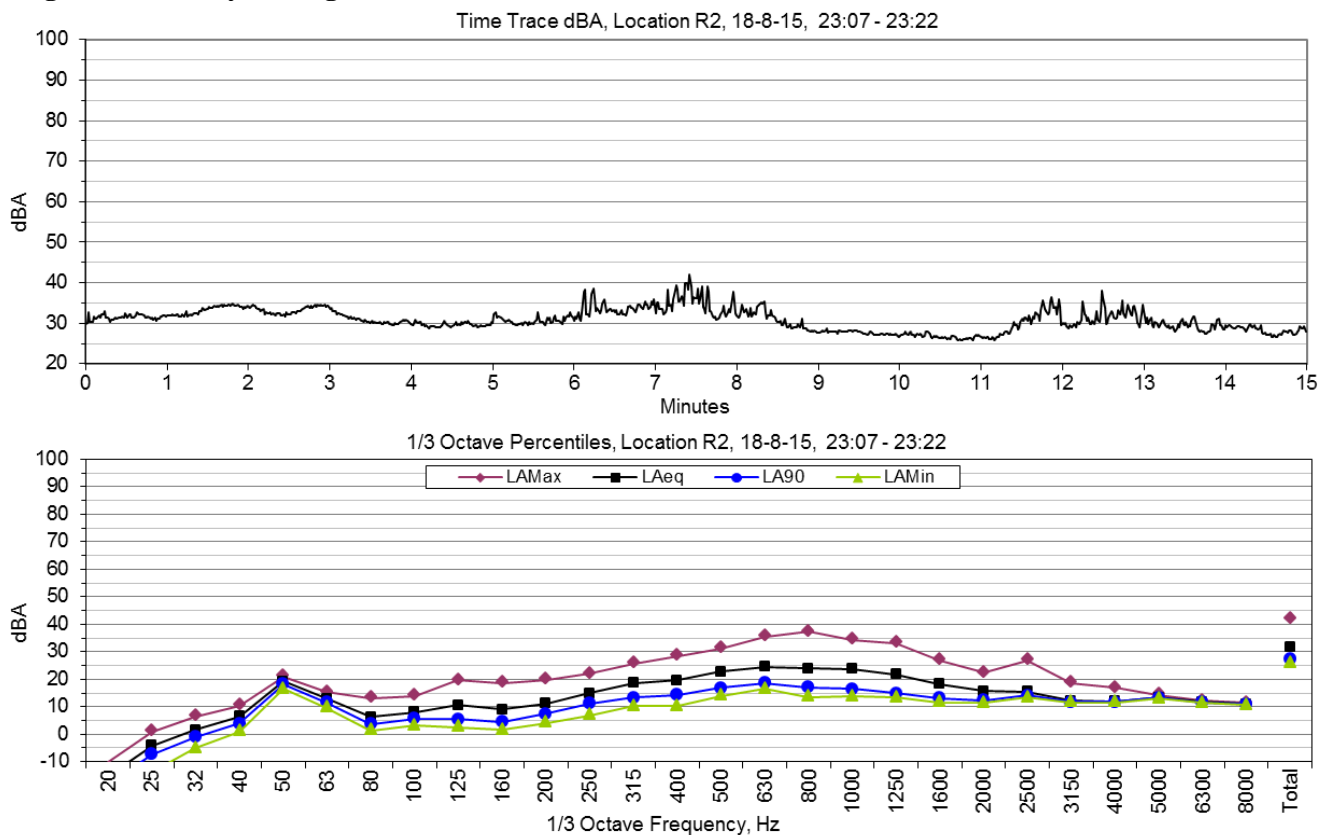


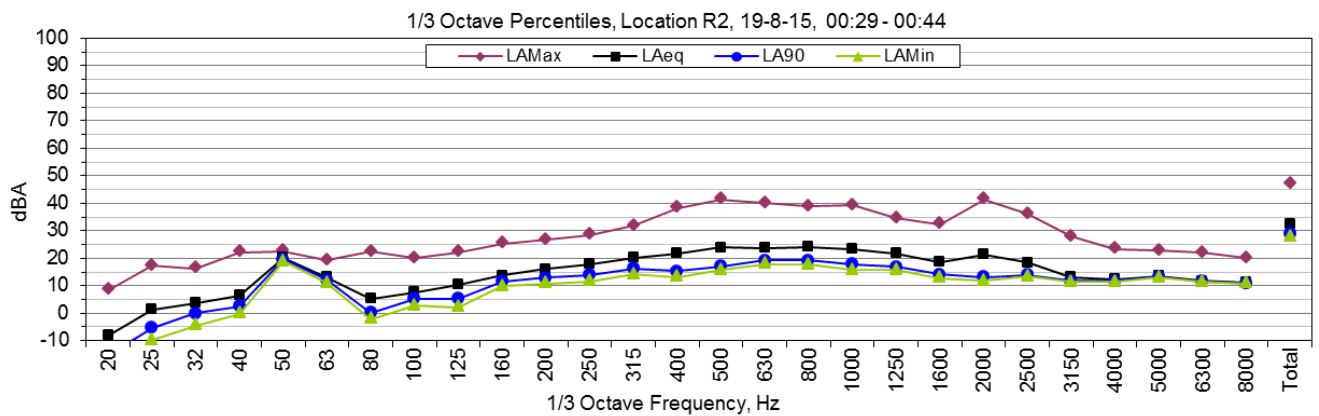
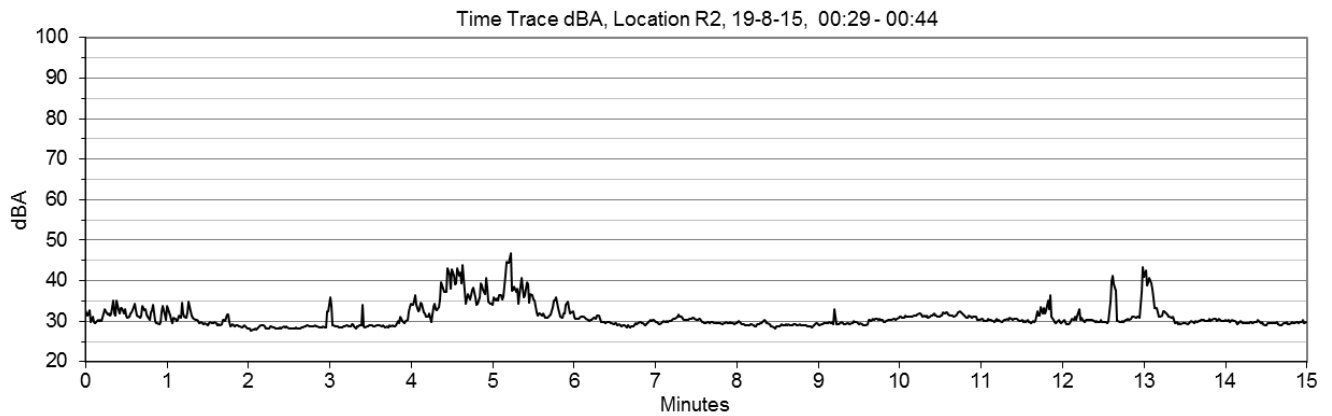
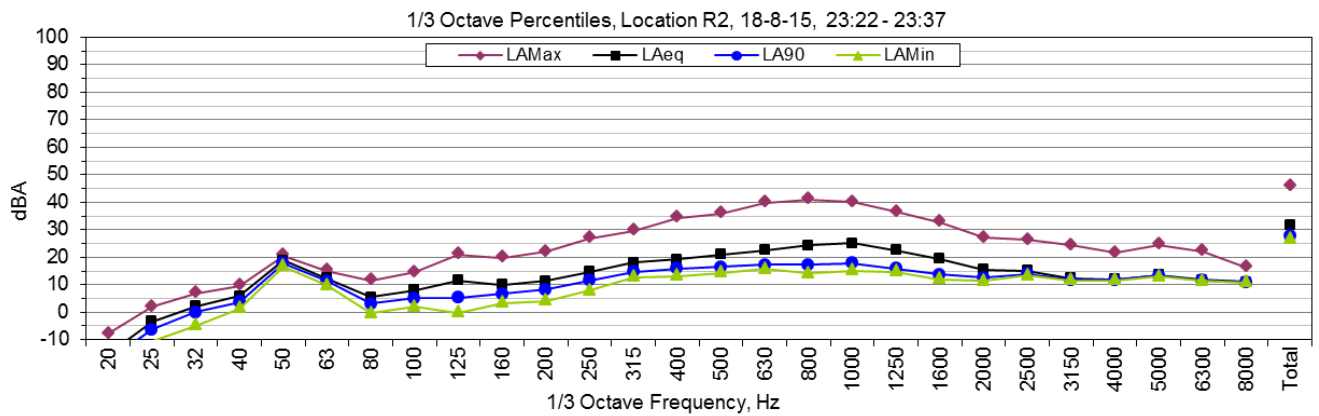
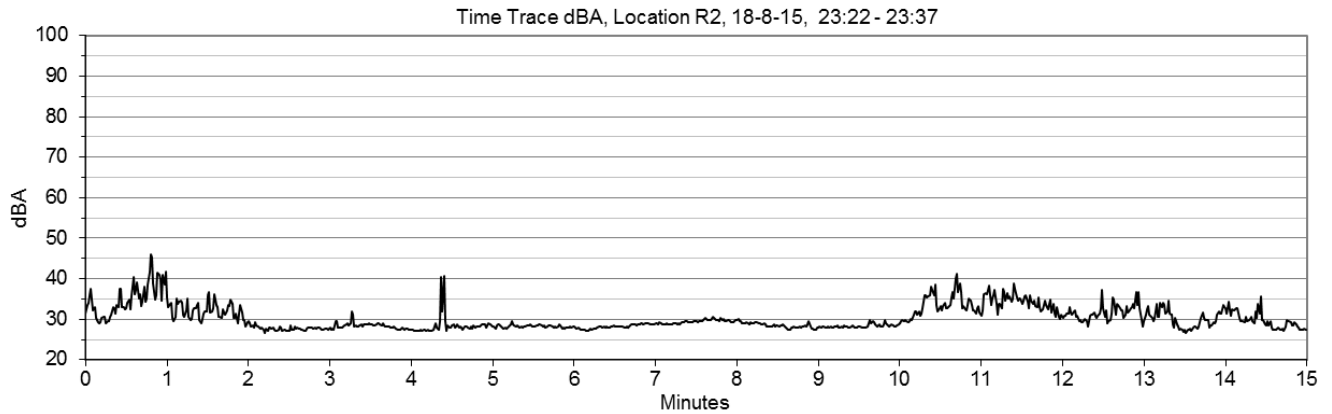
Evening 1 – Tuesday 18 August 2015

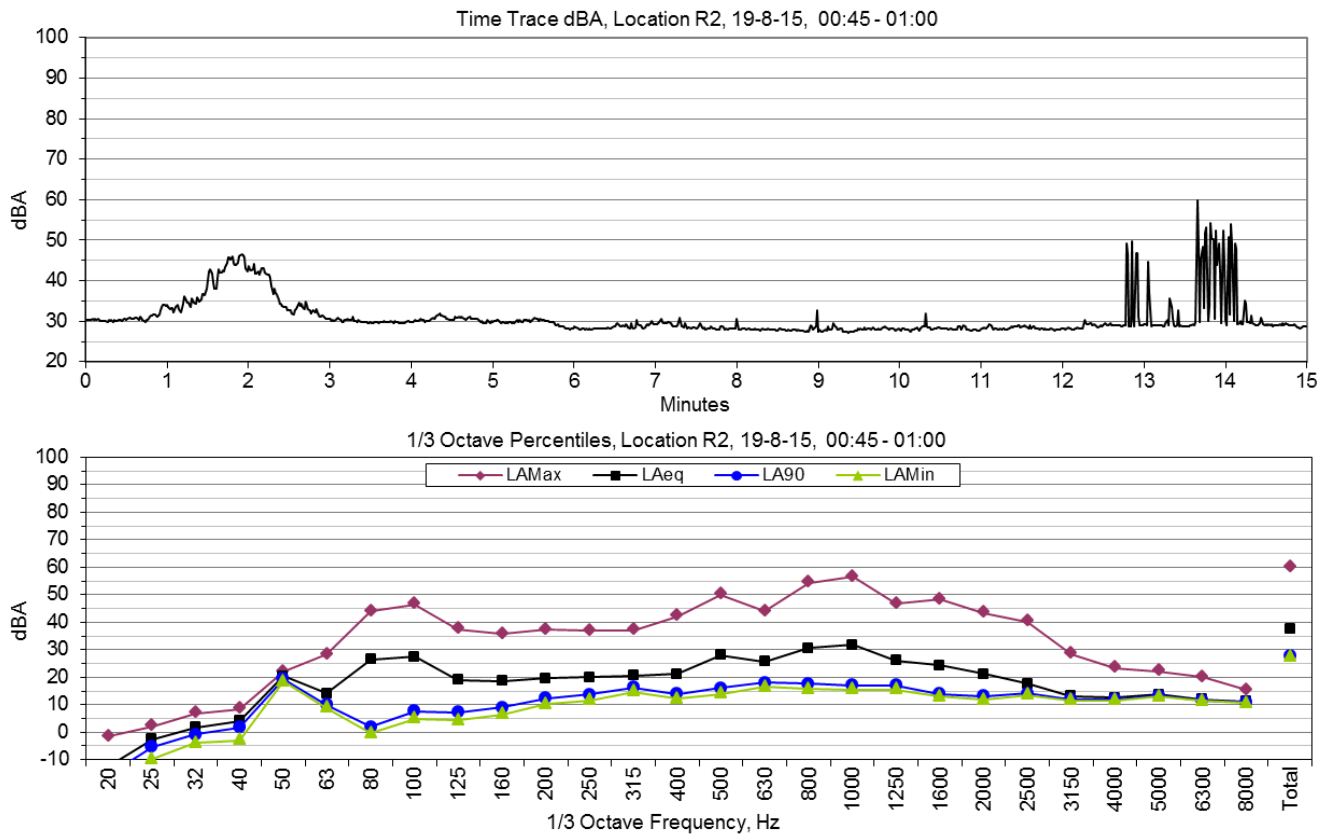




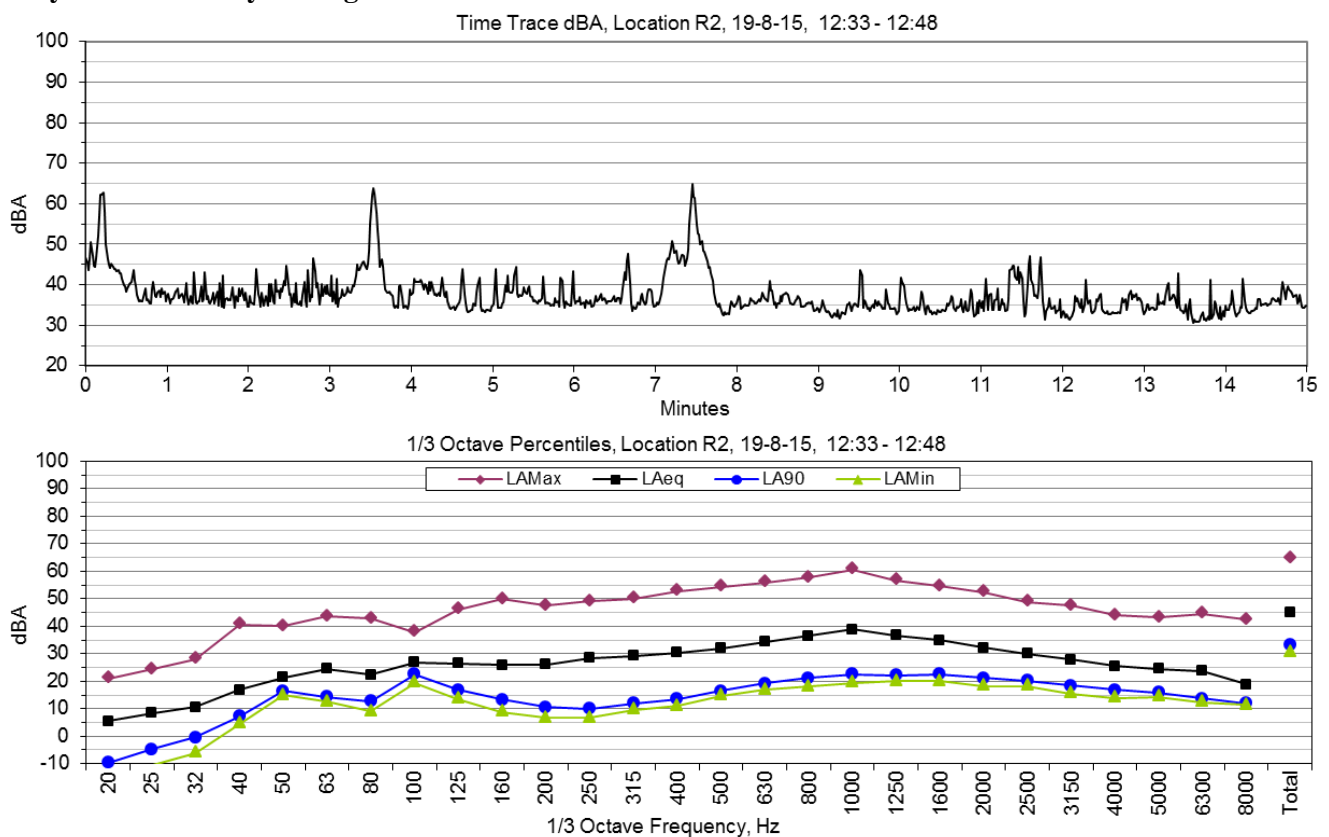
Night 1 – Tuesday 18 August 2015

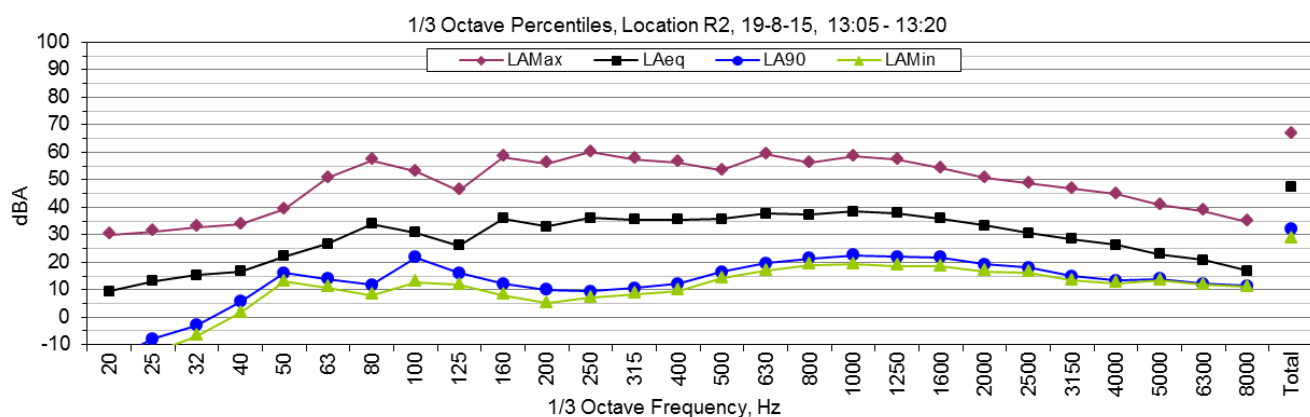
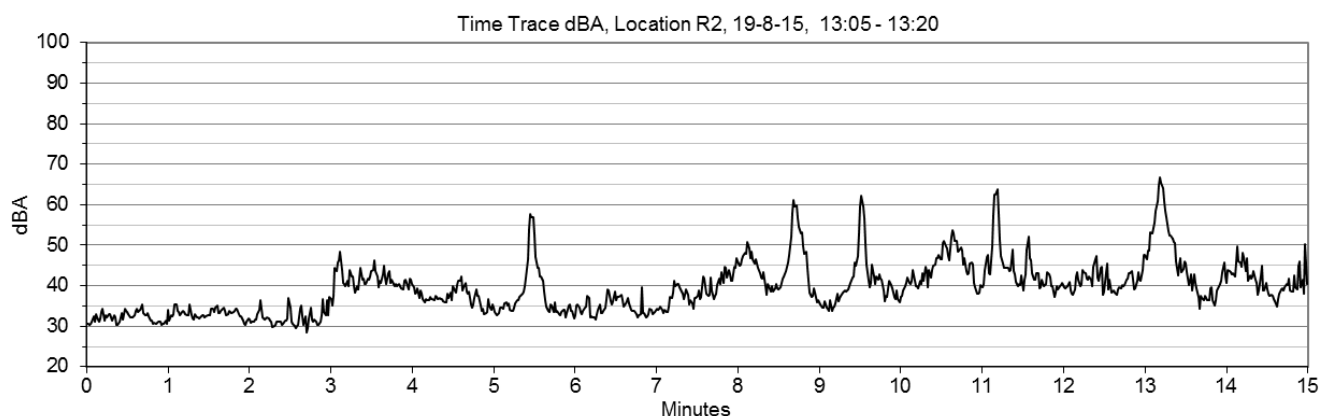
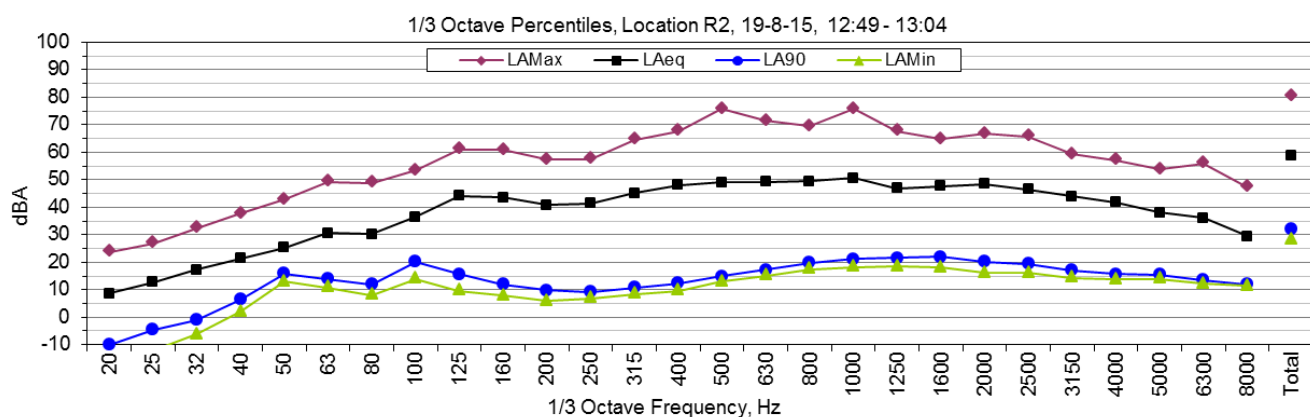
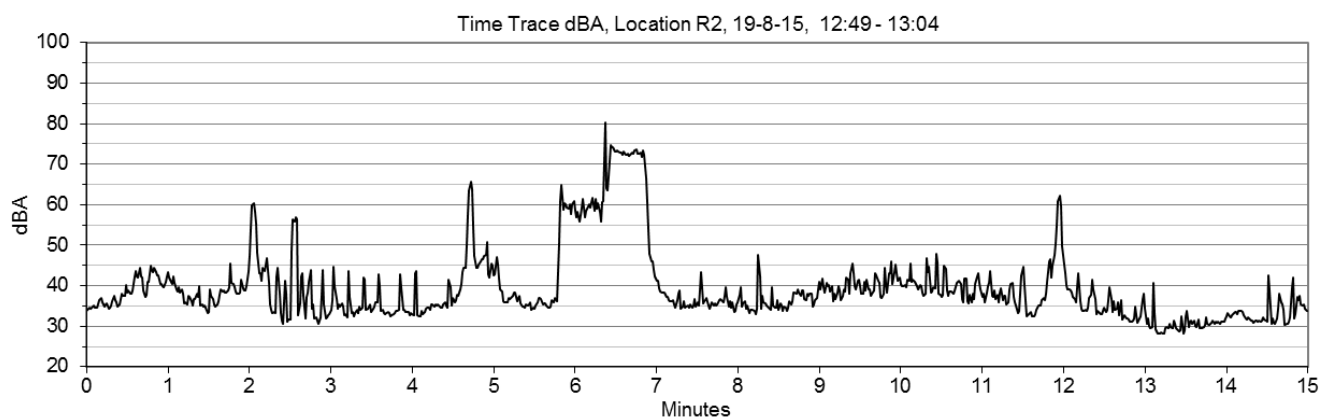


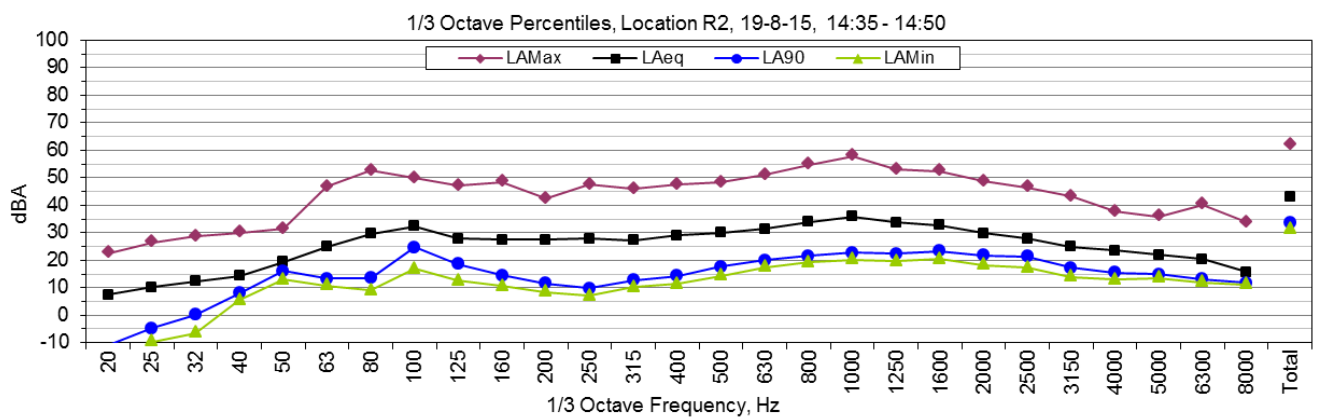
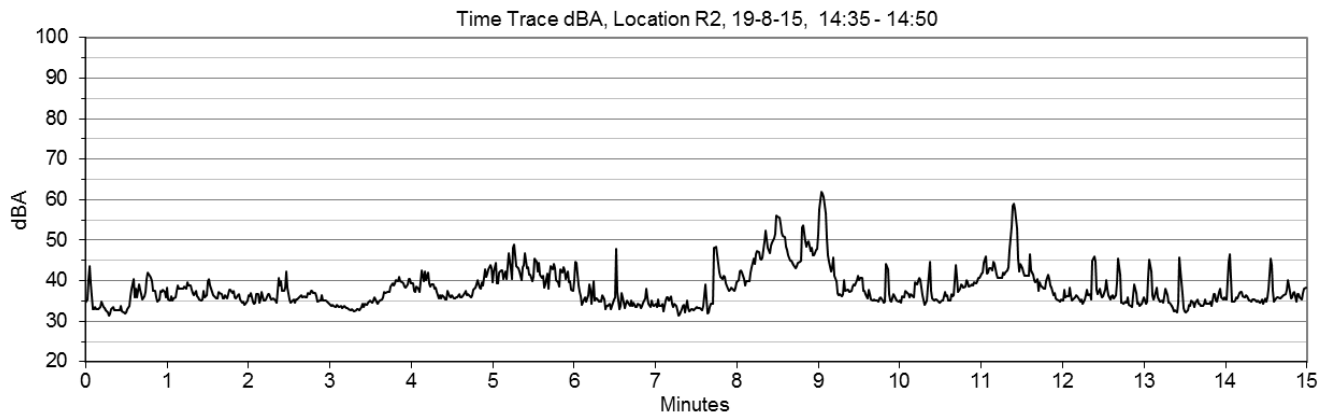
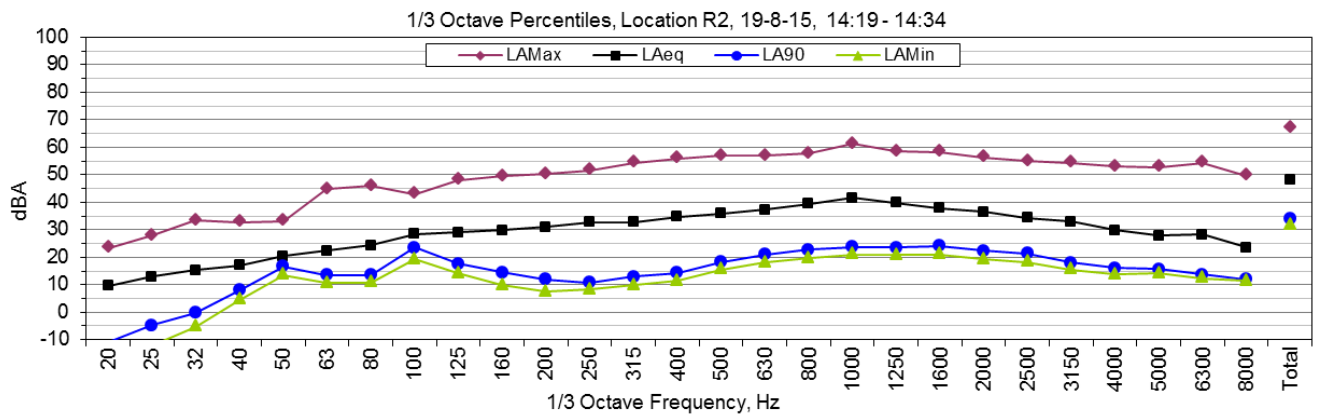
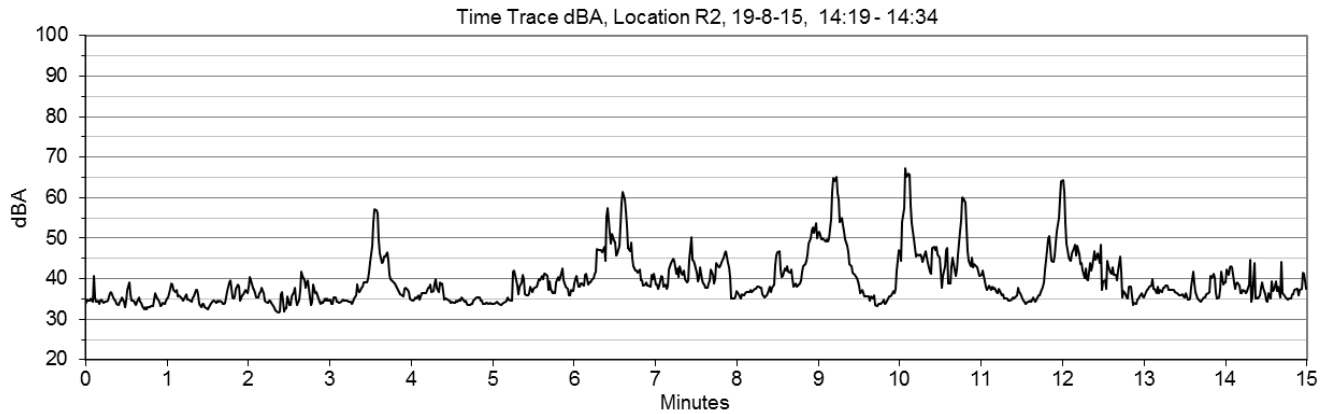


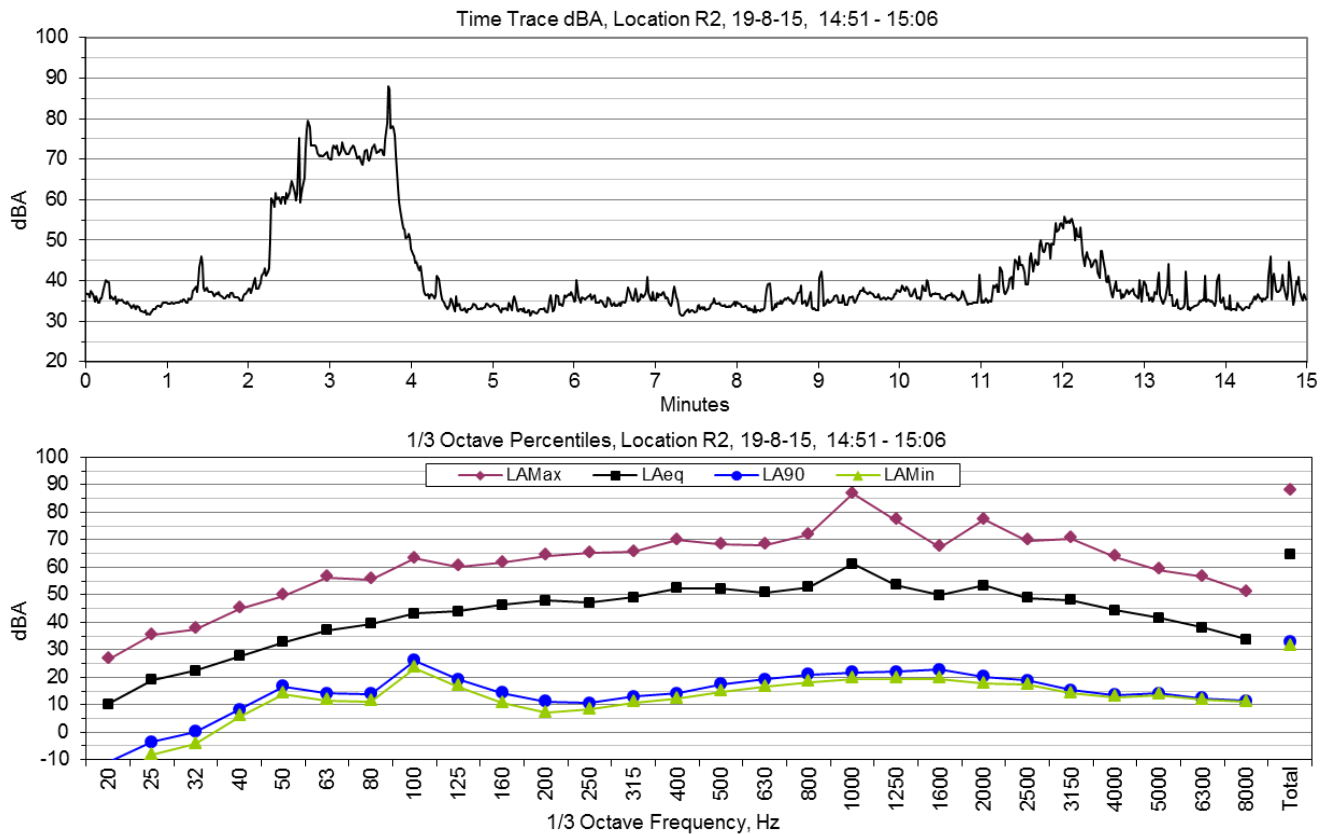


Day 2 – Wednesday 19 August 2015

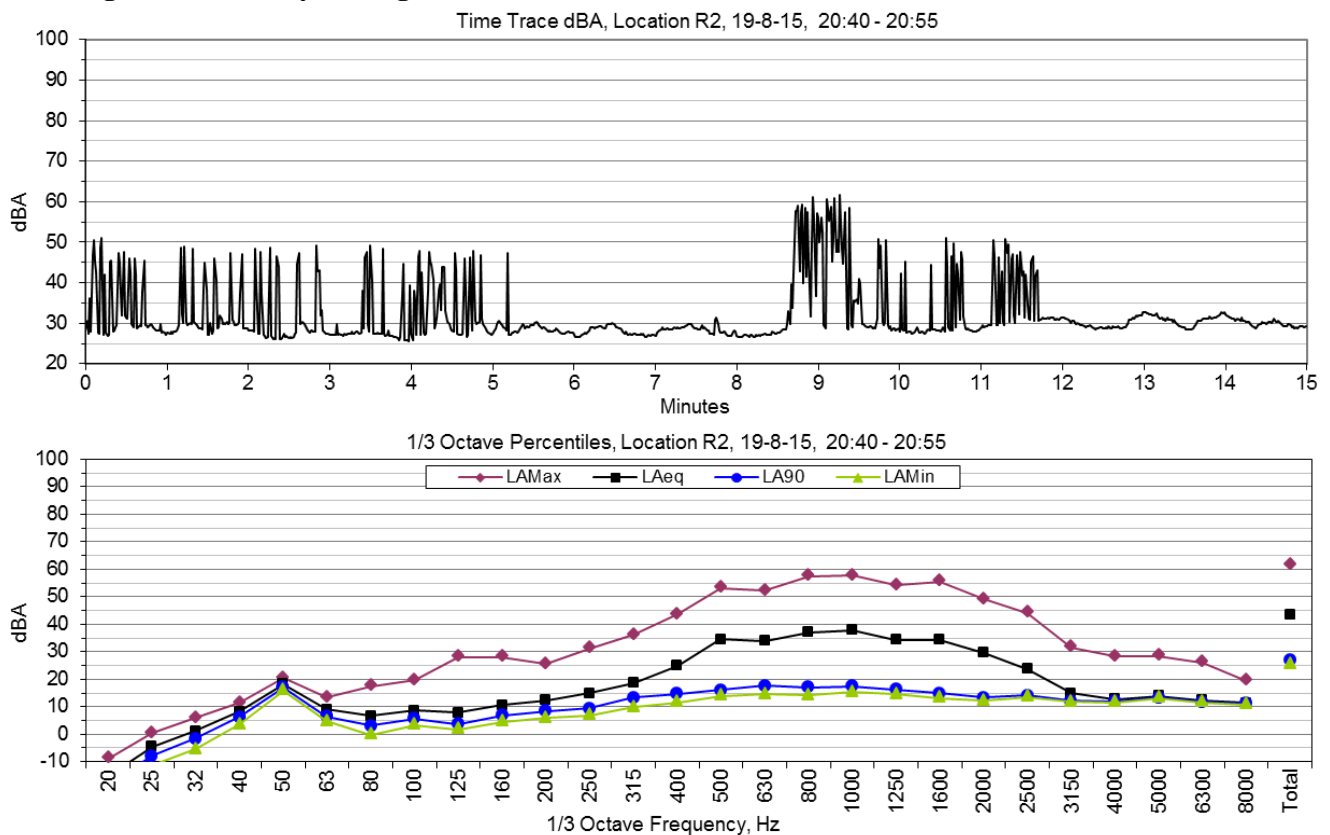


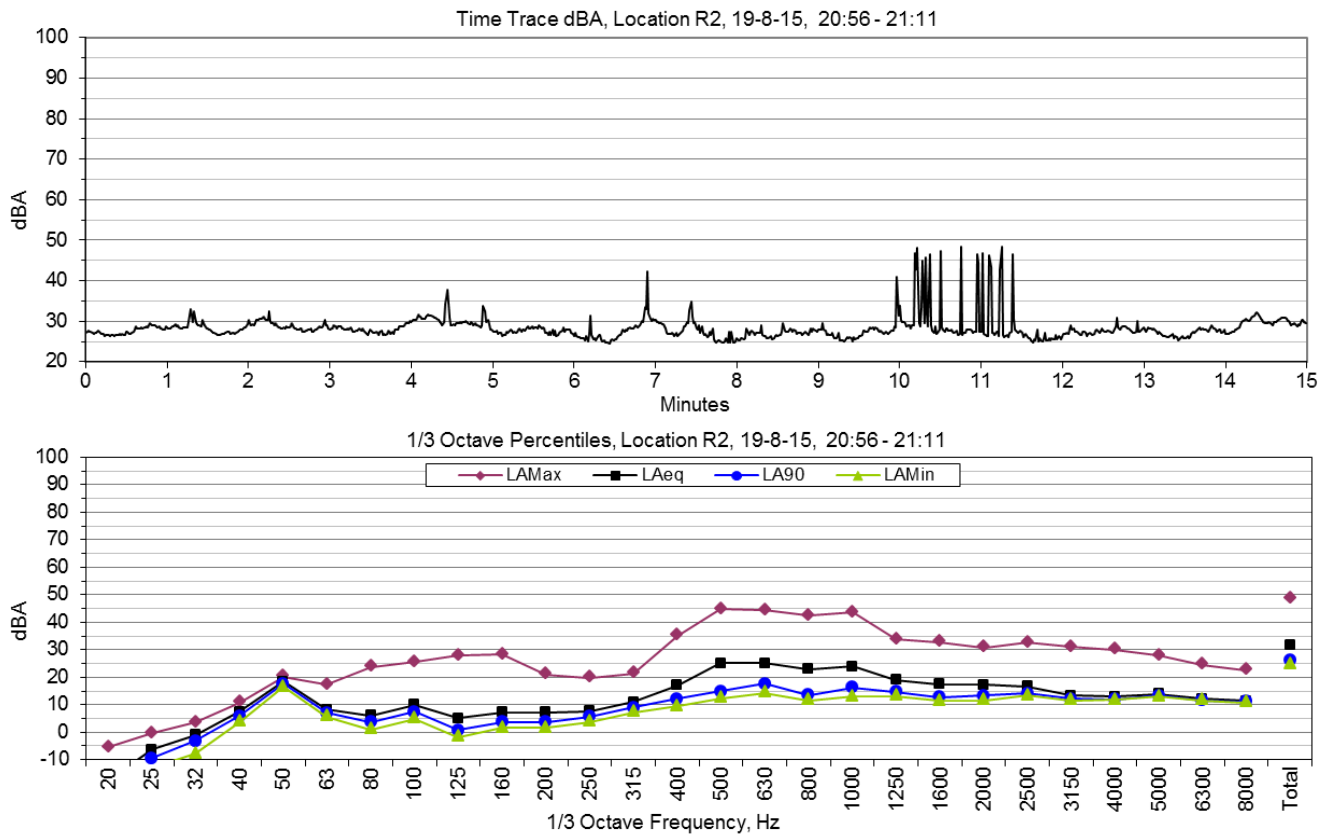




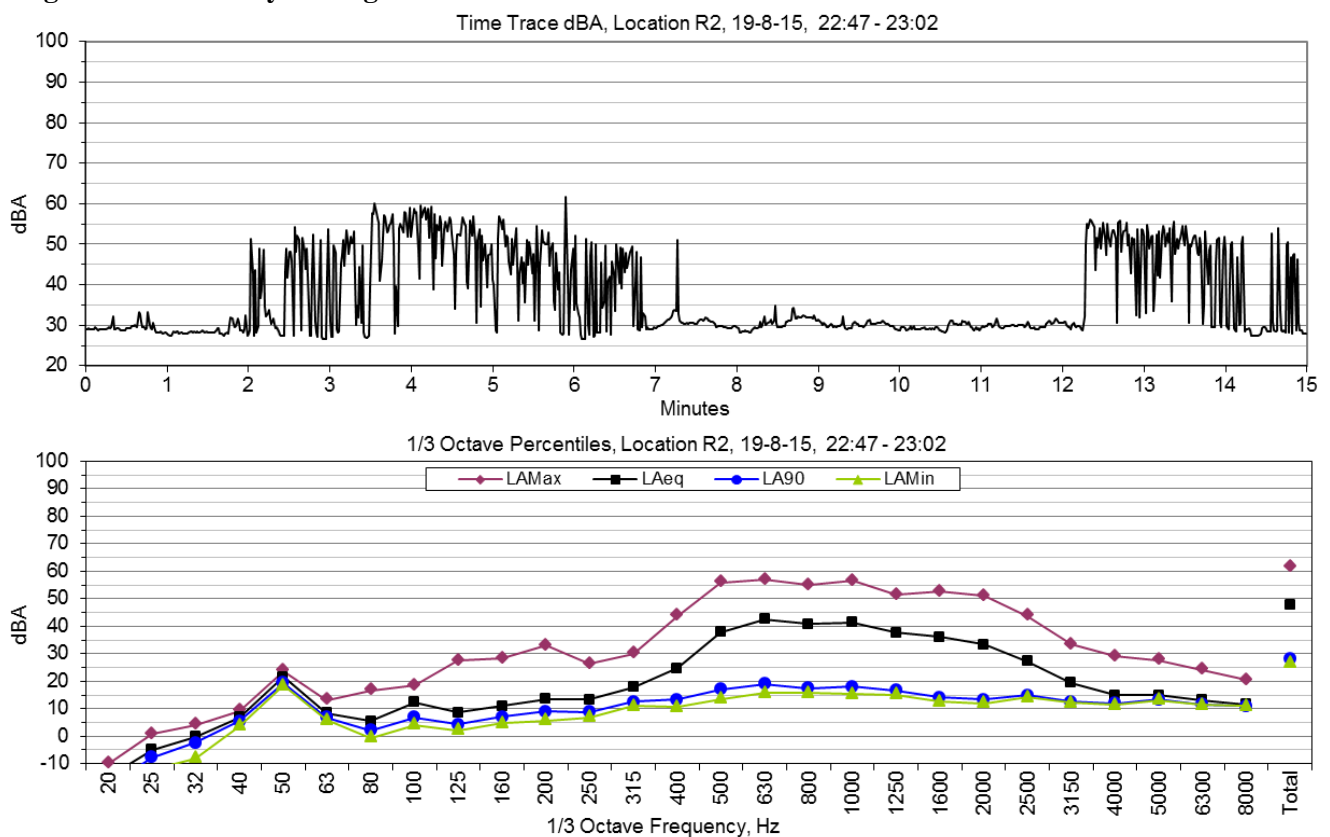


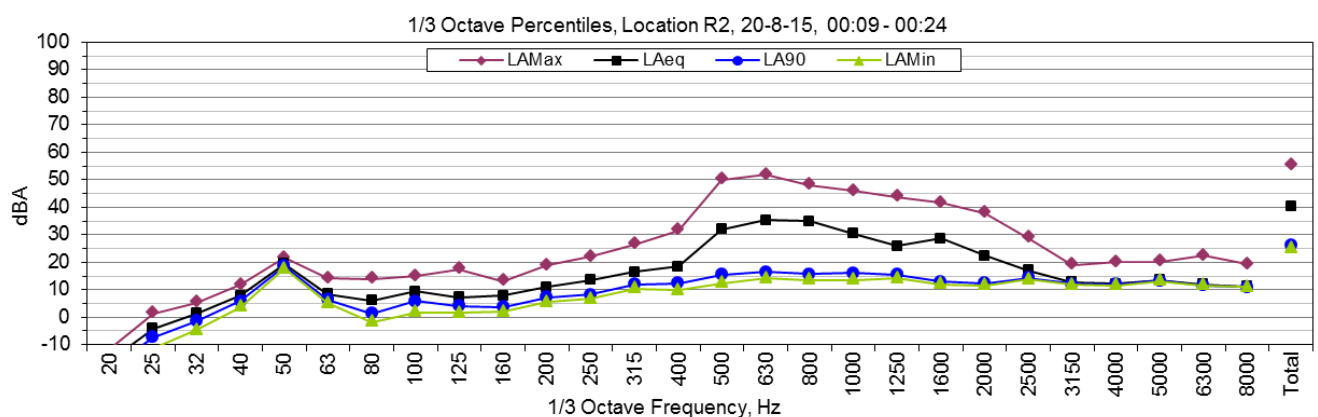
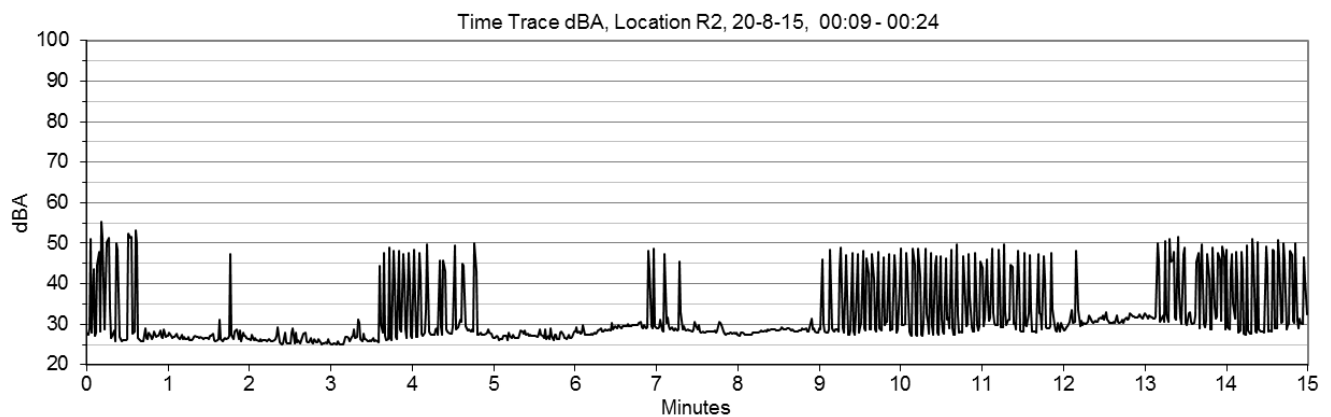
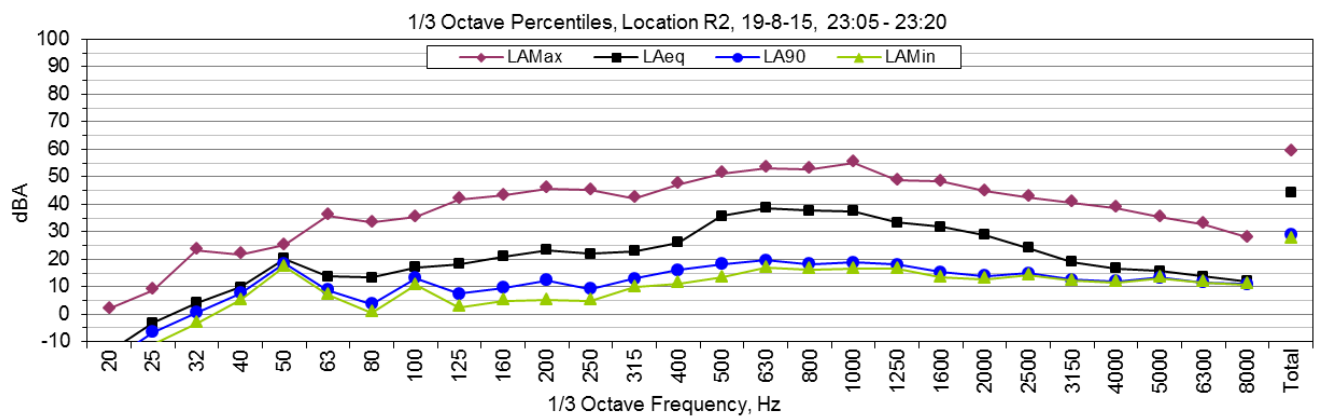
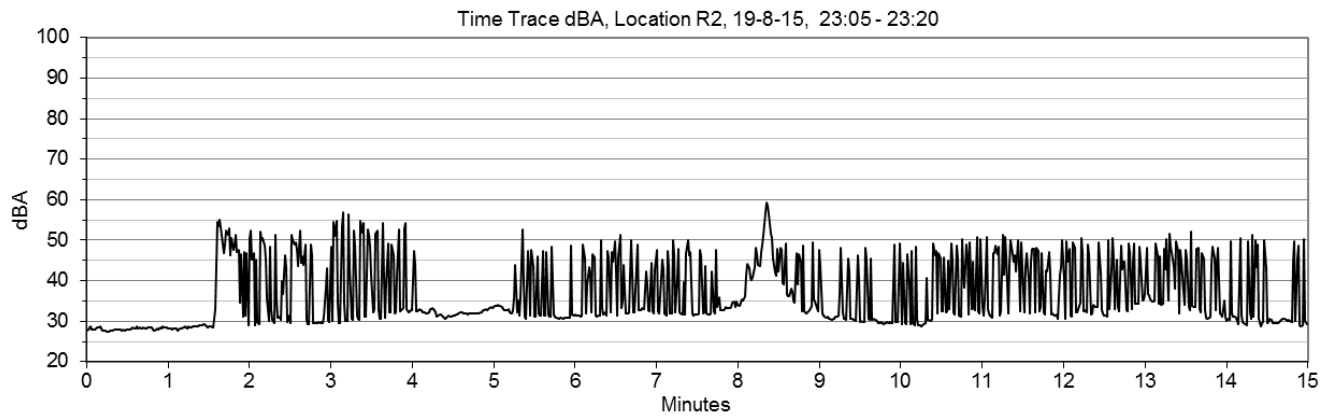
Evening 2 – Wednesday 19 August 2015

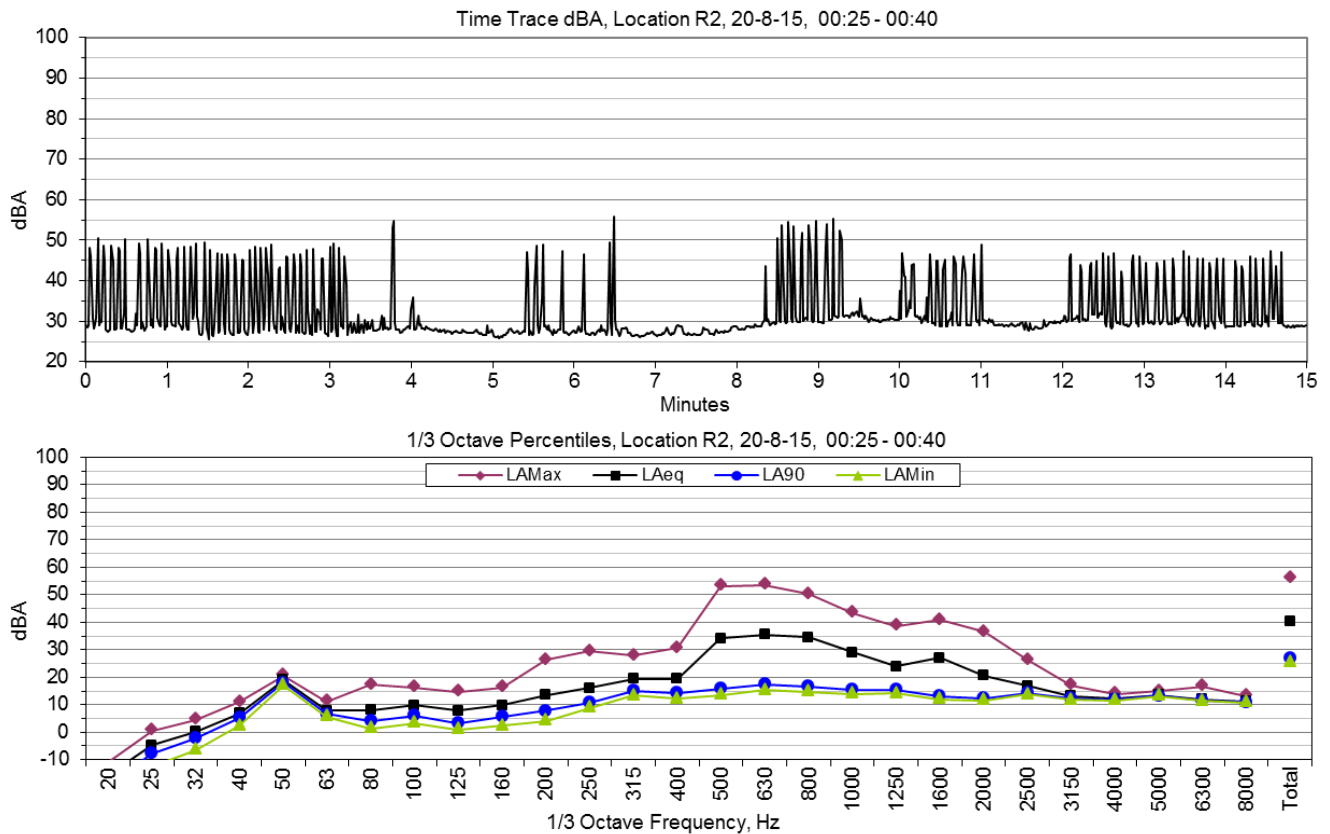




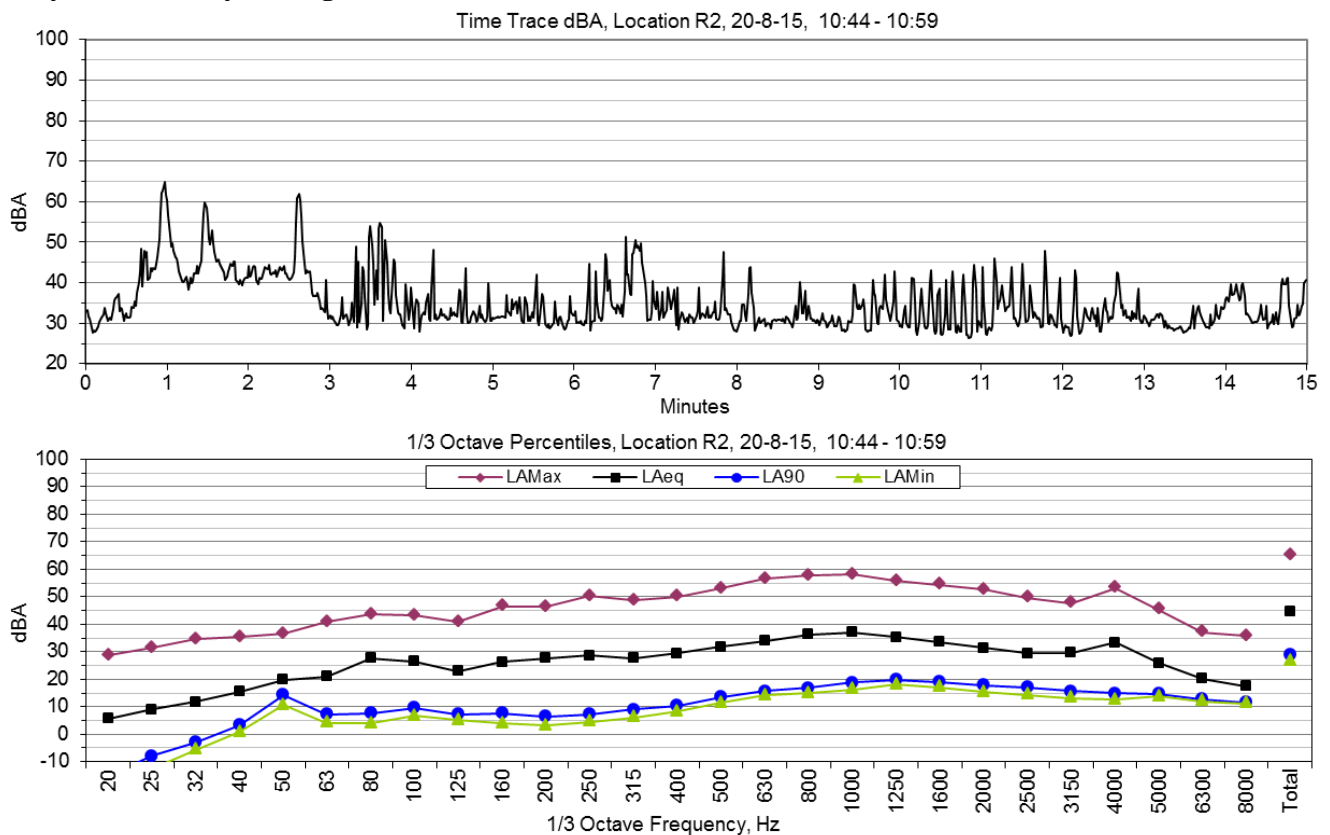
Night 2 – Wednesday 19 August 2015

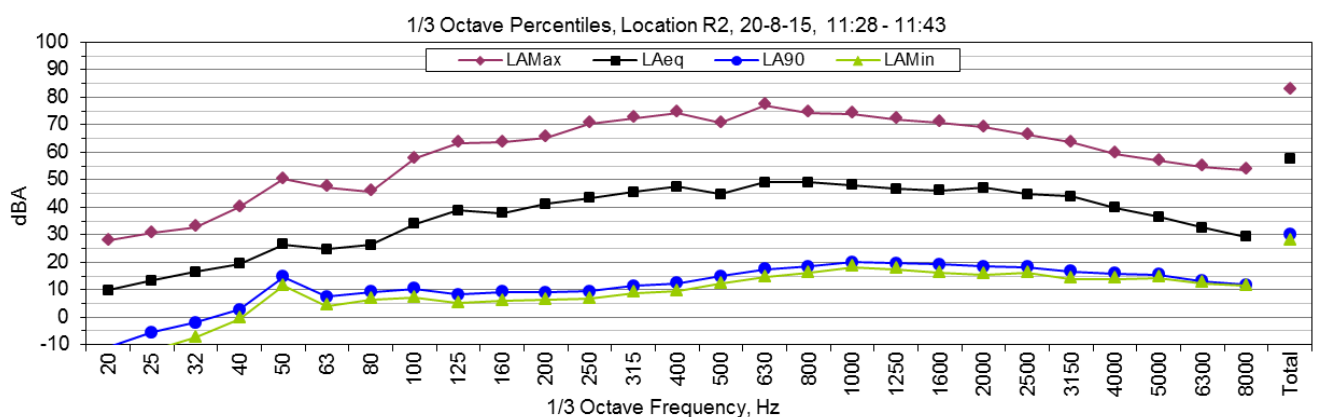
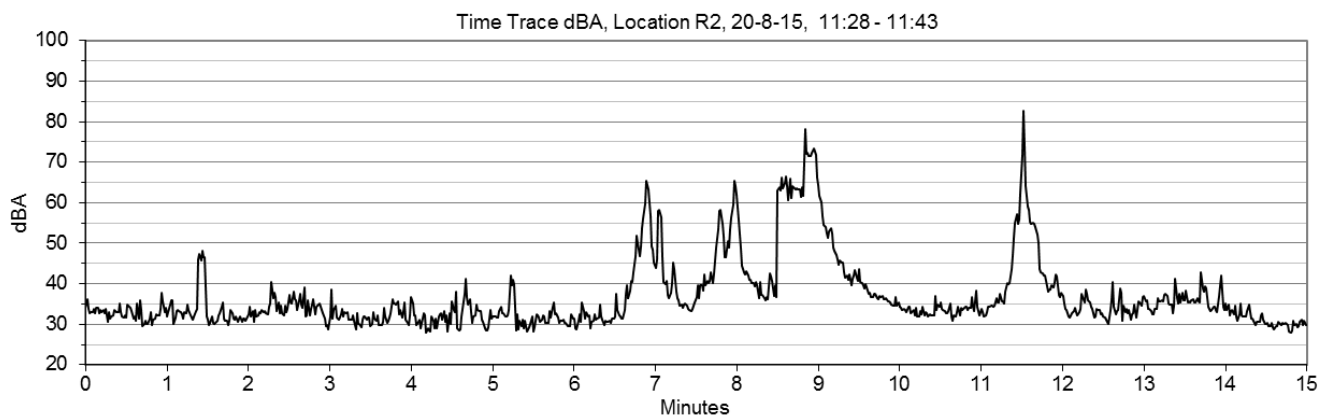
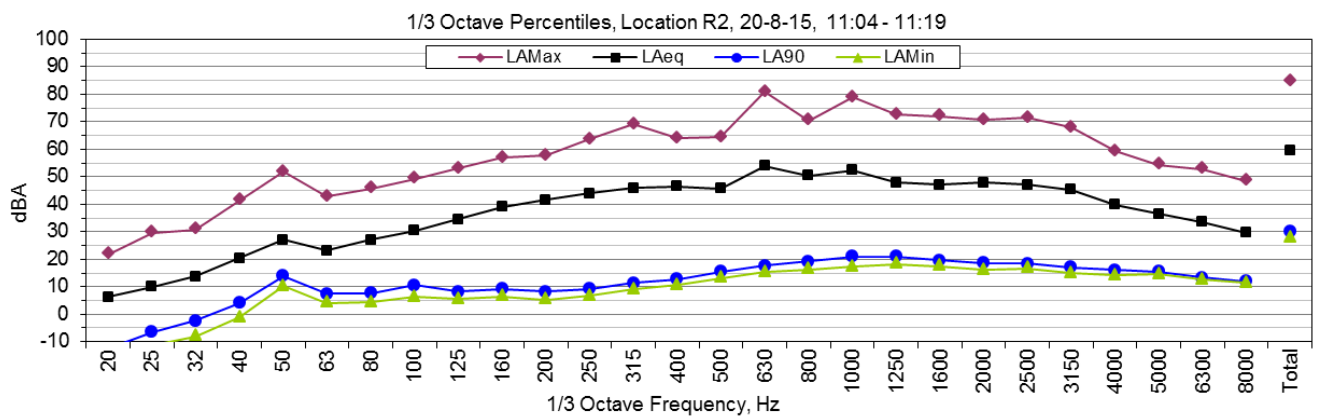
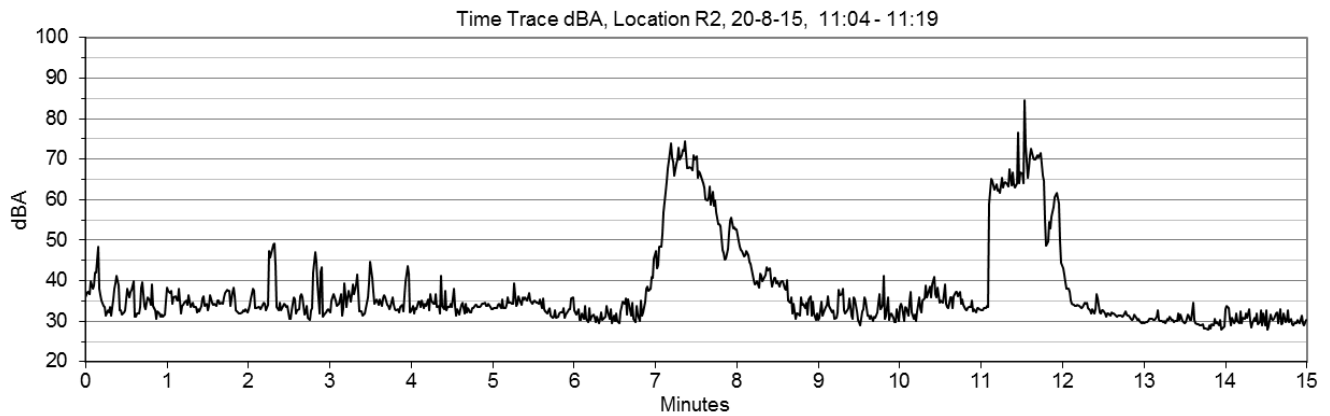


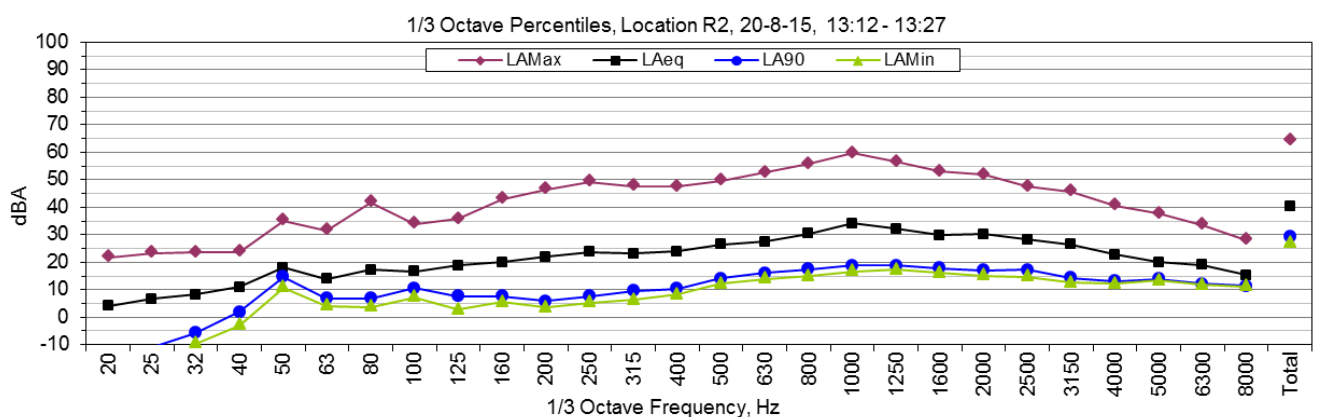
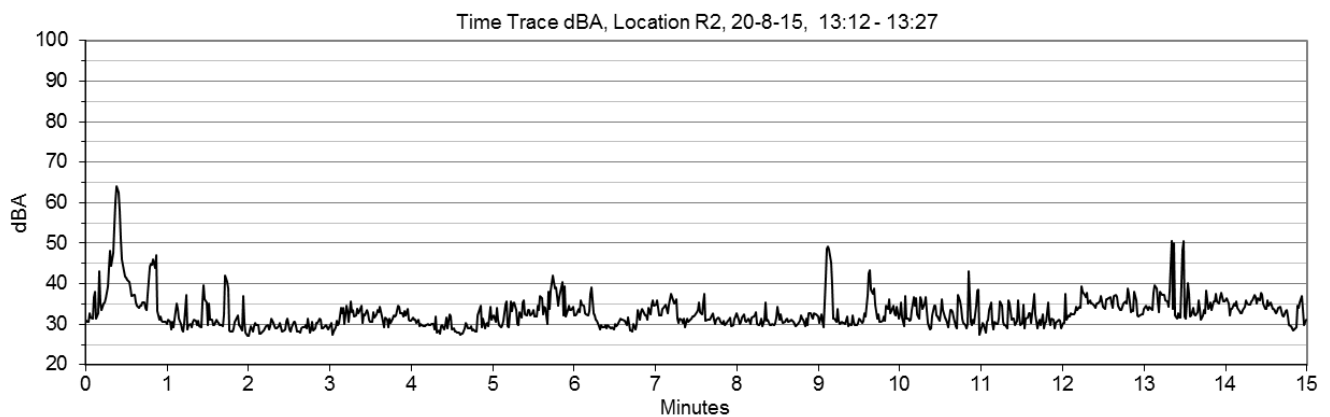
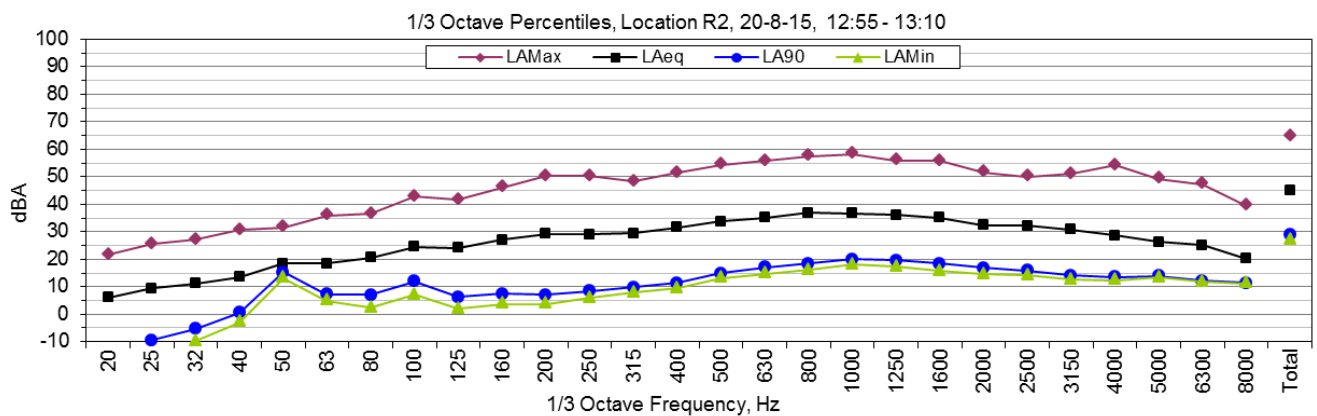
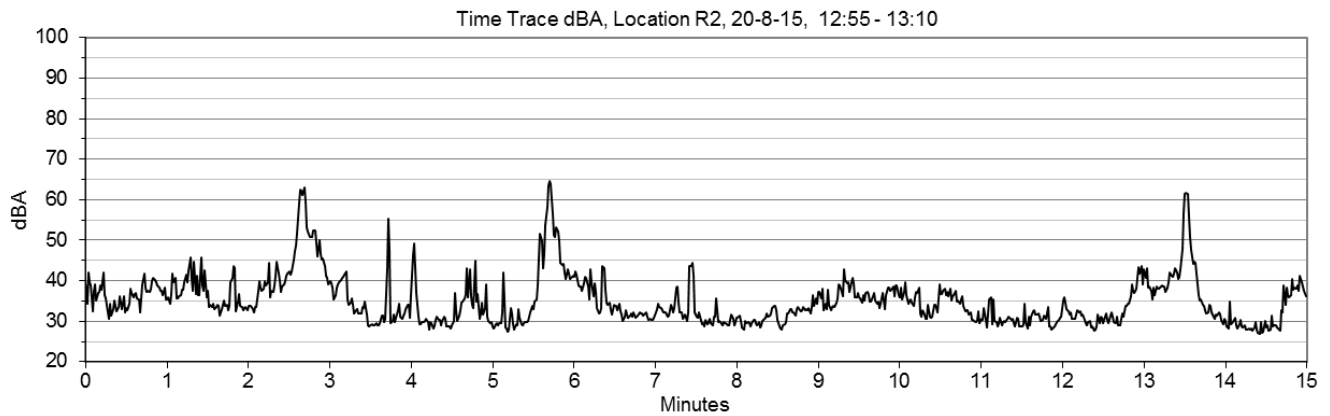


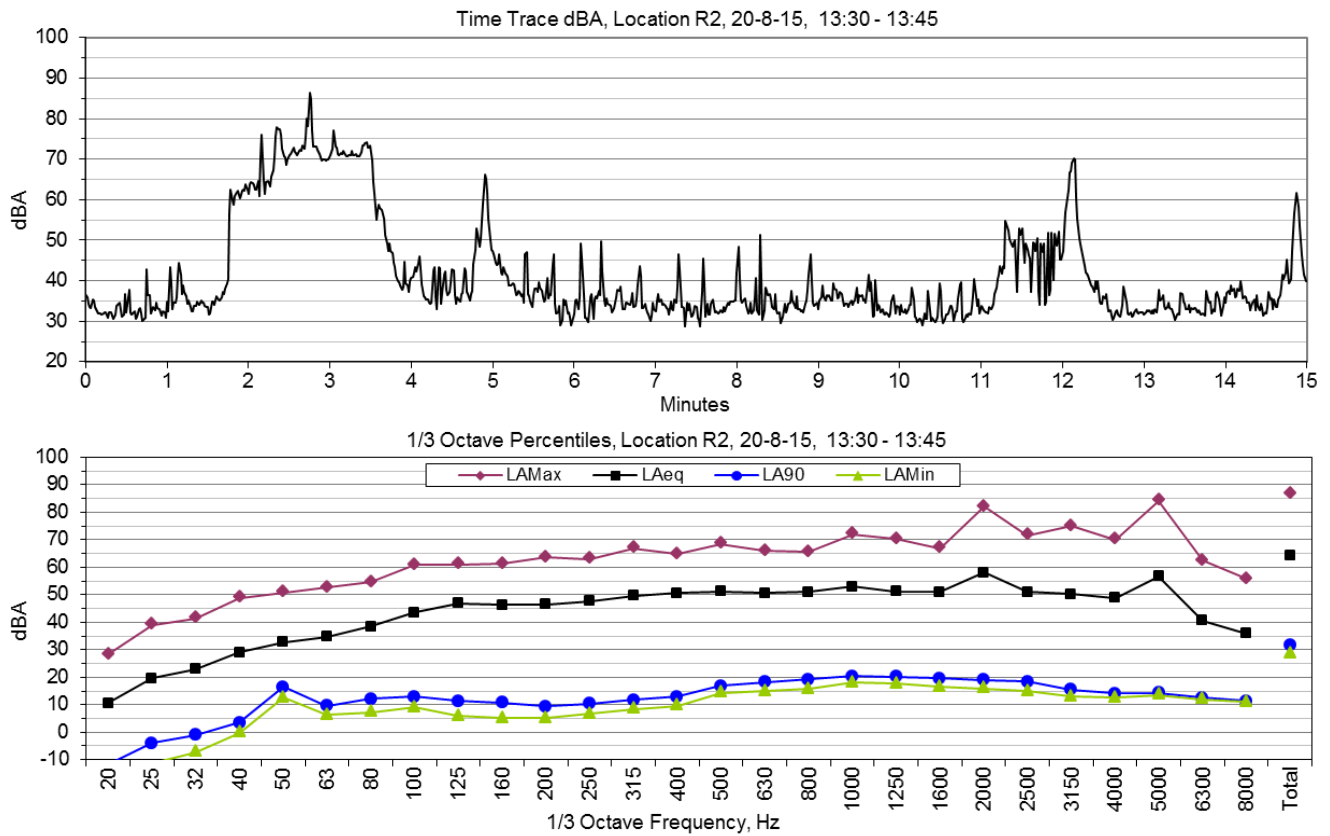


Day 3 – Thursday 20 August 2015

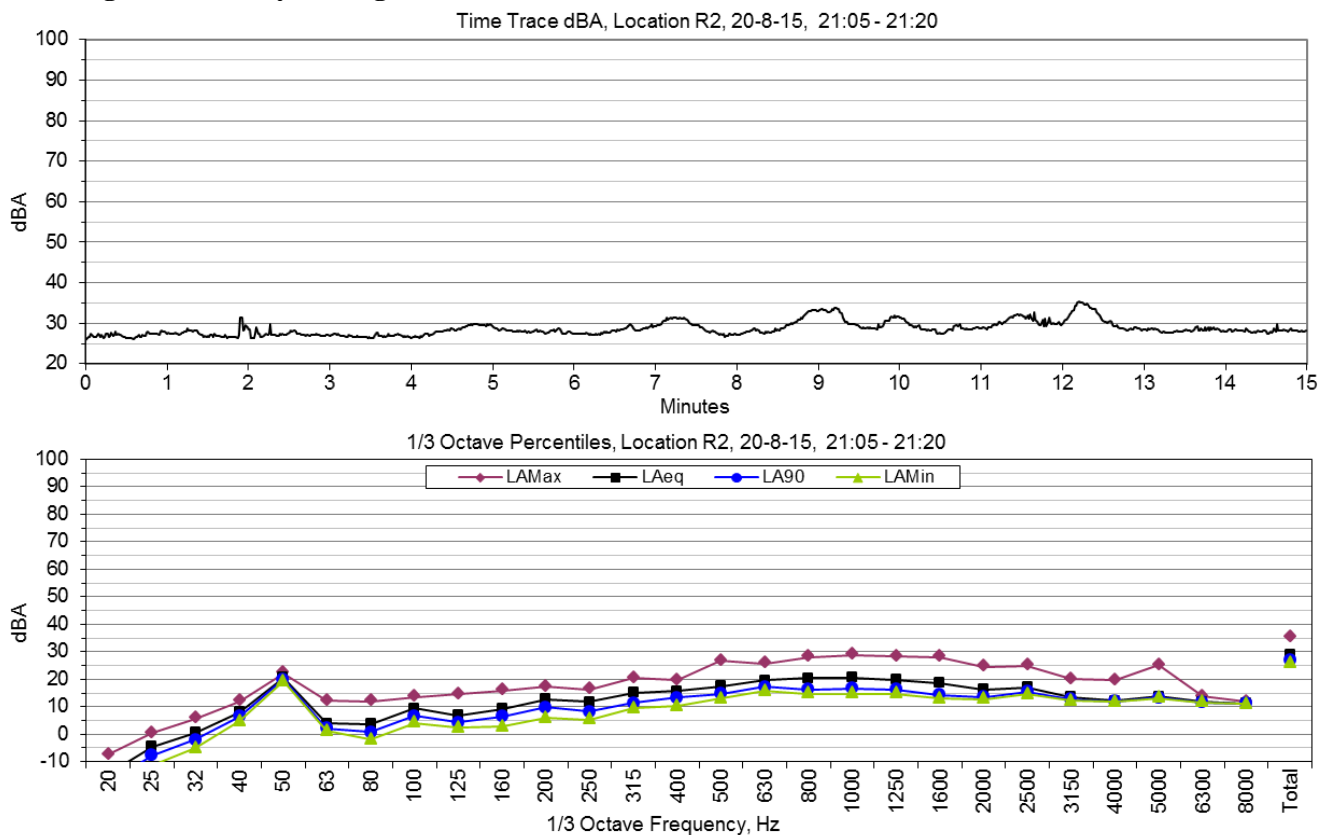


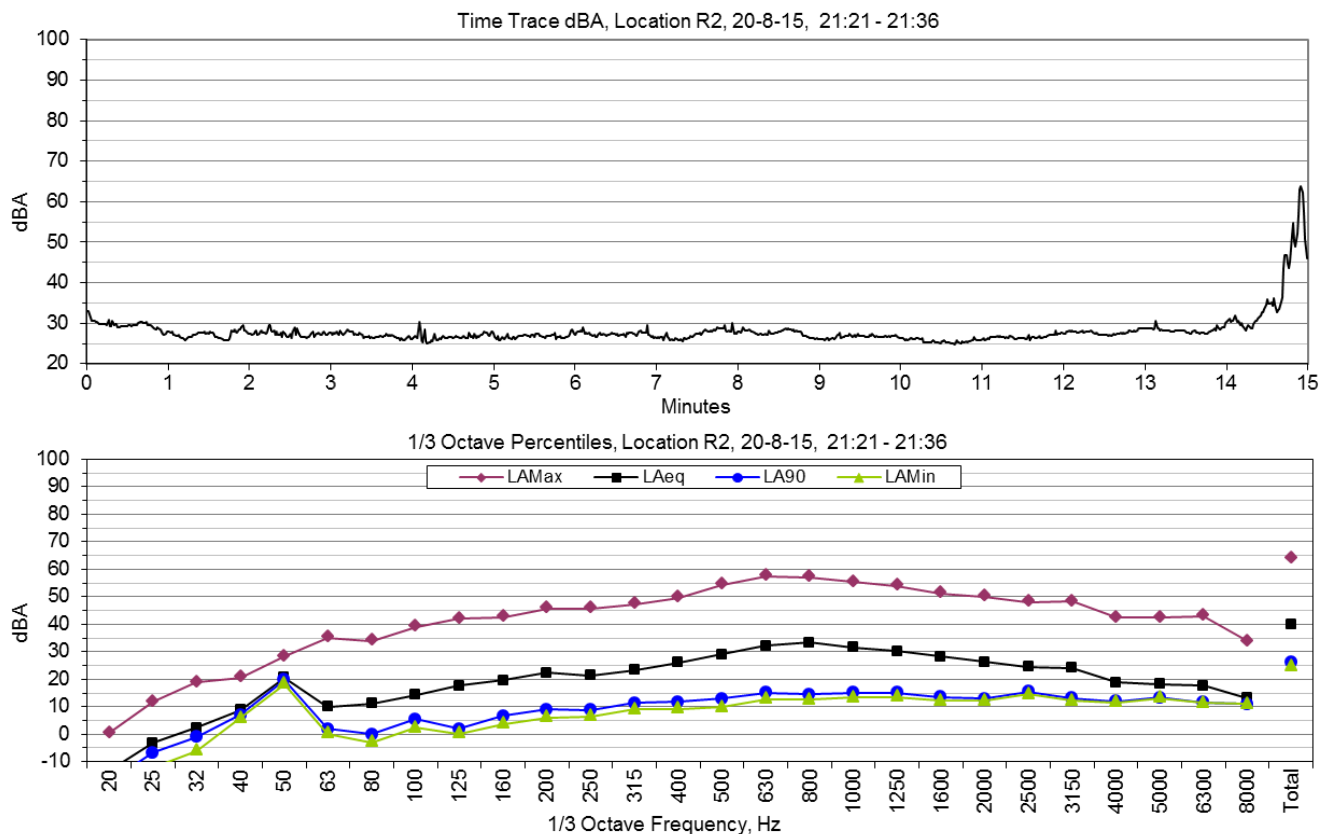




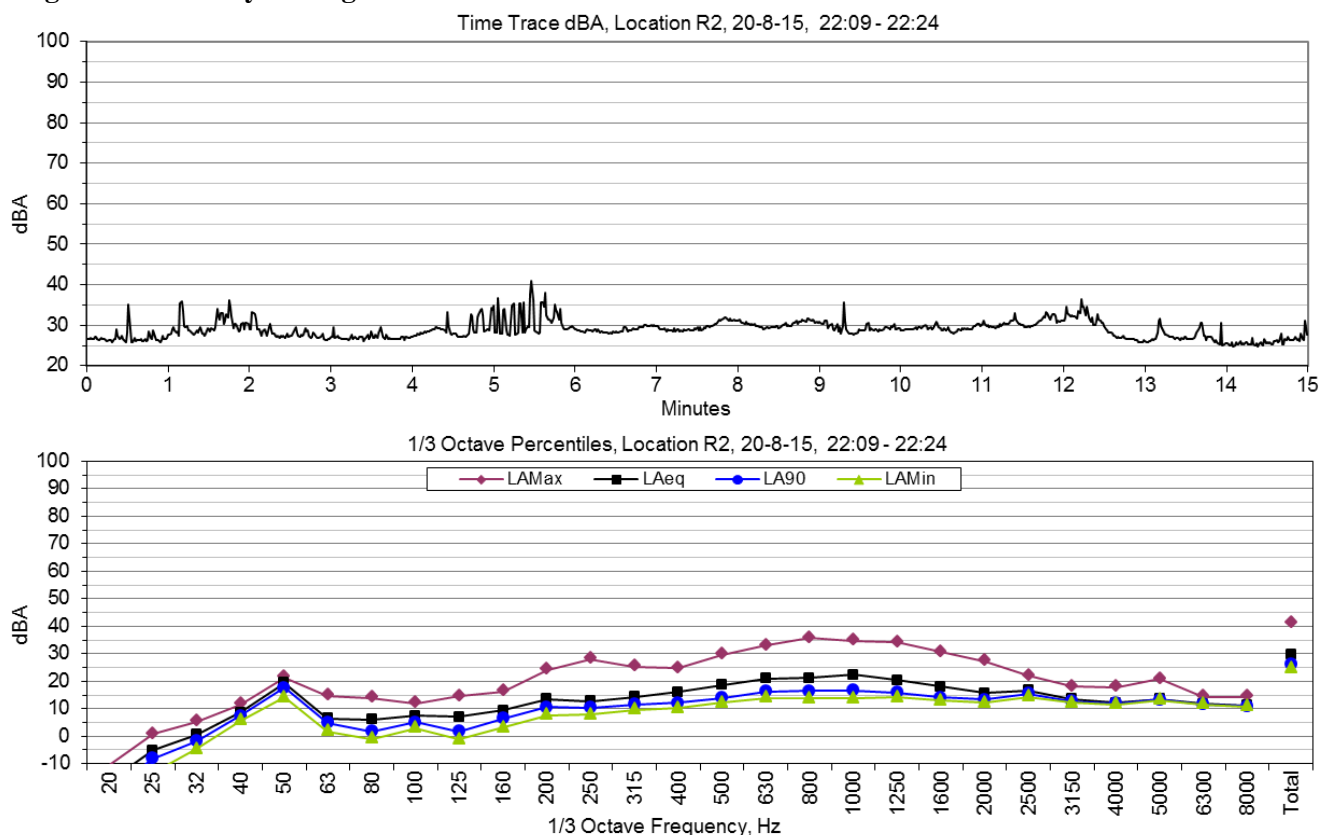


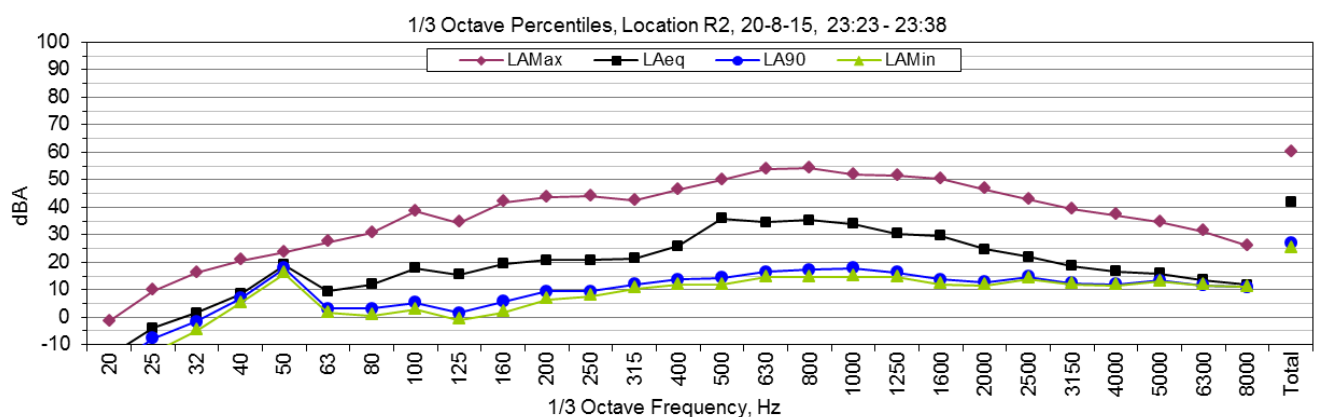
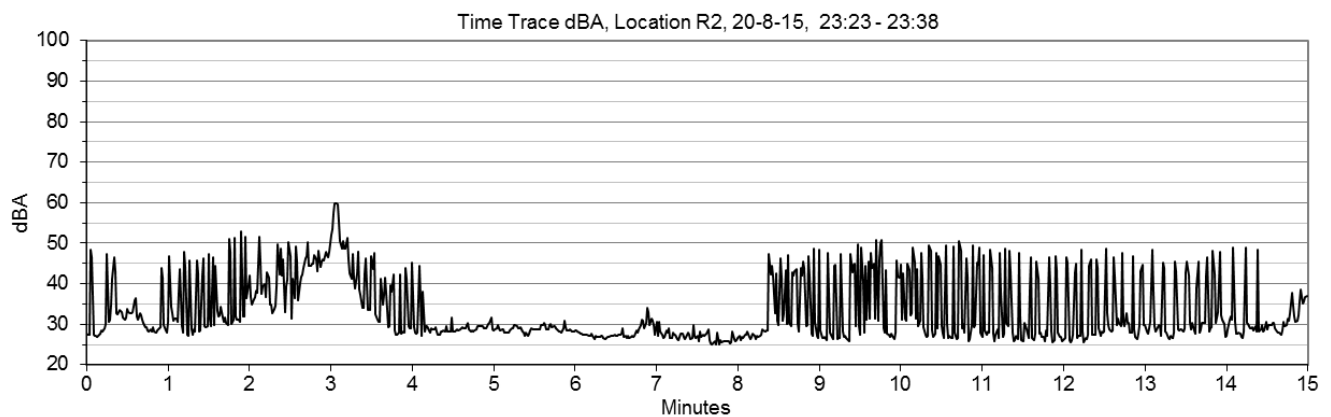
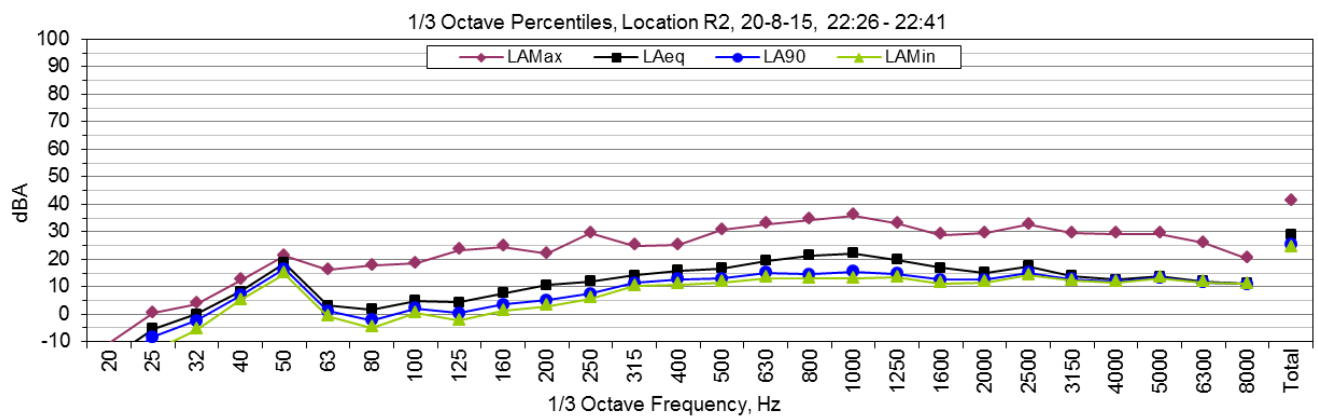
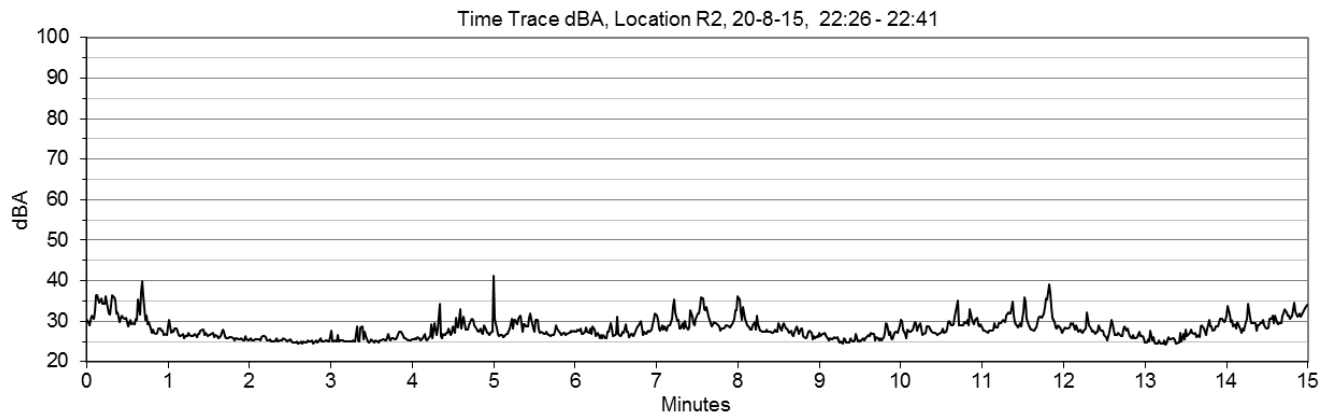
Evening 3 – Thursday 20 August 2015

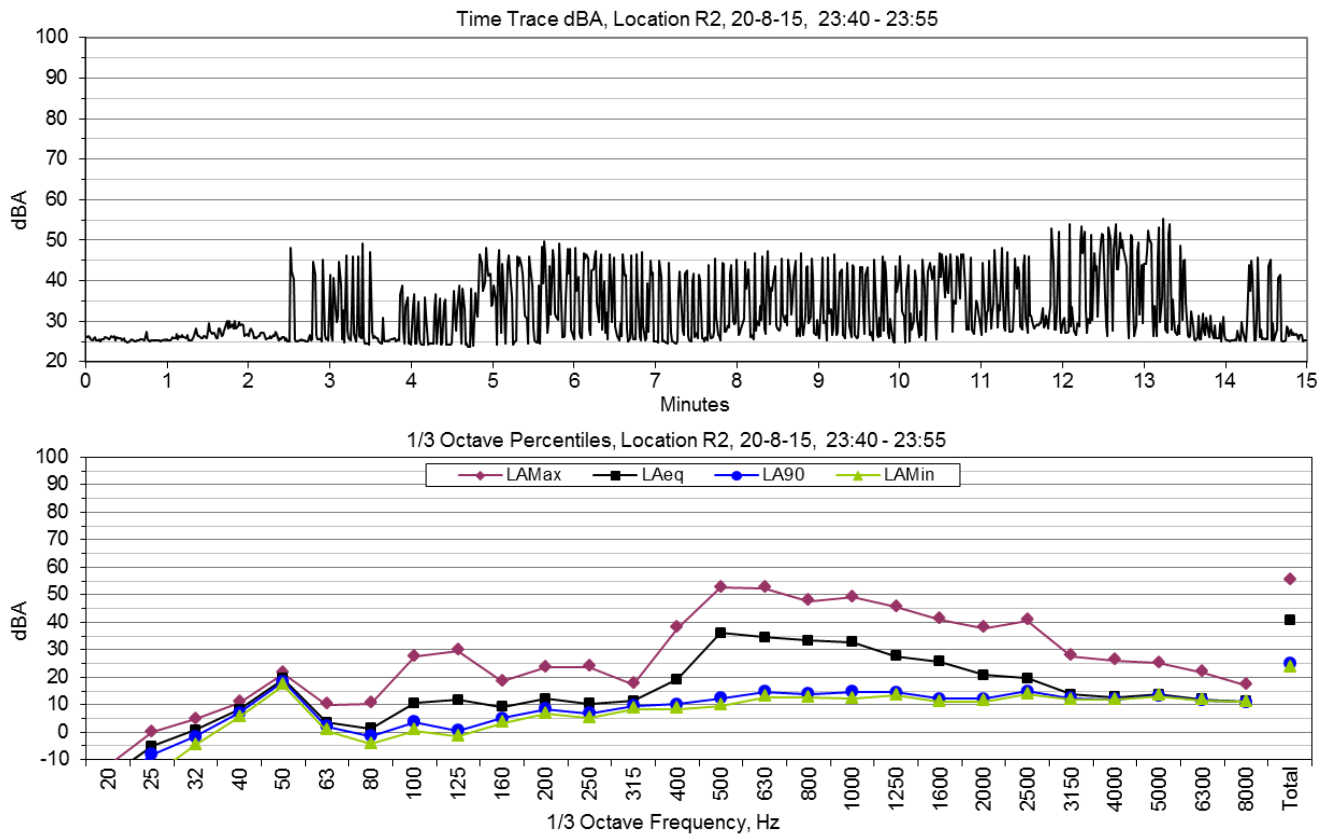




Night 3 – Thursday 20 August 2015





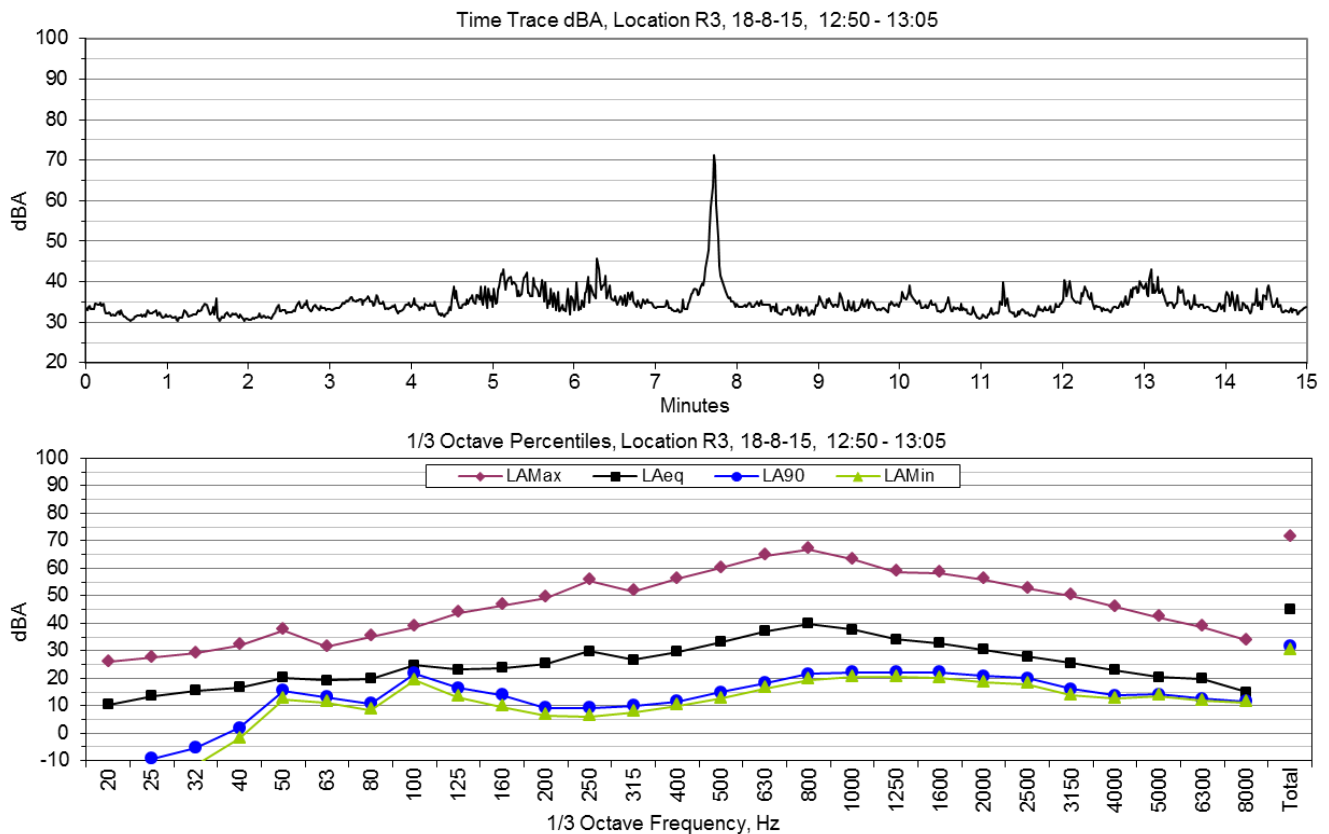


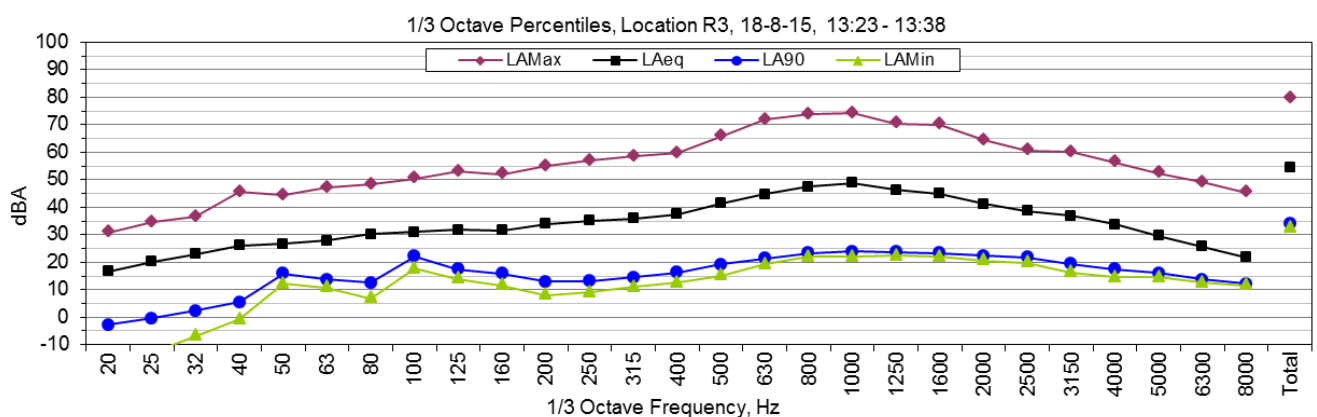
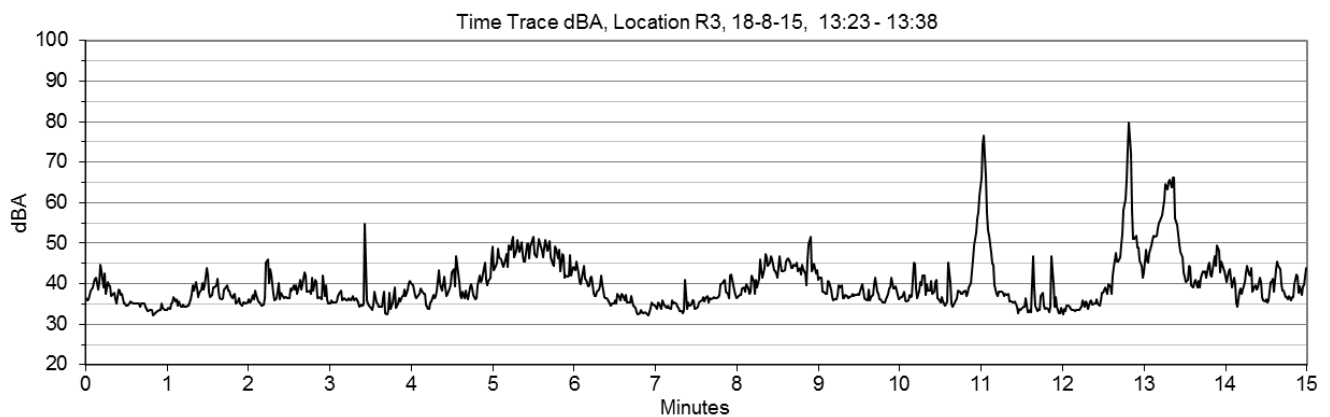
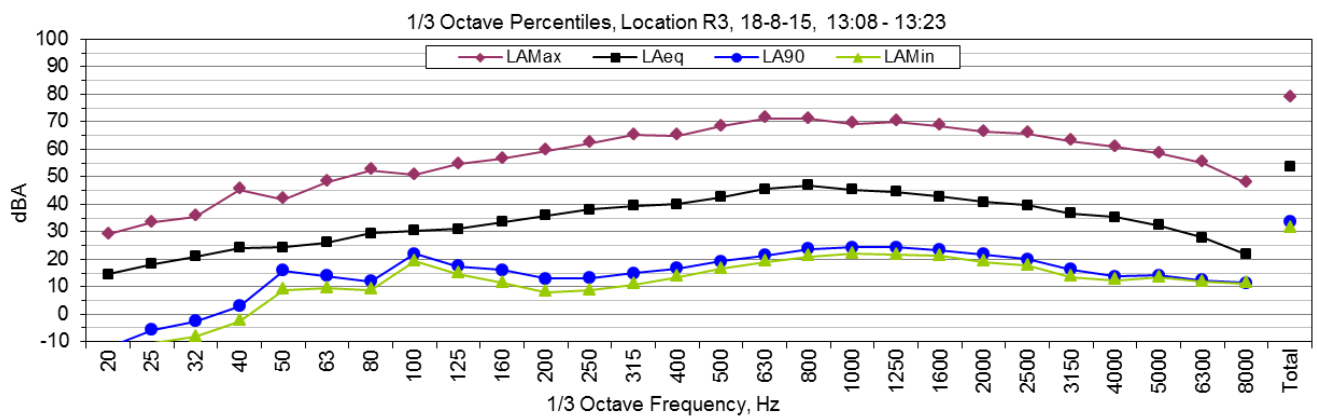
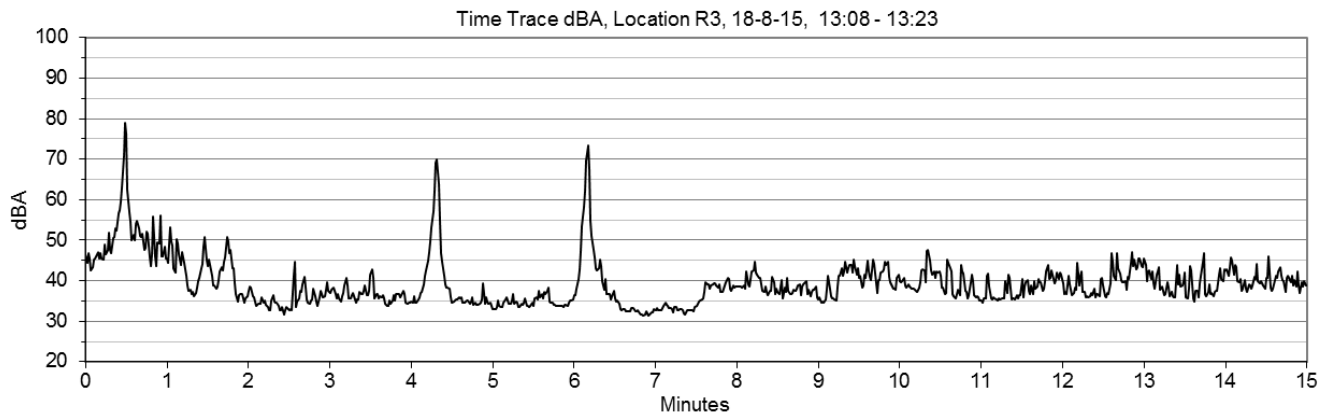
APPENDIX C – MEASURED NOISE LEVELS, RECEPTOR R3

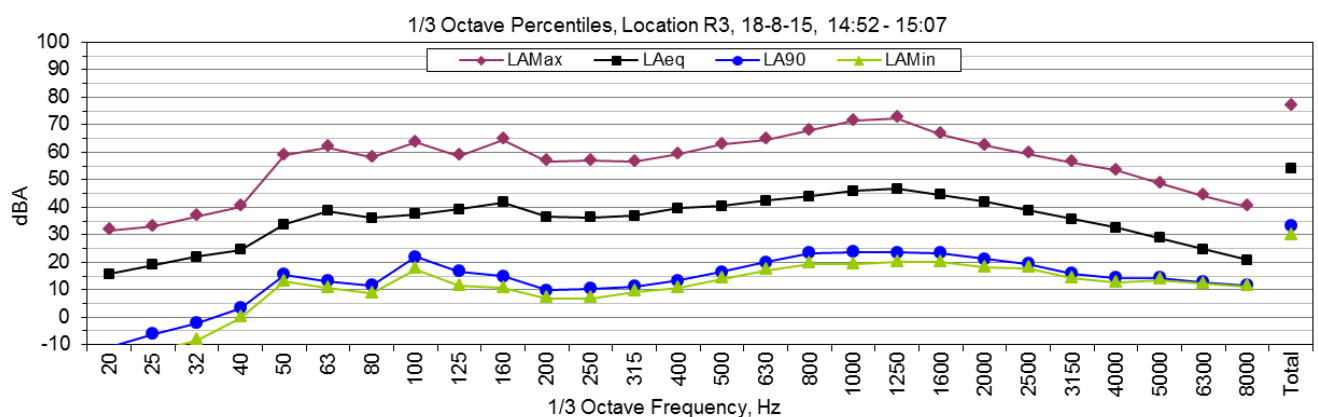
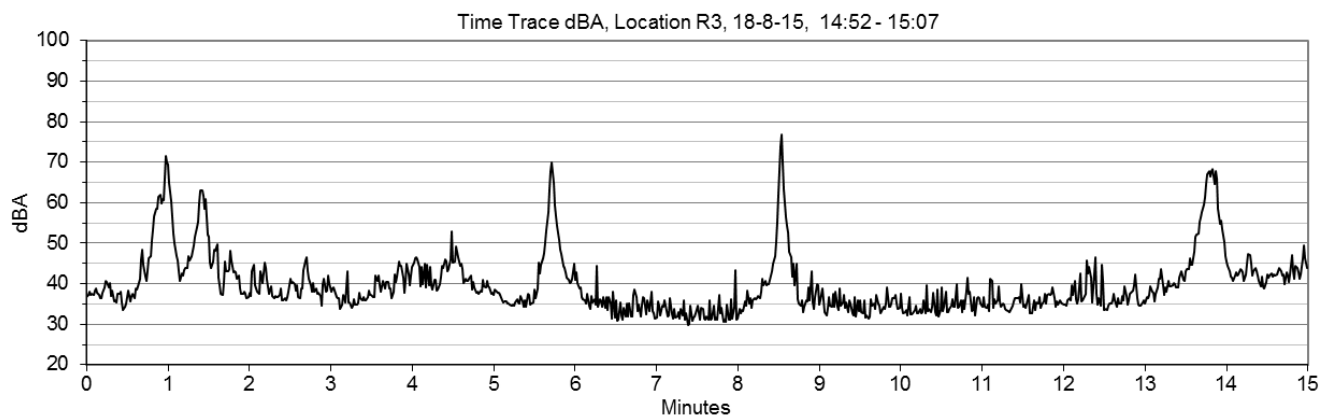
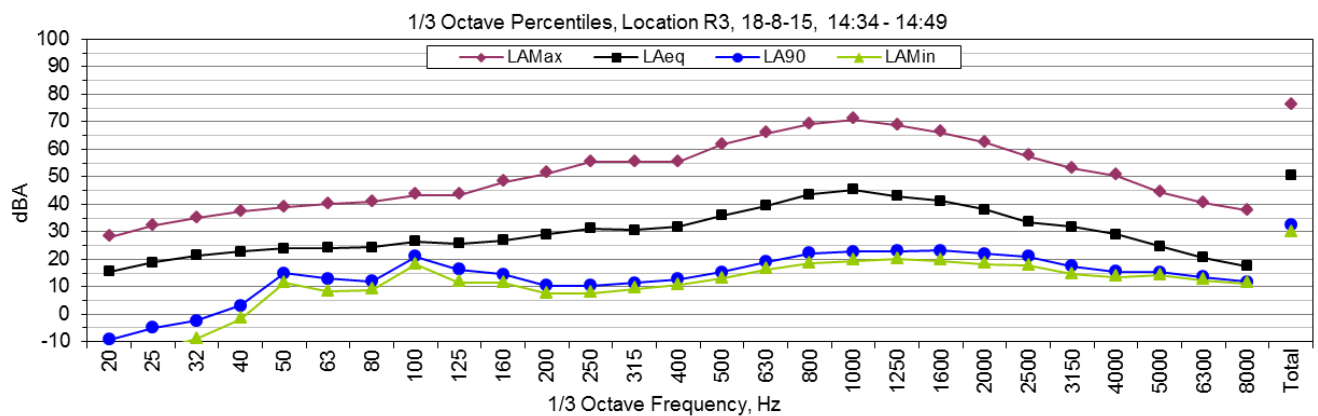
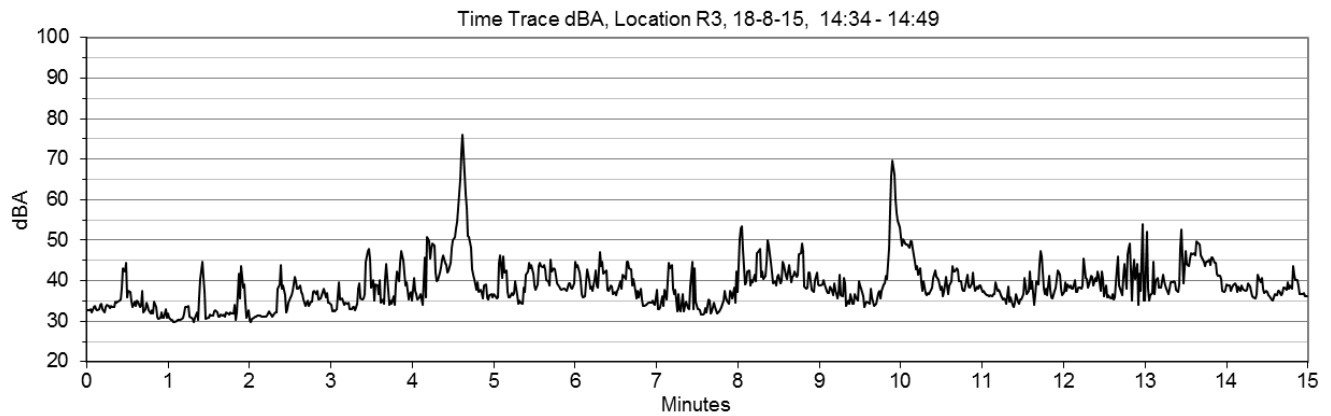
Charts on the following pages show measured noise levels at Receptor R3. Measured noise levels are presented in the order they were measured, with the date and time shown in each figure.

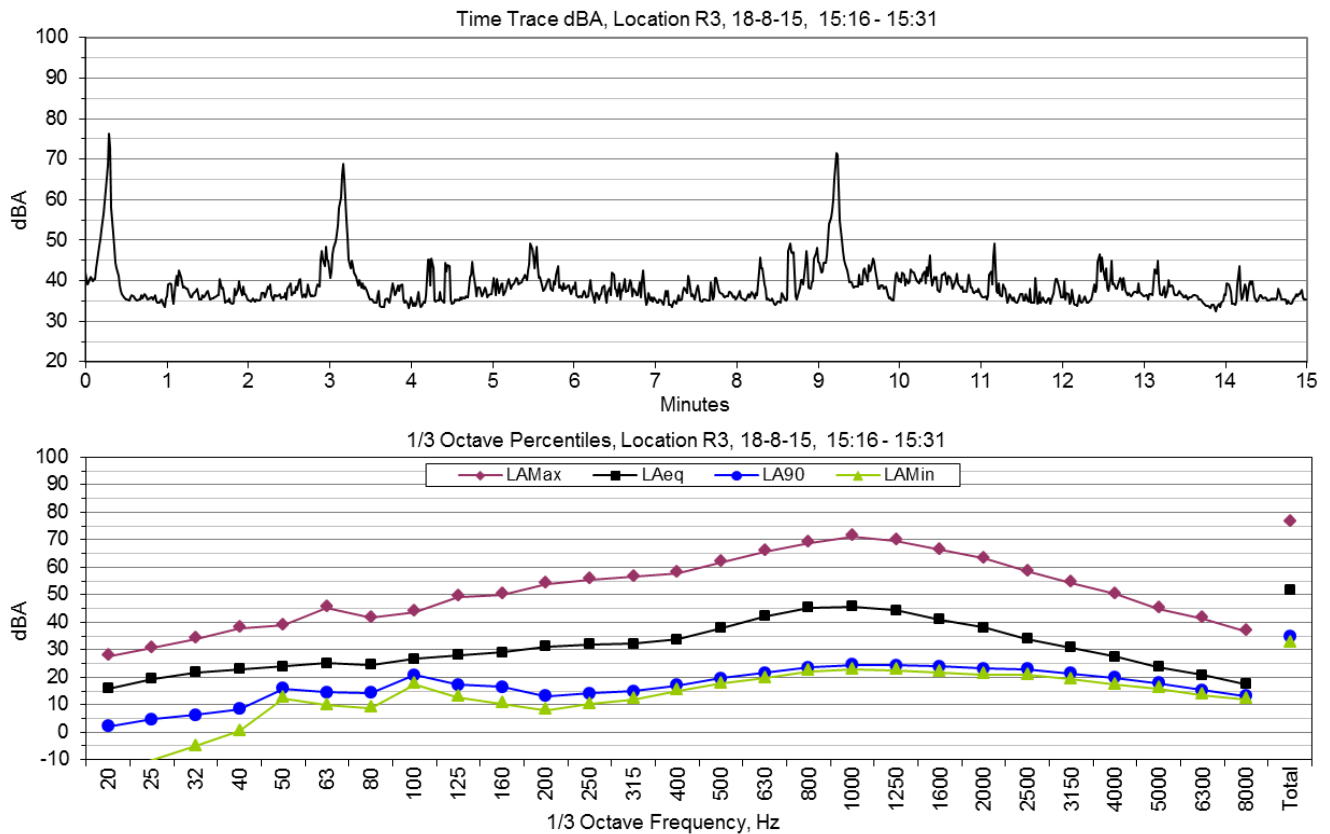
Two charts are shown for each noise measurement. The first chart shows a ‘noise level trace’ for the duration of the noise measurement in one second intervals in dBA. The second chart shows the measured maximum (L_{Amax}), average (L_{Aeq}), background (LA₉₀) and minimum (L_{Amin}) noise levels in 1/3 octave bands from 20 Hz to 8000 Hz and total dBA noise levels.

Day 1 – Tuesday 18 August 2015

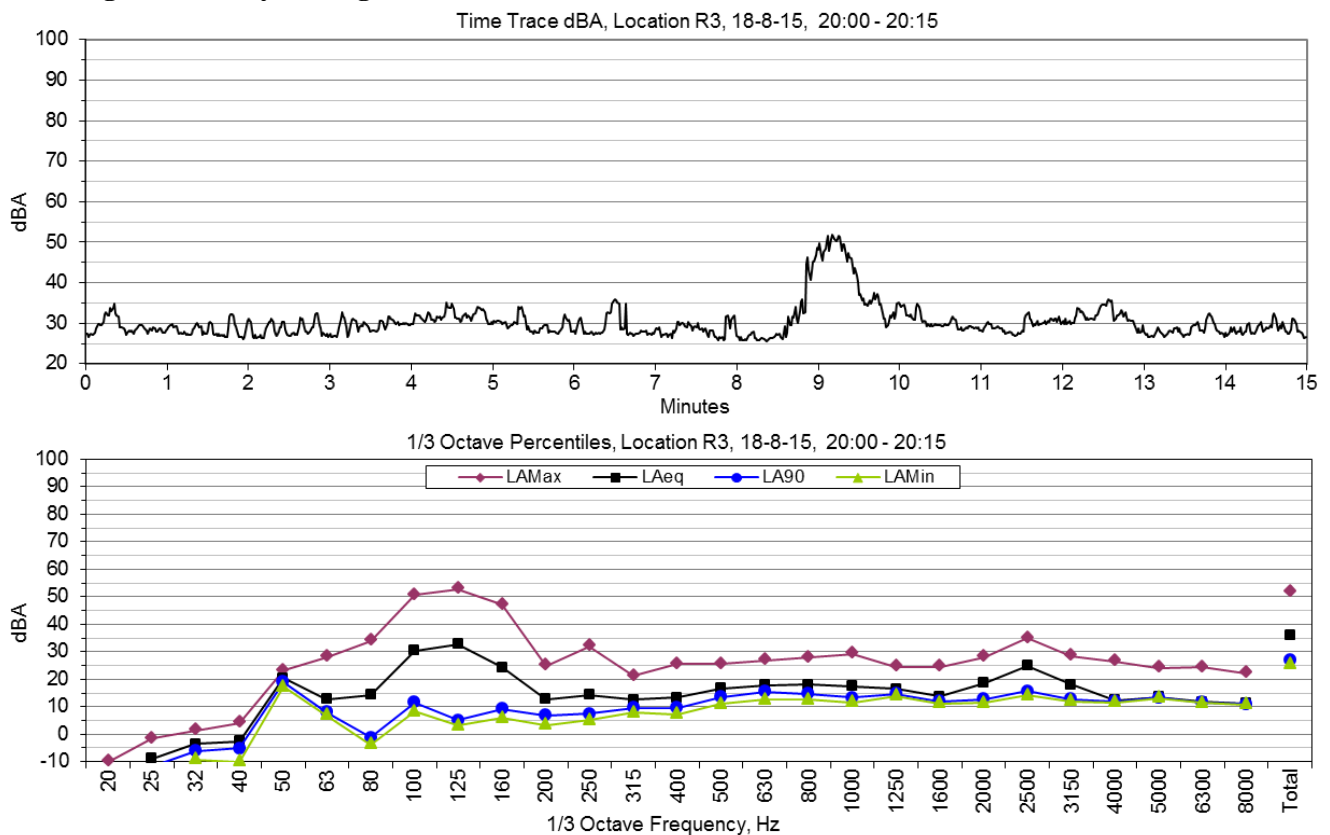


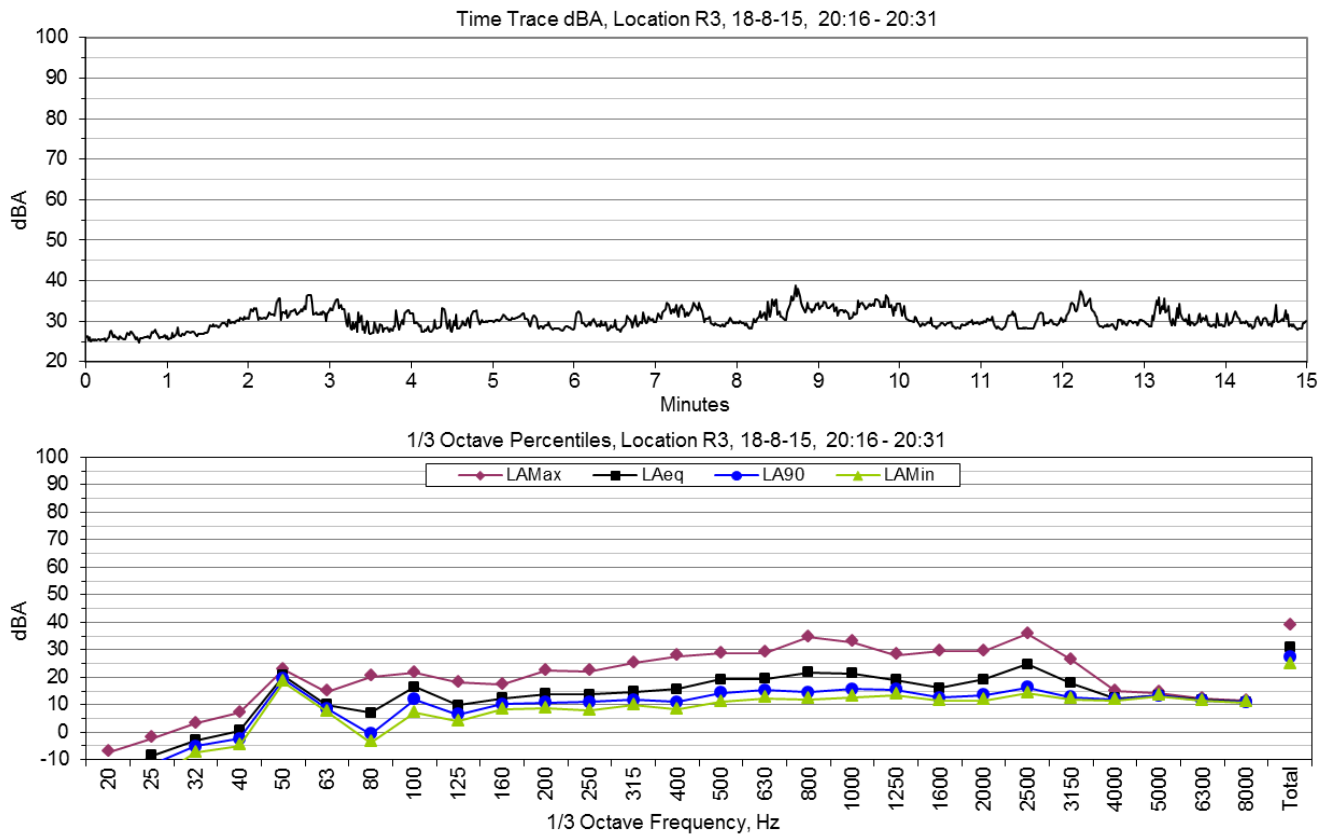




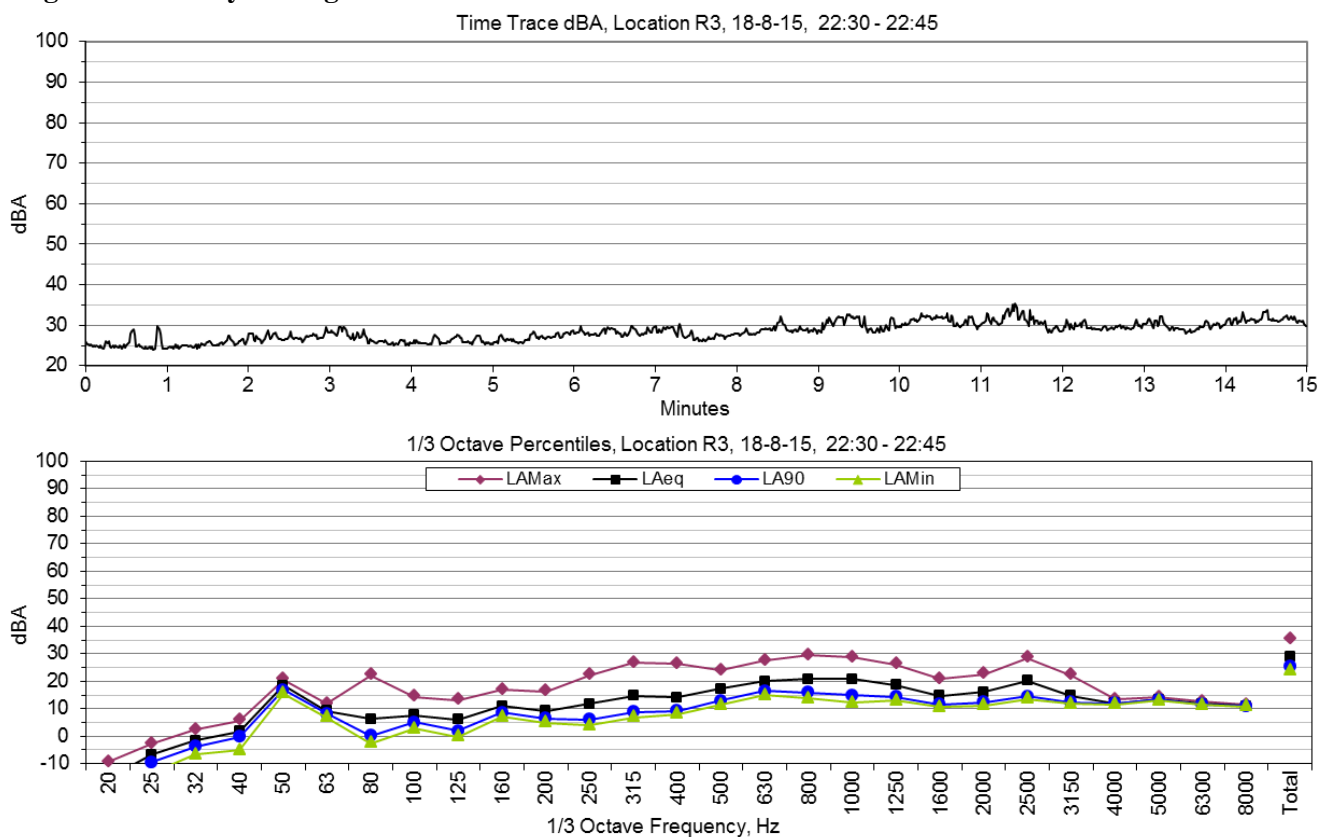


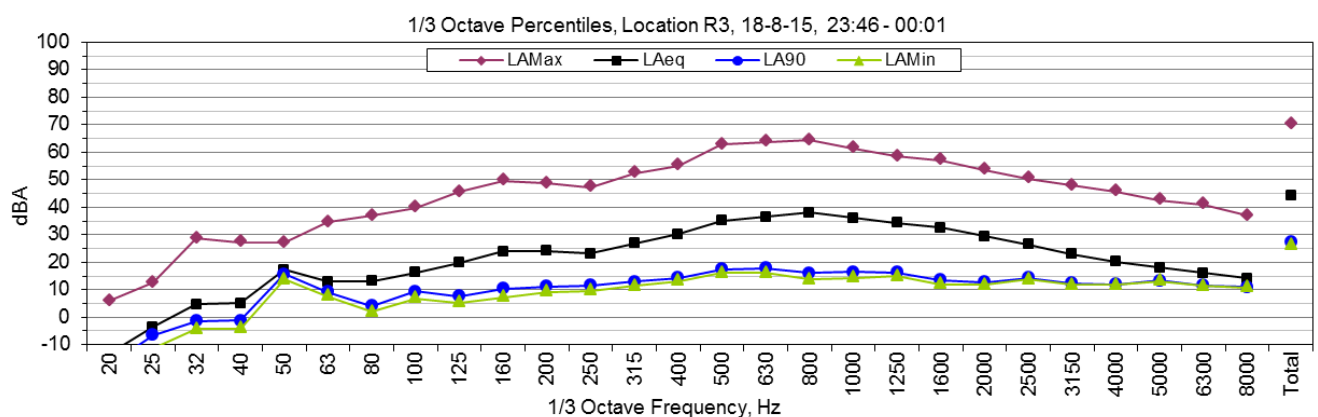
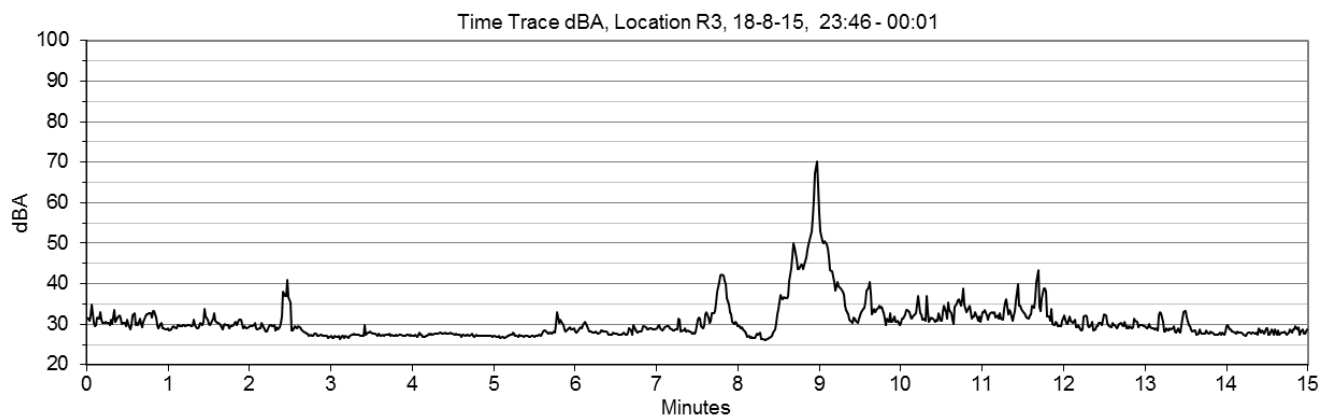
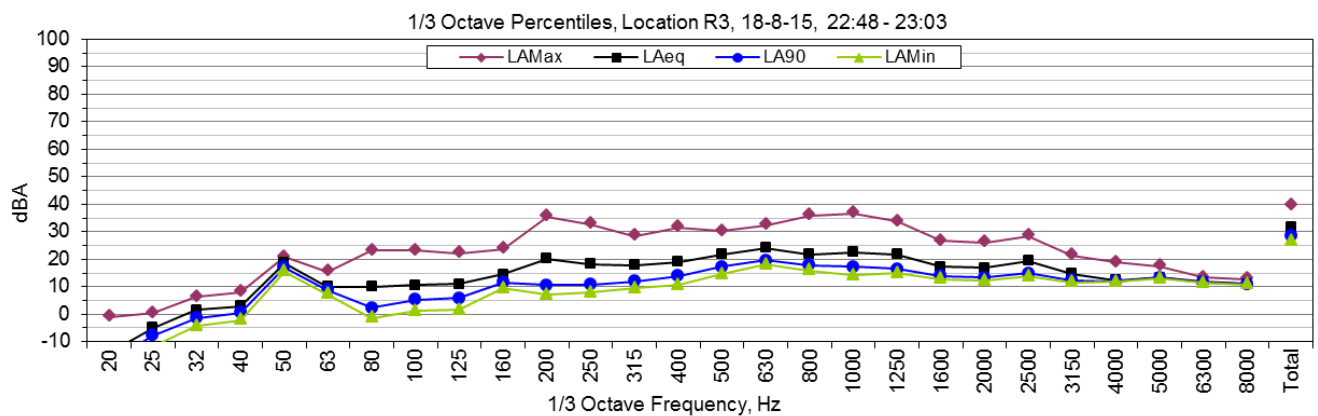
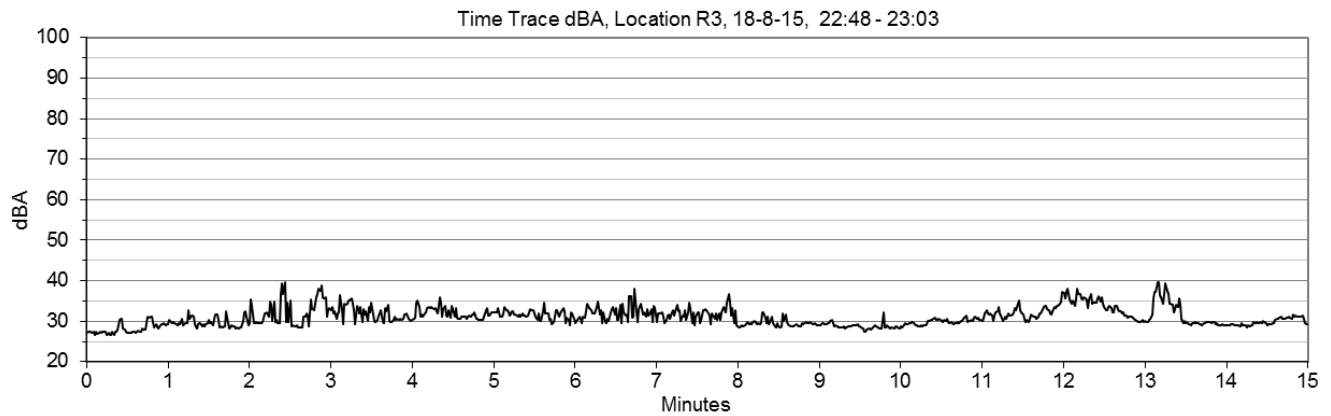
Evening 1 – Tuesday 18 August 2015

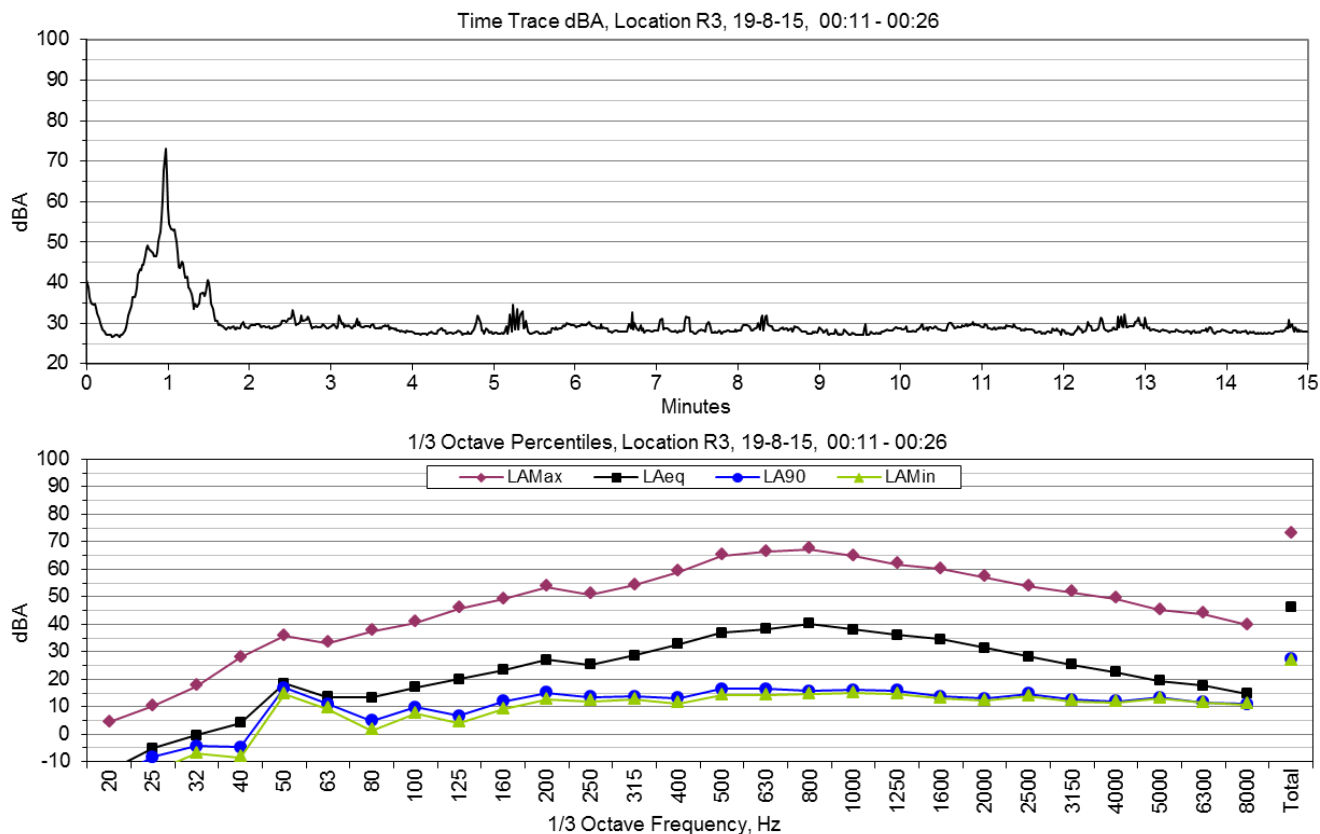




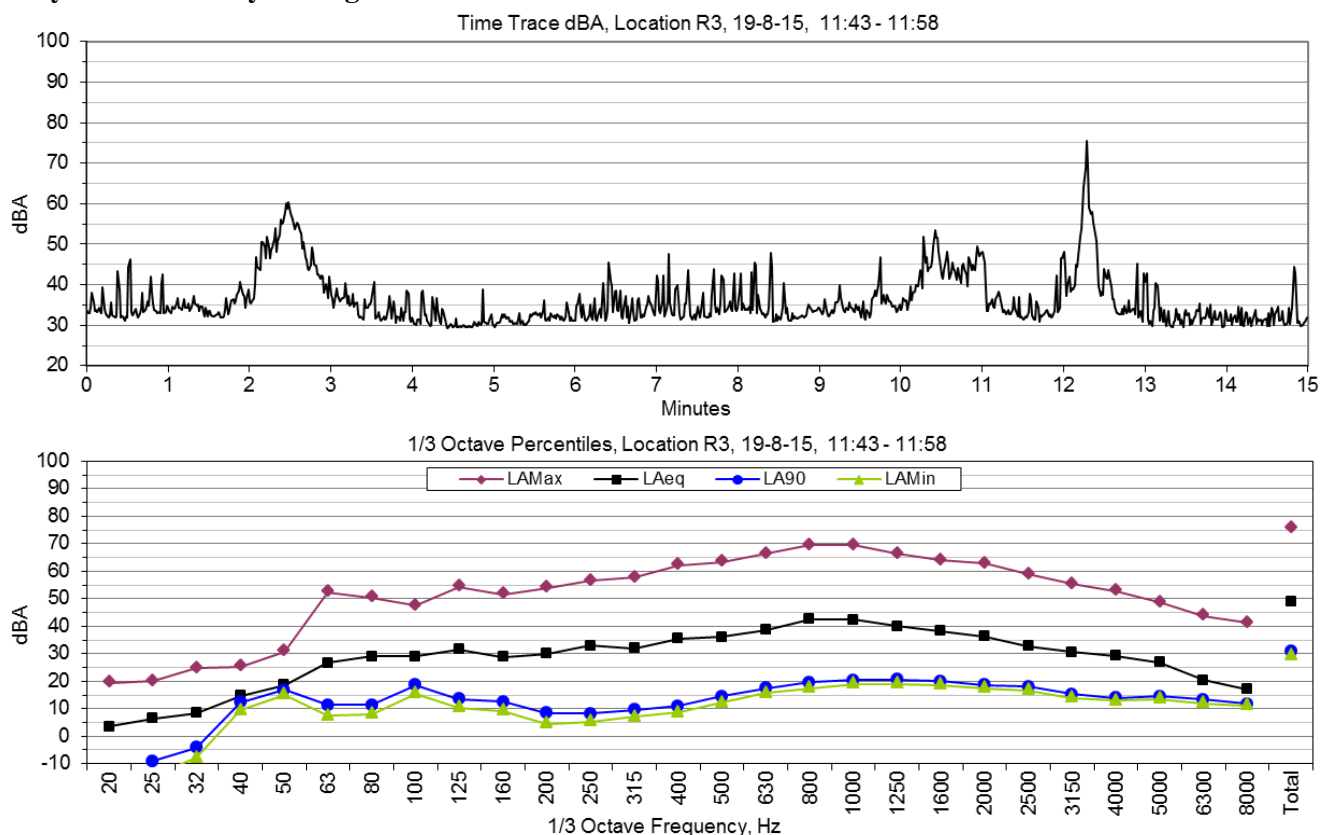
Night 1 – Tuesday 18 August 2015

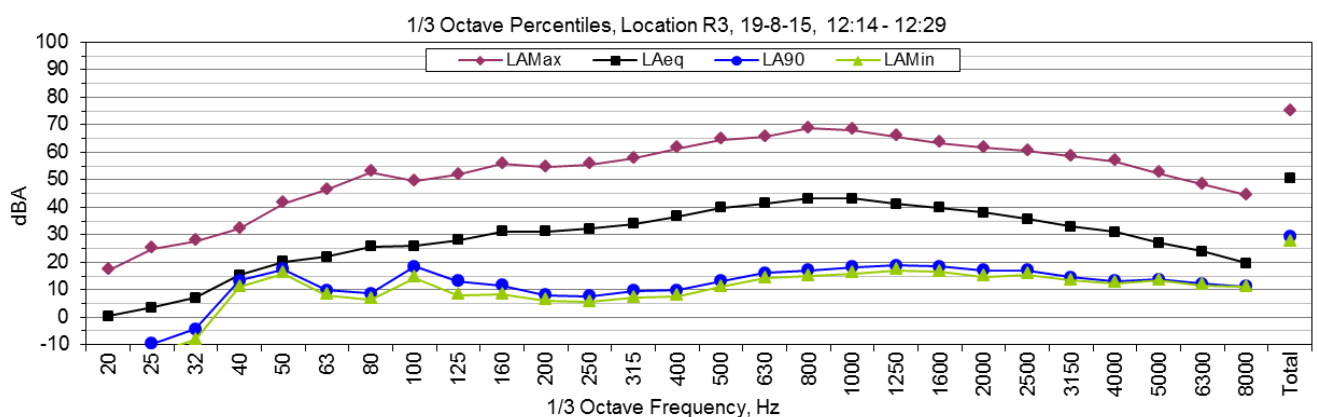
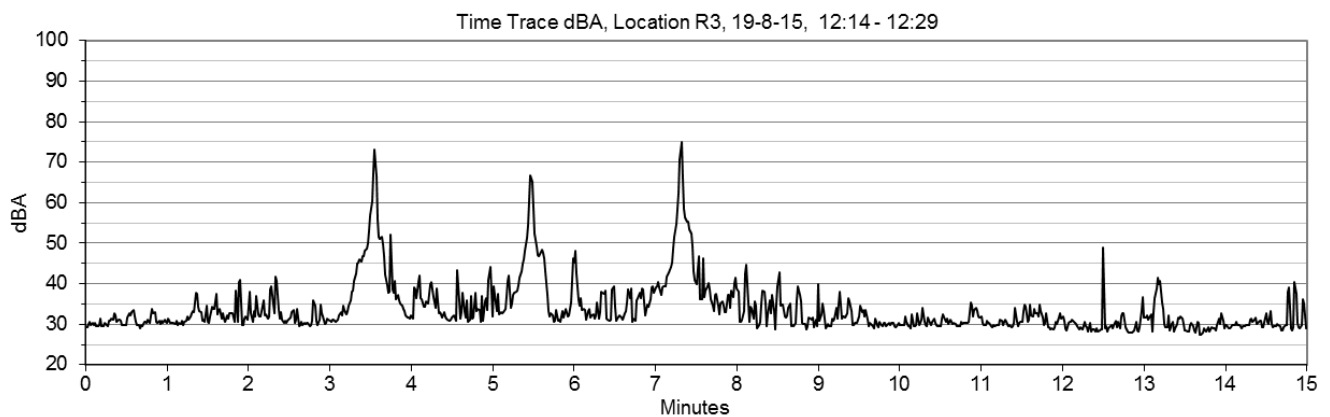
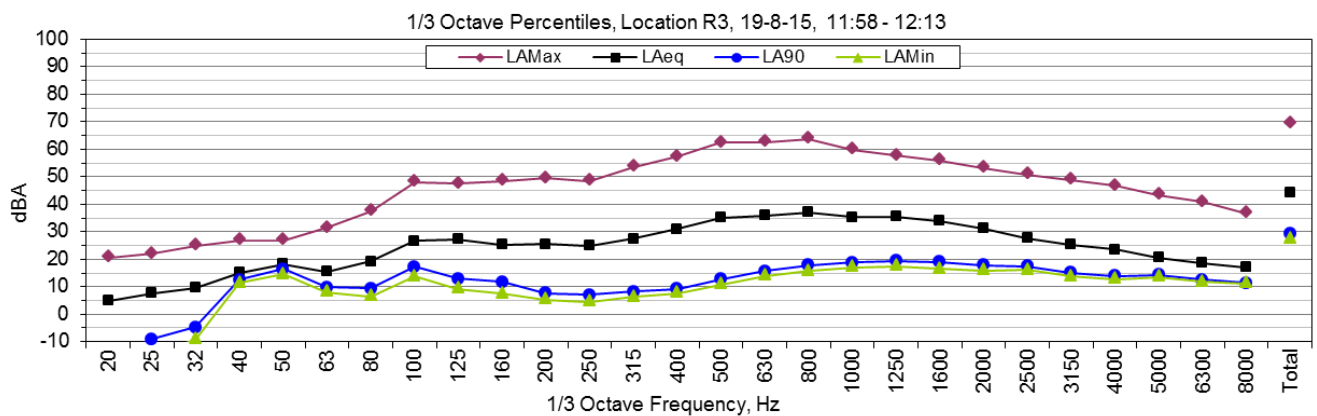
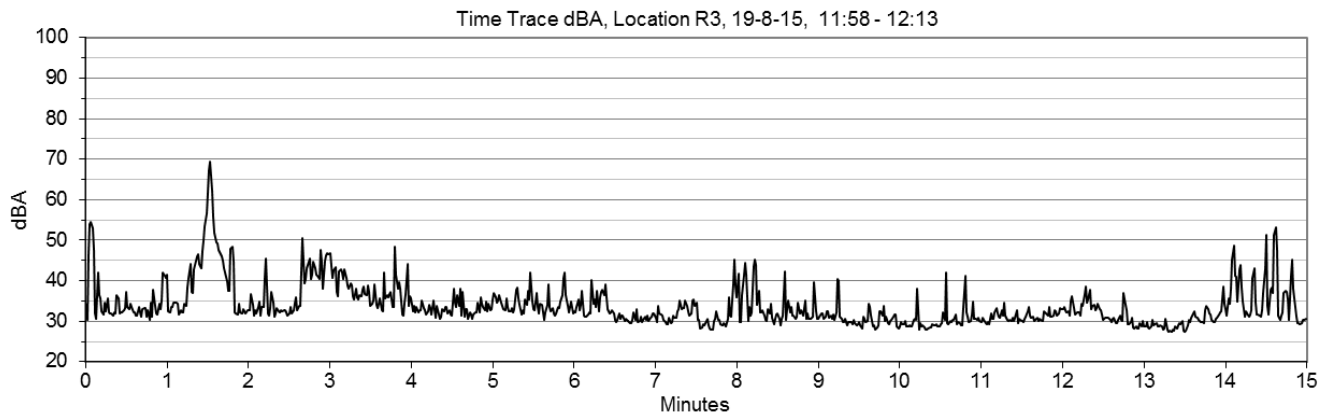


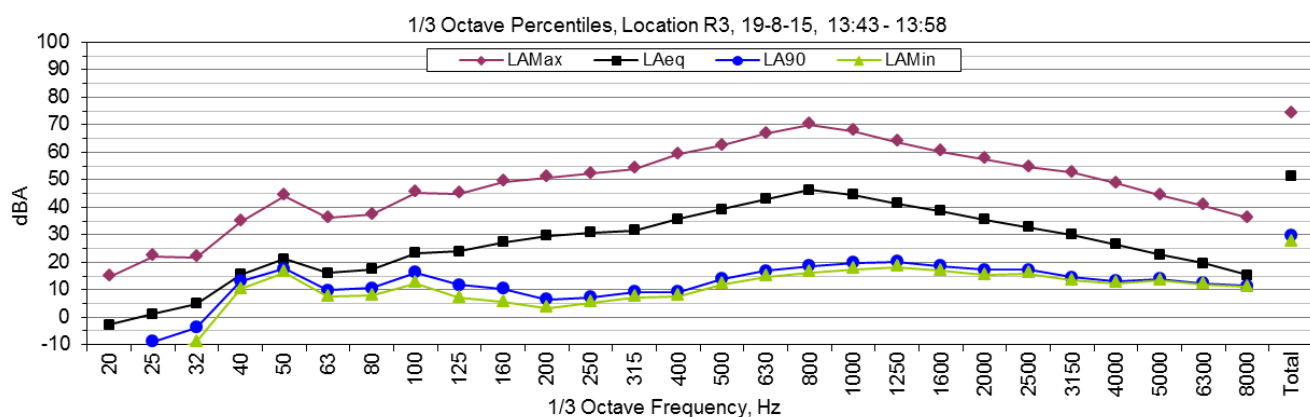
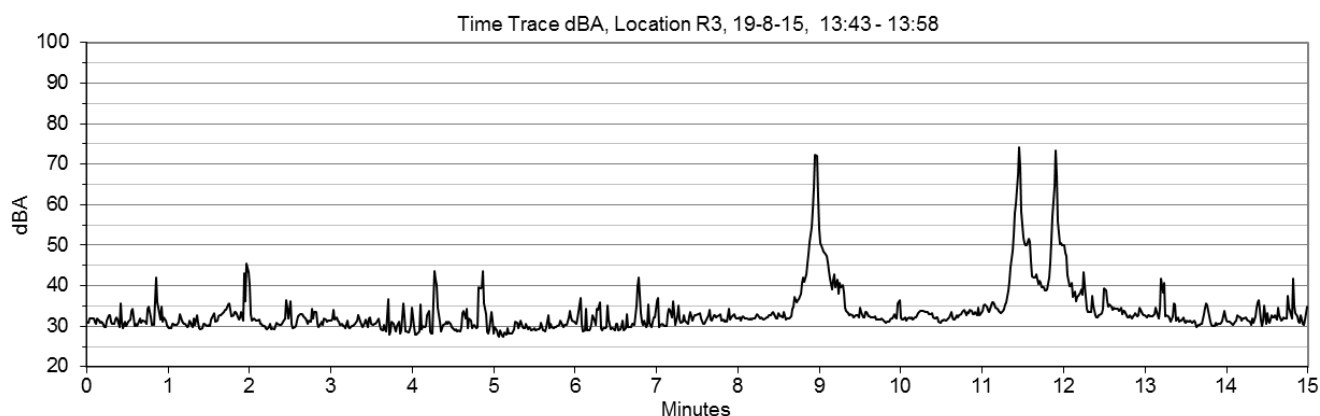
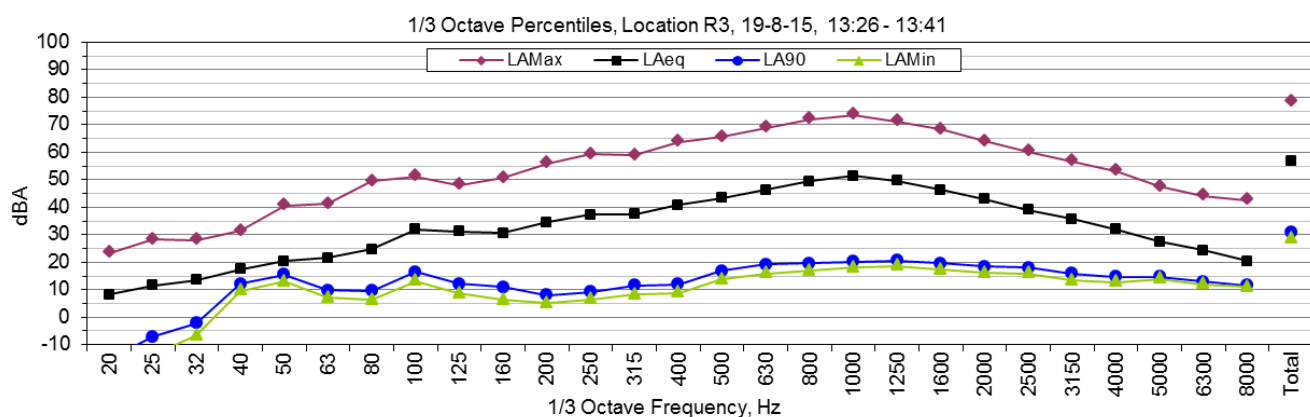
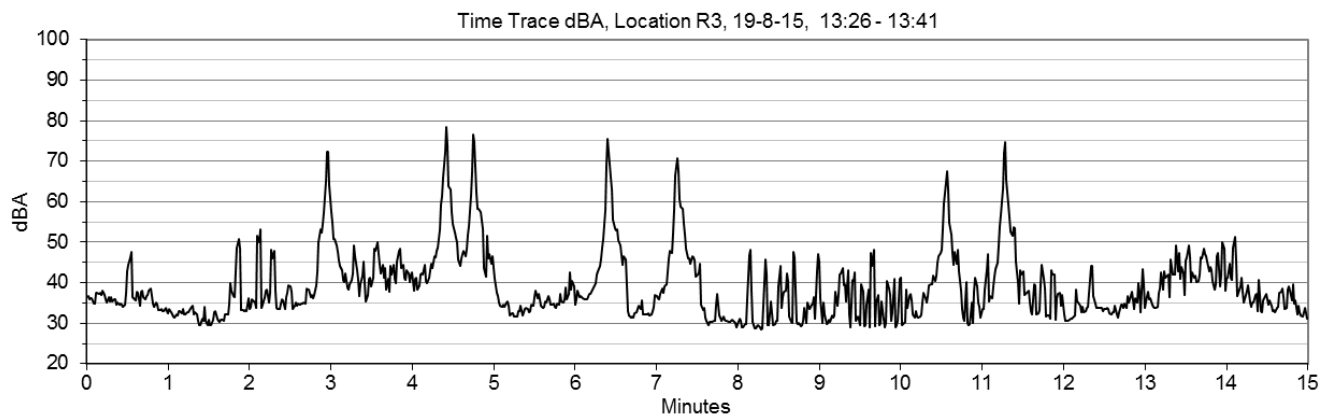


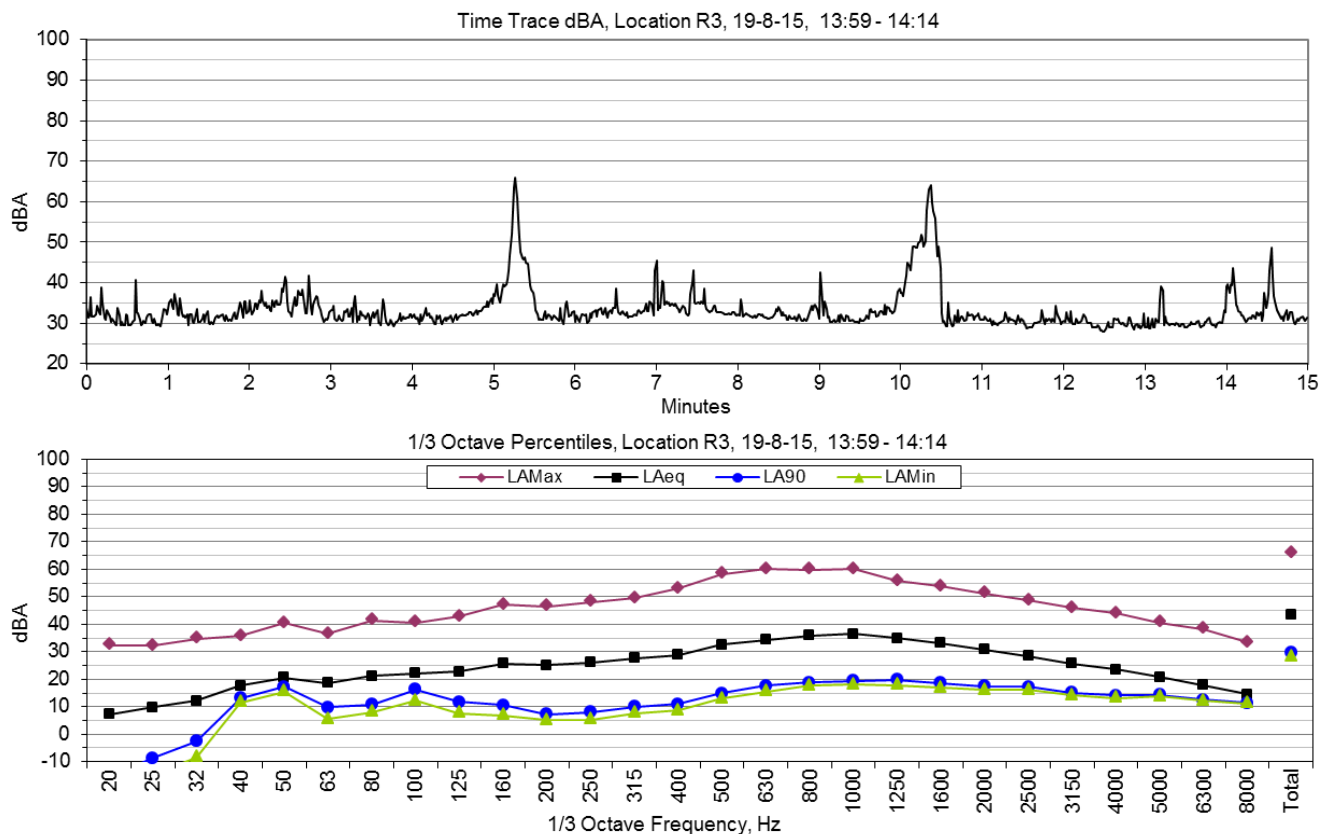


Day 2 – Wednesday 19 August 2015

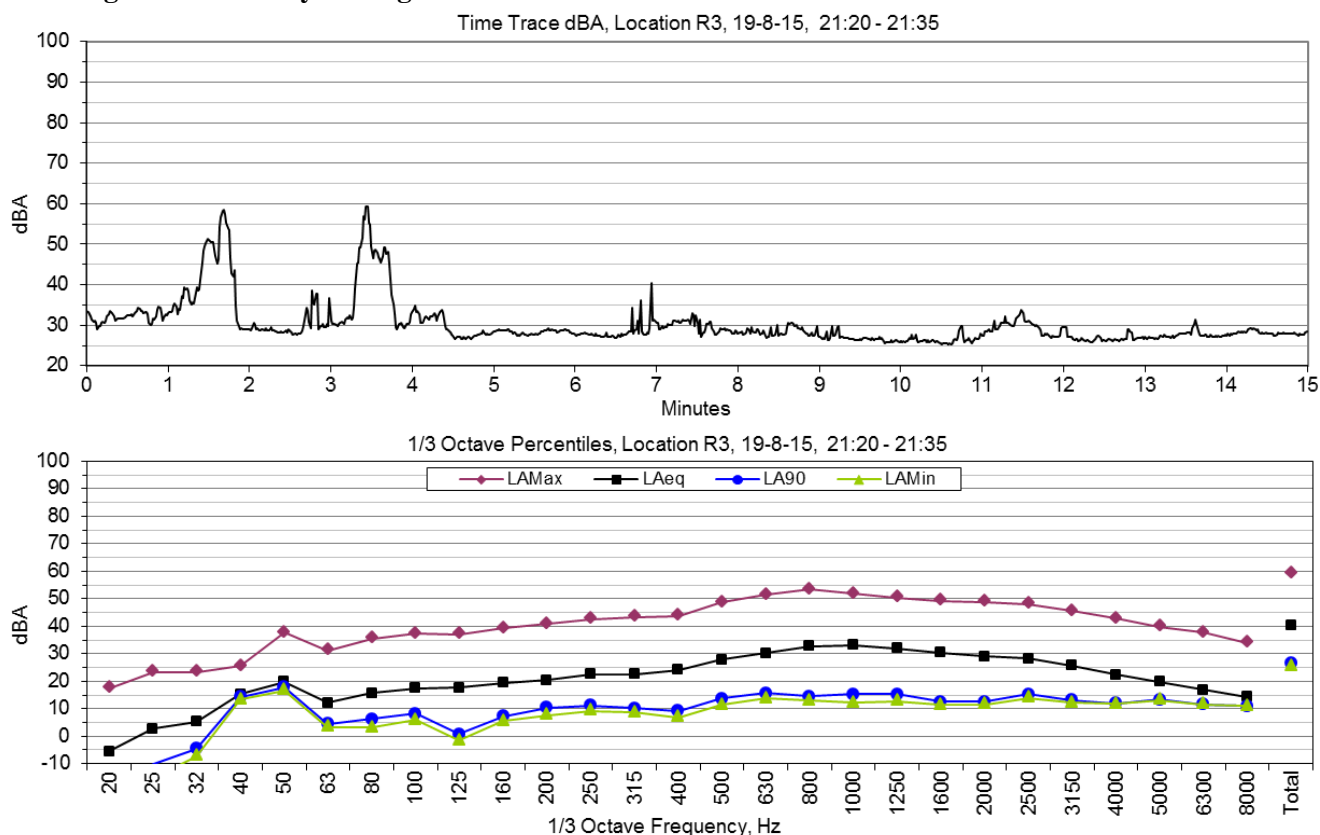


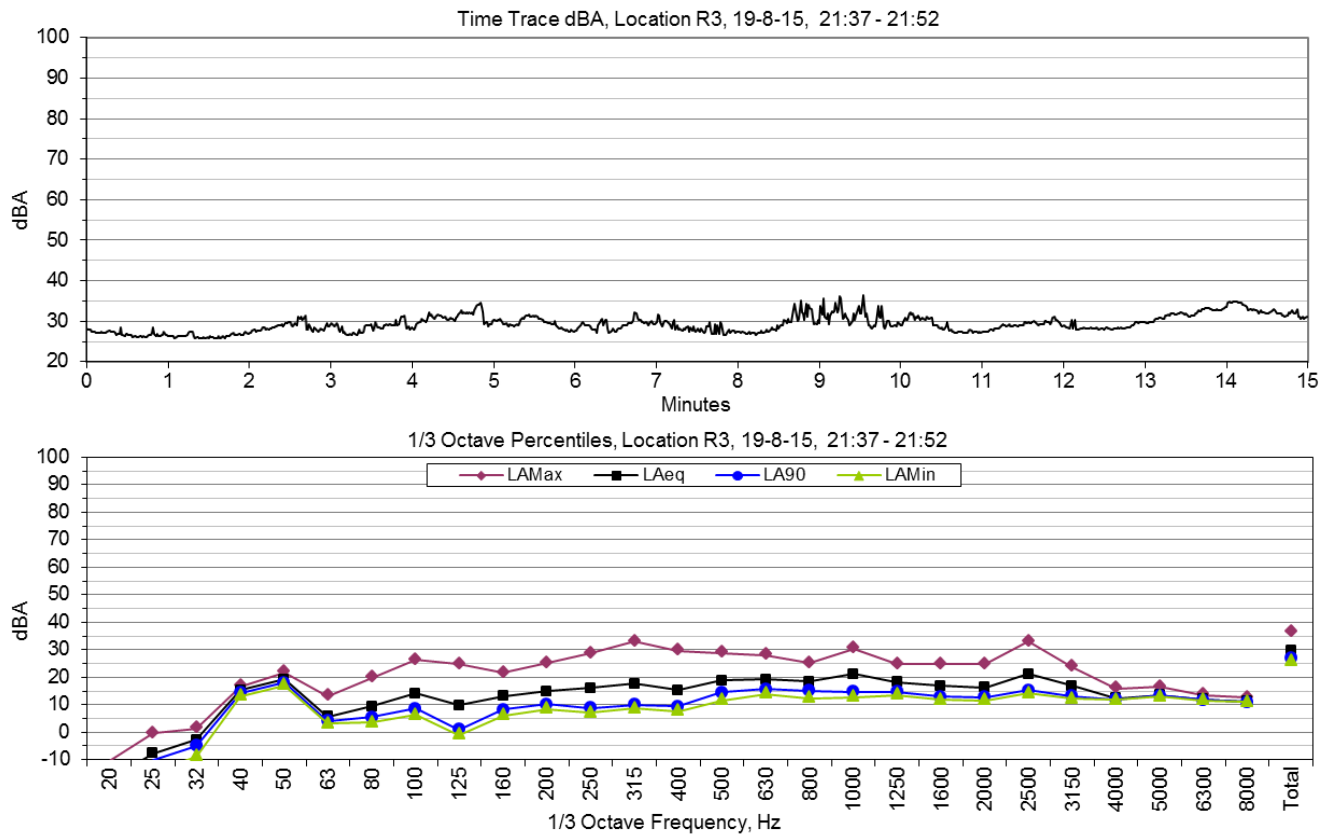




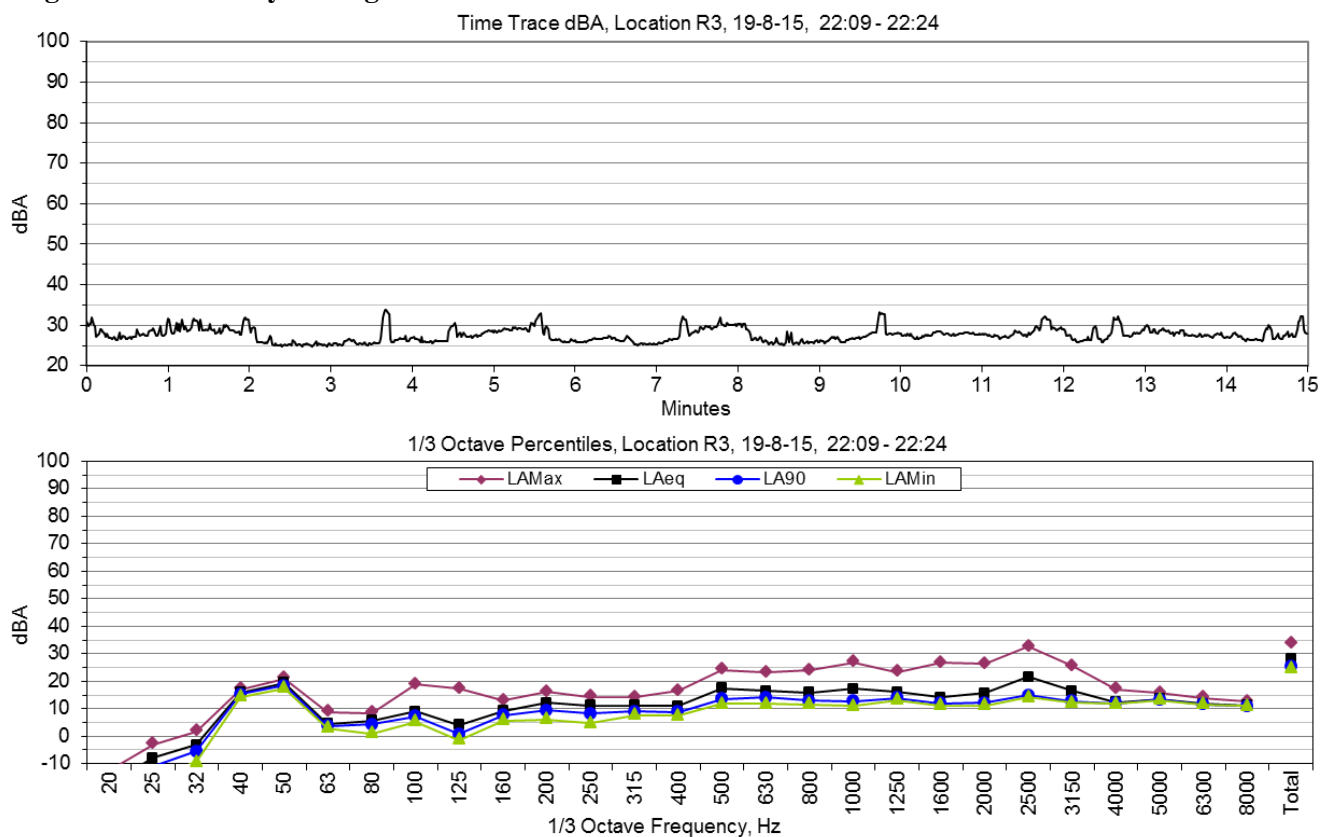


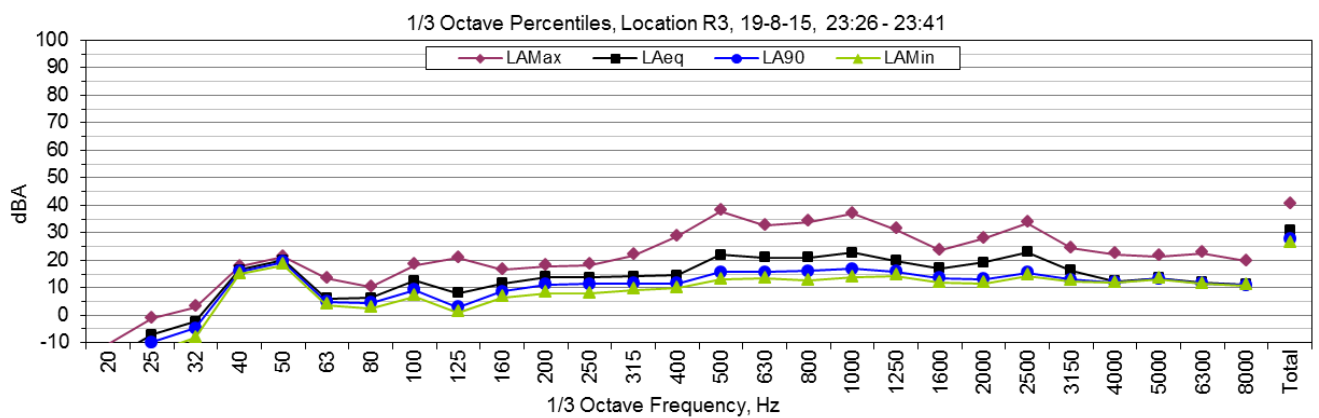
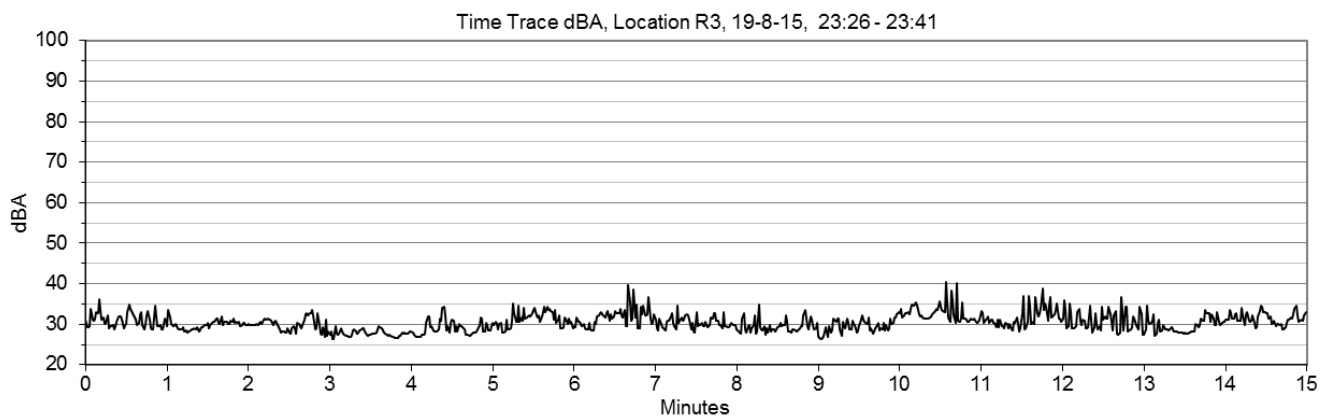
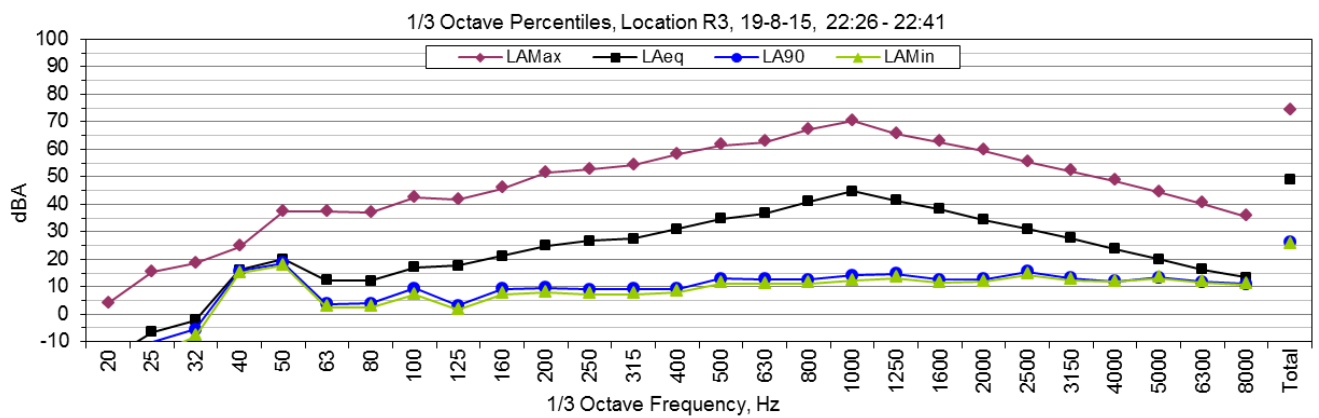
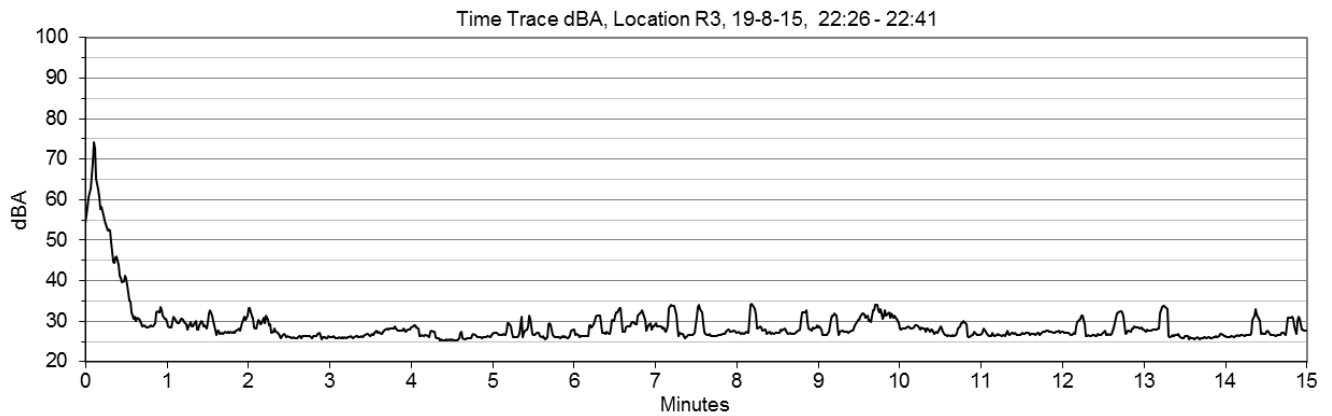
Evening 2 – Wednesday 19 August 2015

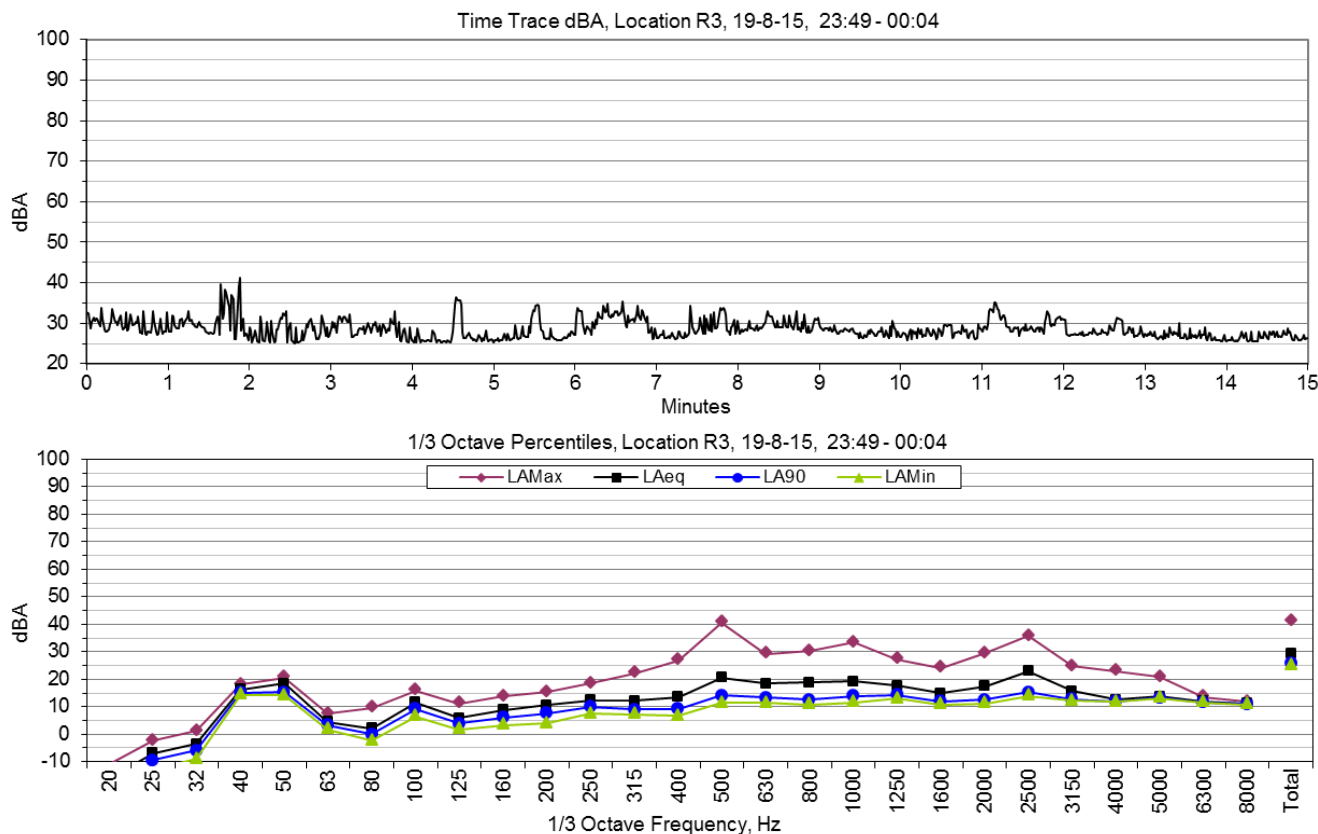




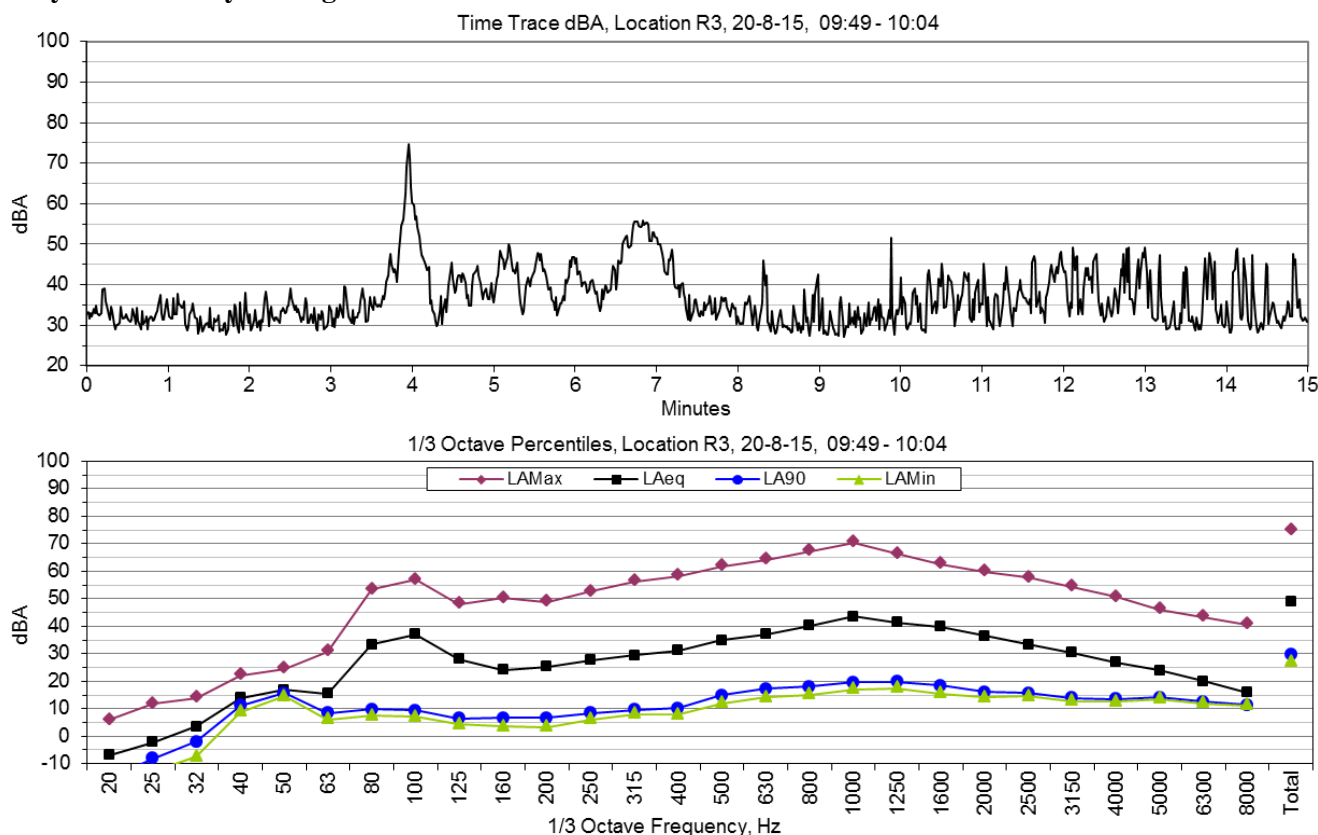
Night 2 – Wednesday 19 August 2015

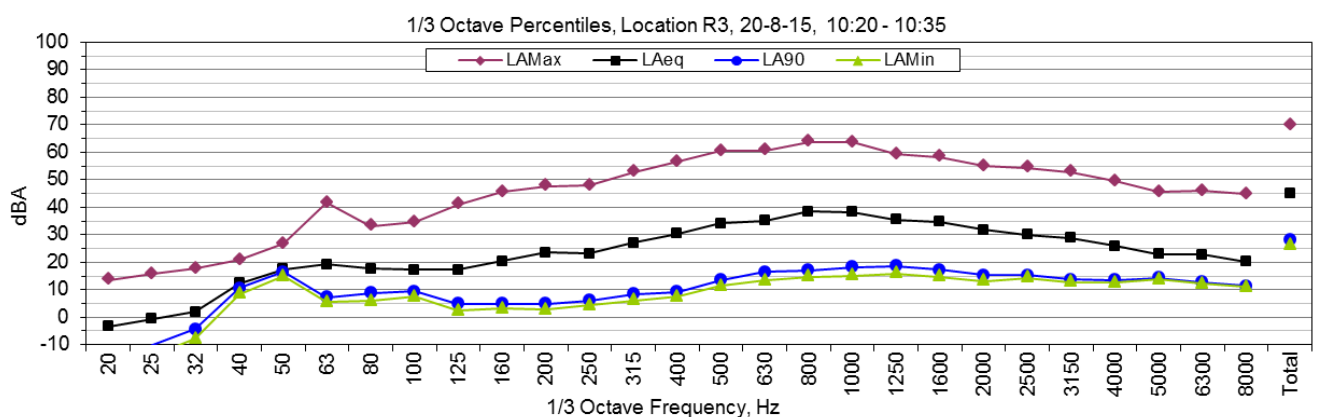
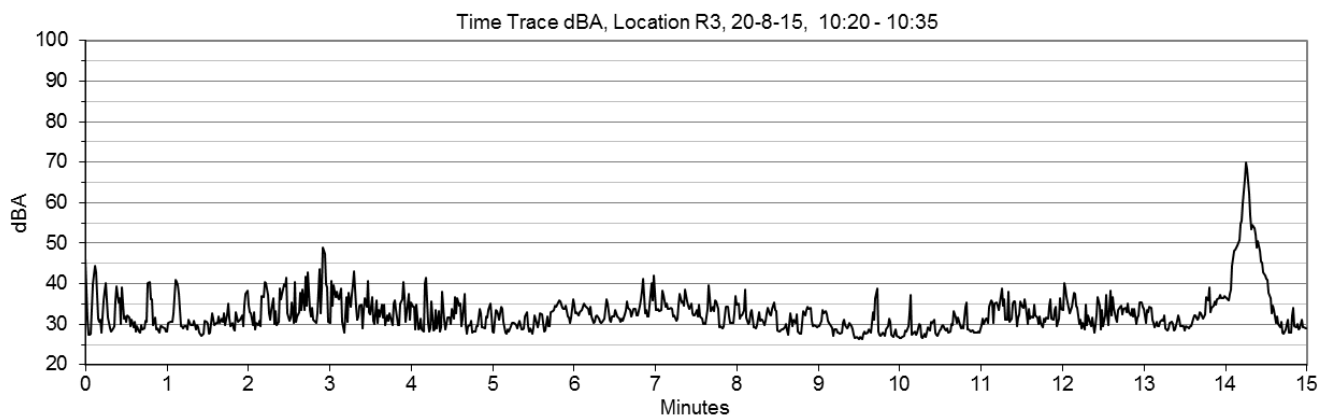
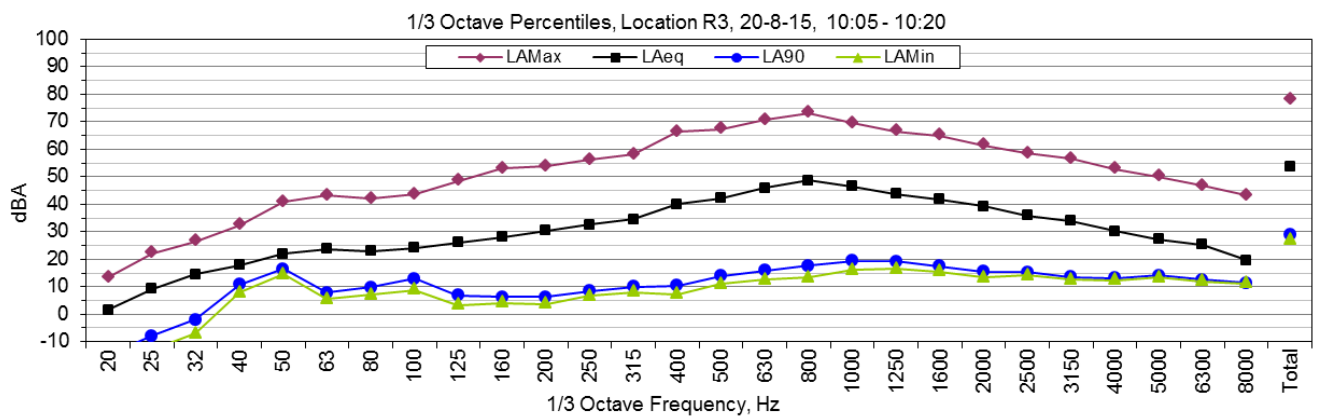
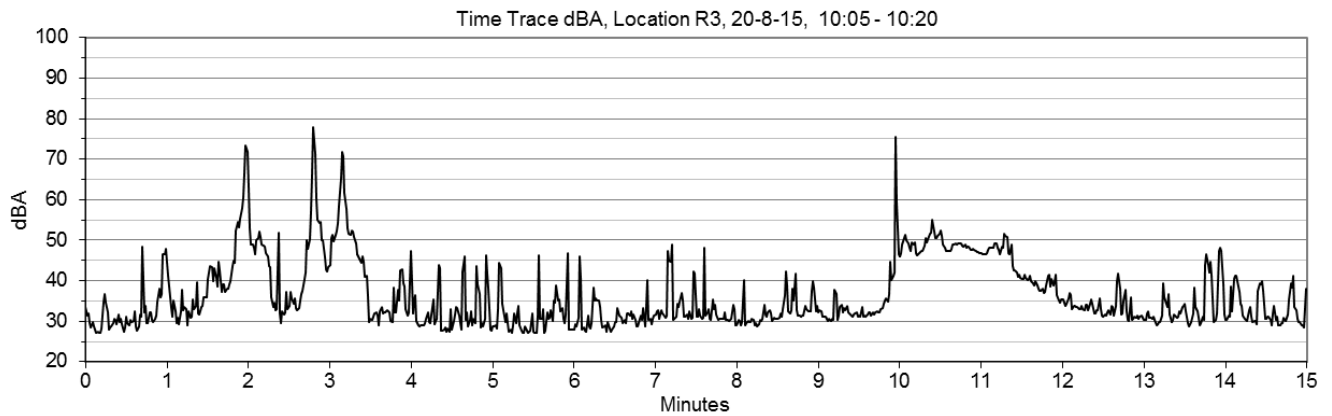


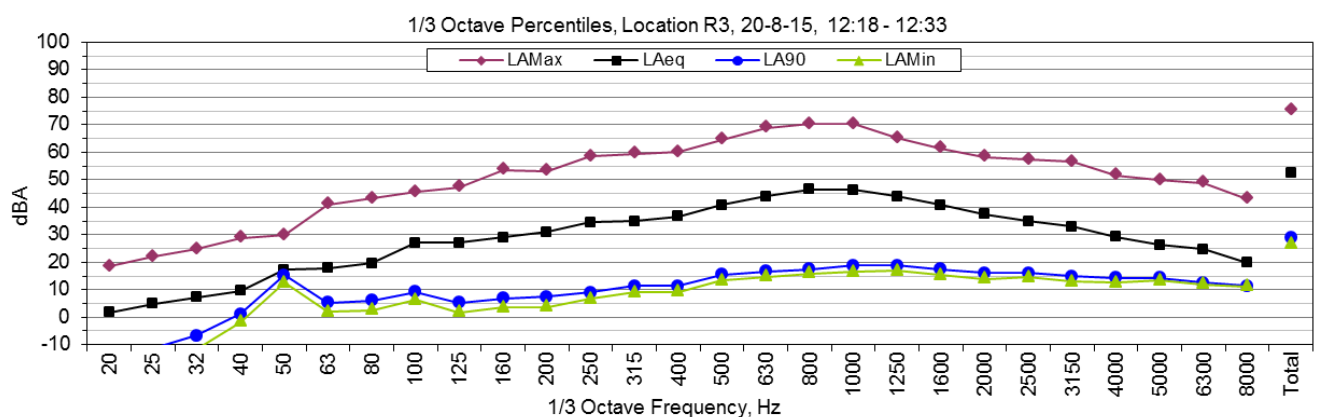
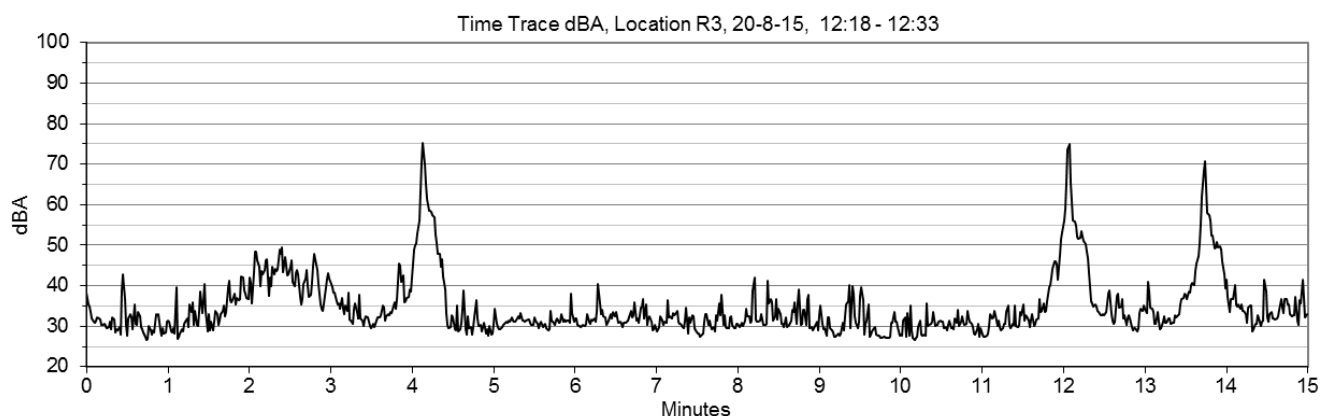
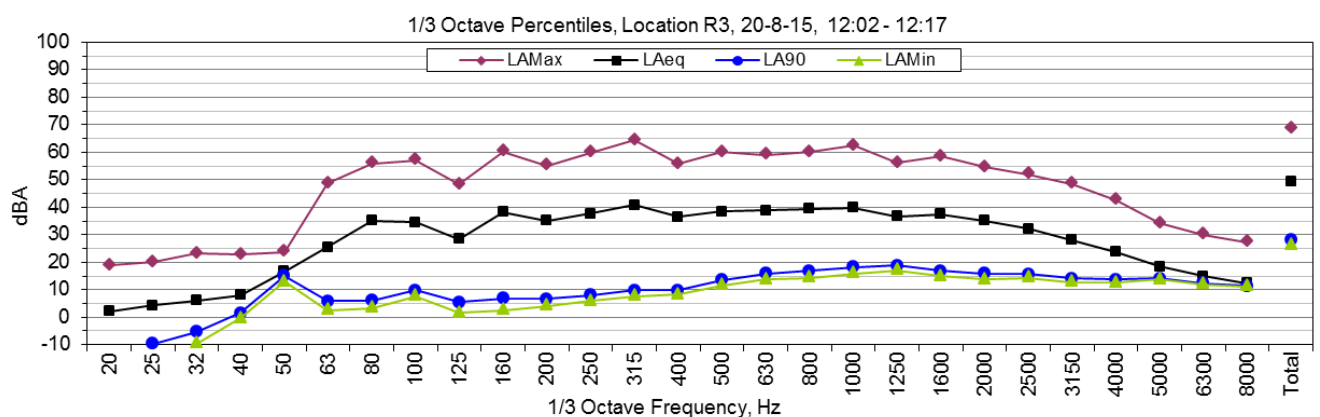
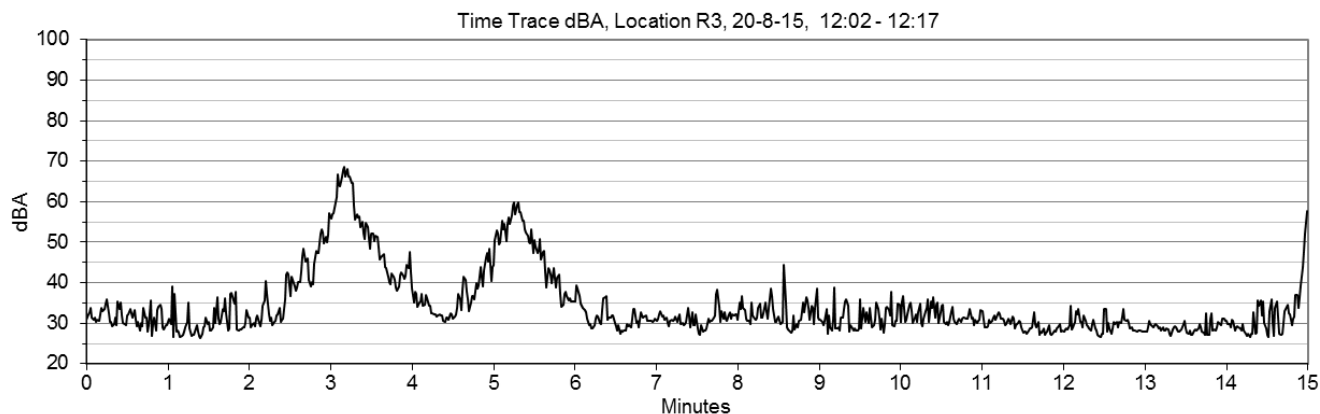


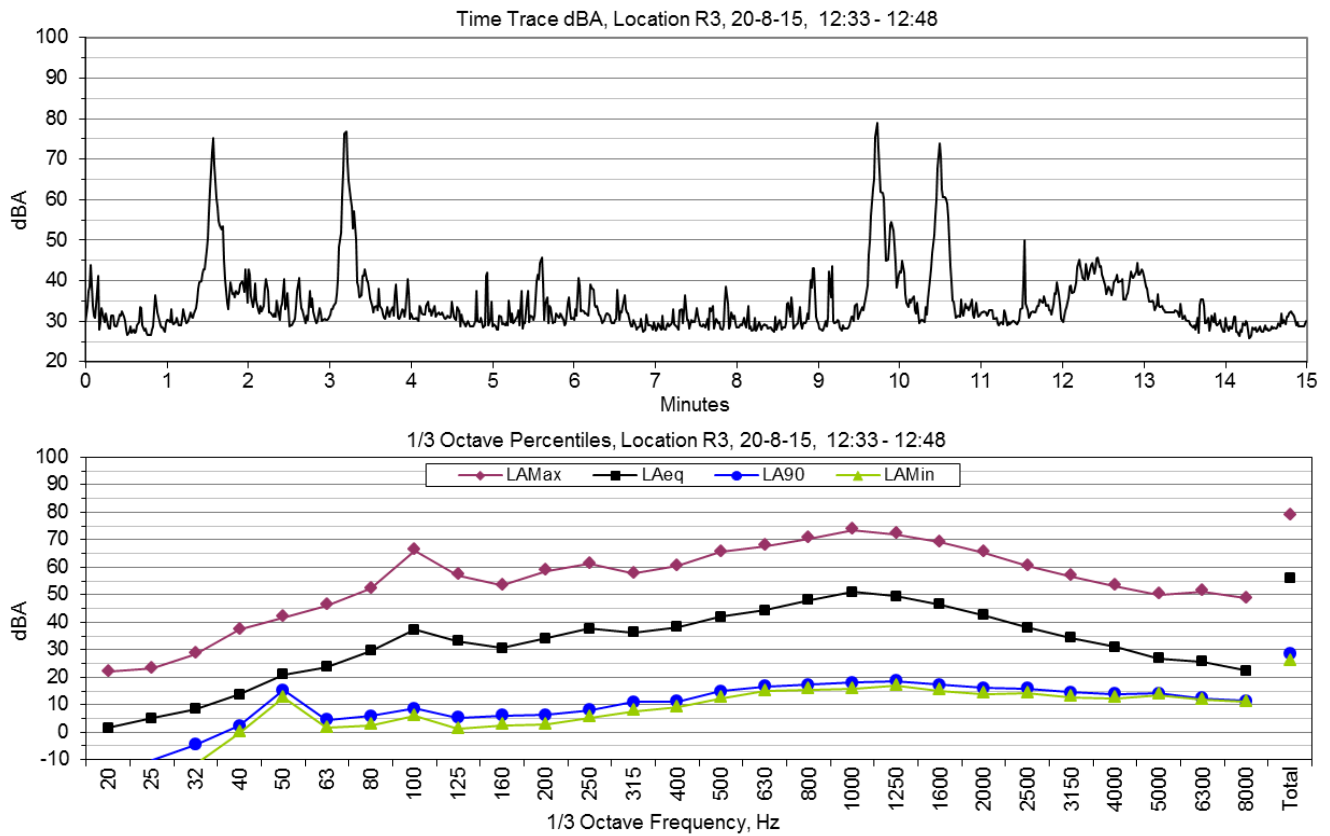


Day 3 – Thursday 20 August 2015

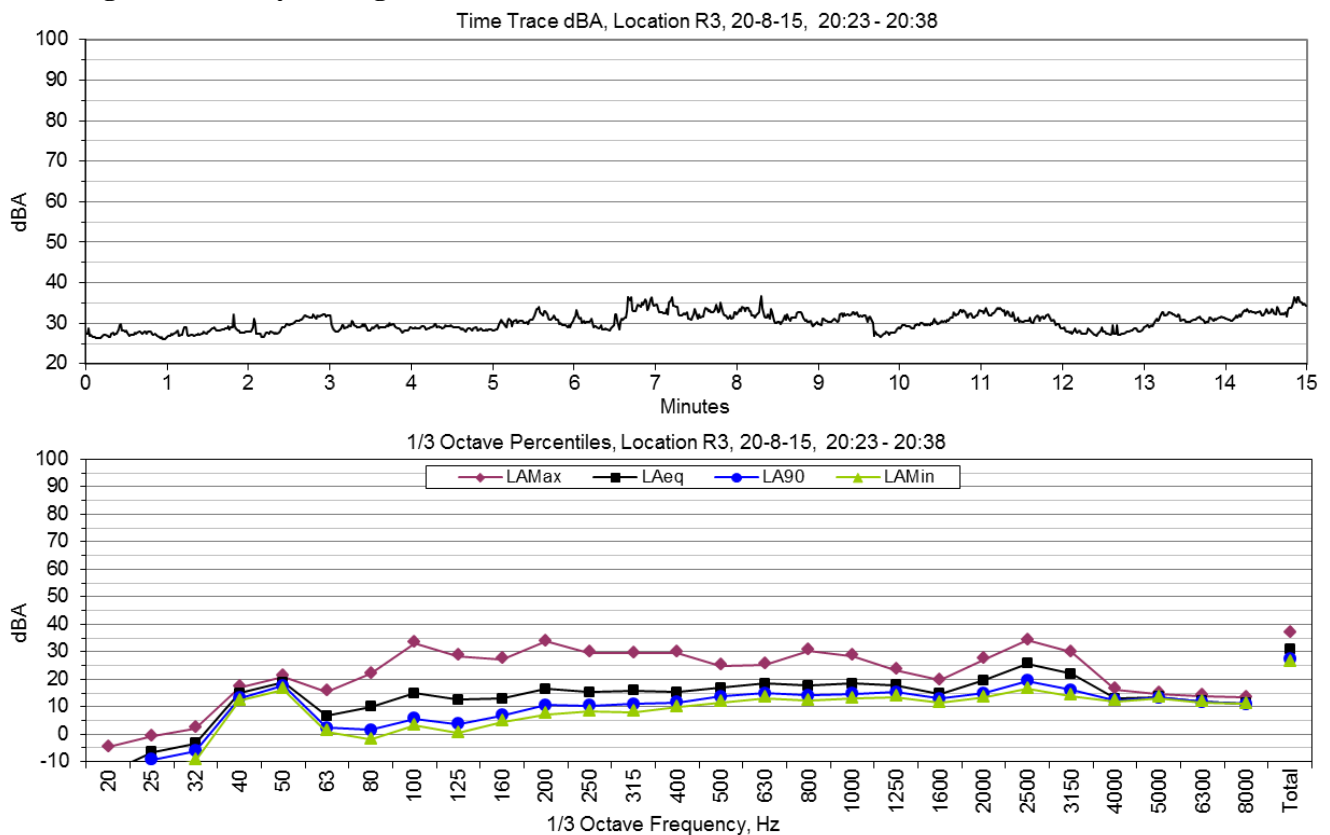


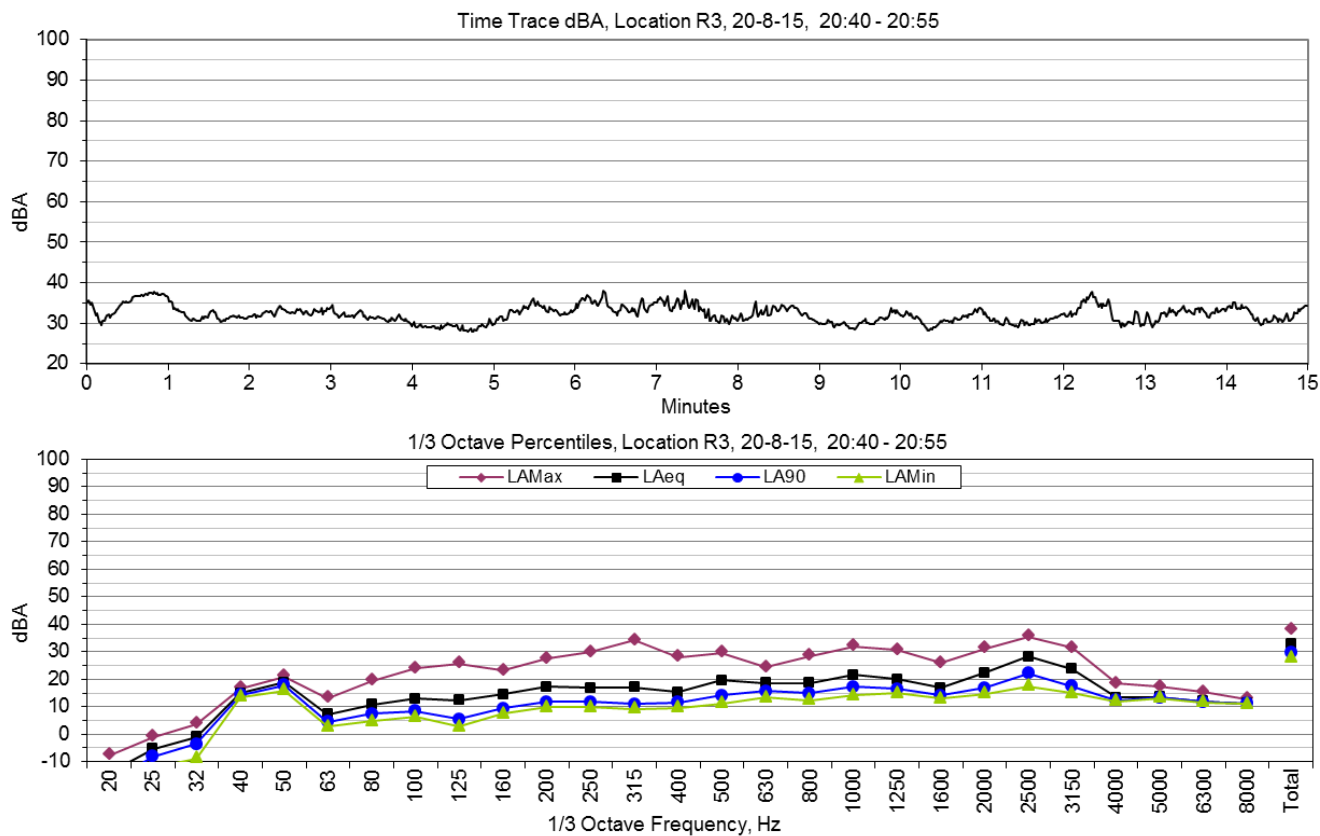






Evening 3 – Thursday 20 August 2015





Night 3 – Thursday 20 August 2015

