



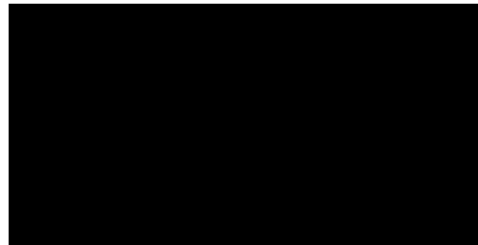
Project: J 03270
Noise Impact Assessment Report
Quercus Nurseries

Consultants: Sound Planning Ltd
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Client: Quercus Nurseries

Prepared by: D. M. Thomas

Signed:



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Dated: Monday 6th August, 2018



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1.0 BACKGROUND

- 1.1 Quercus Nurseries are suppliers of high quality plants to landscape professionals, garden designers and private clients.
- 1.2 Quercus Nurseries grow the majority of their own plants on site, however there is a need to 'import' specialist plants from other nurseries. The imported plants are delivered in wheeled trollies/cages on lorries from 04:00 hours in the morning (the early delivery can be received between 04:00 - 06:00 hours).
- 1.3 Quercus Nurseries have received a complaint about early morning delivery noise and would like to investigate the noise source and the impact on localised noise sensitive receivers (residential dwellings on Littlehampton Road).

See APPENDIX 2 - Site Location/Plans

- 1.4 Sound Planning has been retained to evaluate potential noise impact on the nearest noise sensitive receivers using appropriate methodologies and assessment criteria and design a suitable noise mitigation strategy if required.¹

1.4.1 Participating Acoustic Consultant

Dan Thomas is a Member of the Institute of Acoustics (M.I.O.A) having attained appropriate qualifications in acoustics and experience within the workplace.

1.4.2 Qualifications

Dan has been working within the noise and vibration industry for ten years and has attained the following qualifications within the field of acoustics:

- Institute of Acoustics (IOA) Diploma
- Post Graduate Diploma in Applied Acoustics and Noise Control (University of Surrey)
- Masters Degree in Applied Acoustics and Noise Control (University of Surrey)

¹ Sound Planning to utilize sound measurement equipment which measured both audio and sound levels contemporaneously; this would enable analysis of data files and determine the sound source responsible for the sound levels measured.



2.0 ASSESSMENT CRITERIA

The acoustic evaluation should be carried out in accordance with relevant standards and guidelines:

2.1 World Health Organisation: Guidelines for Community Noise²

2.1.1 The W.H.O document covers a wide array of environmental noise issues and appropriate assessment criteria in relation to acceptable noise levels in various situations.

2.1.2 The Guidelines look at appropriate assessment methodology and statistical parameters which are most relevant when looking at particular noise sources; whether they cause annoyance and to what degree.

2.1.3 *The capacity of a noise to induce annoyance depends upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time. Noise with low-frequency components require lower guideline values. For intermittent noise, it is emphasized that it is necessary to take into account both the maximum sound pressure level and the number of noise events.*

2.1.4 W.H.O – Amenity Criteria

Specific Environment	Critical Health Effects	L _{Aeq} (dB)	Time Base (hours)	L _{AF} max (dB)
Outdoor Living Area	Serious annoyance, daytime evening	55	16	
	Moderate annoyance, daytime evening	50	16	
Dwelling, Indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	
Inside Bedrooms	Sleep disturbance, night time	30	8	45
Outside Bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

² World Health Organisation Recommended Levels for Community Noise 2000.



2.2 British Standard 7445-1: 2003³

2.2.1 The methods and procedures described in BS 7445 are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site.

2.2.2 The aim of the BS 7445 series is to provide authorities with material for the description of noise in community environments. Based on the principles described in this standard, acceptable limits of noise can be specified and compliance with these limits can be controlled.

2.2.3 BS 7445 does not specify limits for environmental noise.

2.3 British Standard 8233: 2014⁴

2.3.1 BS 8233: 2014 is the *Guidance on sound insulation and noise reduction for buildings – Code of practice*.

2.3.2 Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB L _{Aeq, 16hour}	-
Dining	Dining Room/Area	40 dB L _{Aeq, 16hour}	-
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq, 16hour}	30 dB L _{Aeq, 16hour}

2.3.3 Note 7: *Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.*

2.3.4 Note 4: *Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guidance value may be set in terms of SEL of L_{Amax,P} depending on the character and number of events per night. Sporadic noise events could require separate values.*

³ Description and measurement of environmental noise. Part 1 – Guide to quantities and procedures.

⁴ Supersedes BS 8233: 1999.



WHO Guidelines suggest a 45 dB L_{AFmax} criterion for preventing sleep disturbance in bedrooms at night time.

2.3.5 External Amenity Areas

Where design standards cannot be achieved for traditional amenity spaces (e.g. gardens and patios) then the 'lowest practical levels' should be achieved. For non-traditional amenity spaces (e.g. small balconies found in many urban development.) it may not be appropriate to impose any noise criteria – especially when it is unlikely that these areas would be used for relaxation. For larger balconies and roof terraces, especially those intended to be used for relaxation then the same design standards as for traditional amenity areas should be followed.

2.4 BS 4142: 2014 – Scope

2.4.1 This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- a) sound from industrial and manufacturing processes;
- b) sound from fixed installations which comprise mechanical and electrical plant and equipment;
- c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

2.4.2 This standard is applicable to the determination of the following levels at outdoor locations:



a) rating levels for sources of sound of an industrial and/or commercial nature and

b) ambient, background and residual sound levels, for the purposes of:

- investigating complaints;
- assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and
- assessing sound at proposed new dwellings or premises used for residential purposes.

2.5 BS 4142: 2014 – Assessment of Impacts

2.5.1 The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

2.5.2 Evaluation of Adverse Impact

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.



- 2.5.3 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.
- 2.5.4 Objective method for assessing the audibility of tones in sound: One-third octave method

The test for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the $L_{Zeq,T}$ sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands.

For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference. The level differences between adjacent one-third-octave bands that identify a tone are:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz);
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

2.5.5 Rating Level

Subjective Method:

Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.



Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

One-third octave method:

Identify tones using the method given in Annex C, then add a correction of 6 dB if a tone is present.

Reference methods

When the one-third octave method is not sufficient, use the reference method for assessing the audibility of tones given in Annex D, which produces a penalty on a sliding scale from 0 dB to 6 dB.

Use the reference method given in Annex E for measuring the prominence of impulsive sounds, which produces penalties in the range 0.0 dB to 9.0 dB.

Other Sound Characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Intermittency

When the specific sound has identifiable on/off conditions a penalty of 3 dB can be applied.



3.0 METHODOLOGY

3.1 Delivery/Unloading Noise Measurements

- 3.1.1 Quercus Nurseries carried out a 'mock' delivery using a Quercus rigid vehicle with tailgate lift; the vehicle was driven into position and plants (on trolleys) were then lifted down to ground level and pushed into the nursery as per usual delivery/unloading methods.

See APPENDIX 2 - Site Location and APPENDIX 3 - Site Photographs

- 3.1.2 Sound Planning installed sound monitoring equipment at a distance of 3.5m (1.2m above ground level) away from the rear of the delivery vehicle and measured sound levels as the vehicle moved into position and unloaded plants.
- 3.1.3 Sound Planning carried out environmental sound measurements in accordance with BS 7445: 2003⁵.
- 3.1.4 The Sound Level Meter (SLM) is Class 1 and has real time one third octave band measurement capability and compliant to IEC 61672⁶.
- 3.1.5 A-weighted equivalent continuous level (L_{Aeq}) and other statistical parameters were measured with the Fast (F) setting for the measurement period.
- 3.1.6 One third octave band analysis was undertaken to be utilised in post measurement analysis and evaluating acoustic features/tones.

See APPENDIX 5 - Delivery Noise Measurements

3.2 Extended Ambient Noise Measurements (144 Littlehampton Road)

- 3.2.1 Sound Planning installed sound monitoring equipment (recording sound levels and audio) at 144 Littlehampton Road in a position representative of the nearest noise sensitive windows to Quercus Nurseries.

See APPENDIX 2 - Site Location and APPENDIX 3 - Site Photographs

⁵ British Standard BS 7445-1: 2003. *Description and measurement of environmental noise*. ISBN 0 580 43032 4

⁶ International Standard IEC 61672-1: 2002. Electroacoustics – Sound level meters – Part 1: Specifications.



- 3.2.2 The Sound Level Meter (SLM) is Type 1 and has real time one third octave band measurement capability and compliant to IEC 61672⁷. All measurements were carried out in accordance with BS 7445: 2003⁸.
- 3.2.3 A-weighted equivalent continuous level (L_{Aeq}) and maximum level (L_{Amax}) parameters were measured with the Fast (F) setting for the extended measurement period.
- 3.2.4 One third octave band analysis and was undertaken to be utilised in post measurement analysis and noise insulation scheme specification.
- 3.2.5 Audio measurements were recorded contemporaneously with level measurements to assist the acoustic analysis of noise events during the 48 hour period; this would enable analysis of data files and determine the sound source responsible for the sound levels measured.

4.0 INSTRUMENTATION

4.1 Sound Level Measurement Equipment

Equipment	Make	Model	Class	Serial Number	UKAS Calibration
SLM	Norsonic	Nor 140	1	1405819	U28608 (21/5/18)
SLM	Casella	CEL 490	1	128950	U25585 (18/5/17)
Field Calibrator	Casella	CEL 110/1	1	077948	U28606 (21/5/18)
Environmental Tripods					
Wind/Weather Shields					
Laser Measurer	Leica	Disto A5		1073750838	
Digital Camera	Samsung				

⁷ International Standard IEC 61672-1: 2002. Electroacoustics – Sound level meters – Part 1: Specifications.

⁸ British Standard BS 7445-1: 2003. *Description and measurement of environmental noise*. ISBN 0 580 43032 4



4.2 Calibration

4.2.1 Field Calibration

The Sound Level Meters (SLM) were field calibrated before and after the on-site noise measurements. No deviation was detected (1kHz).

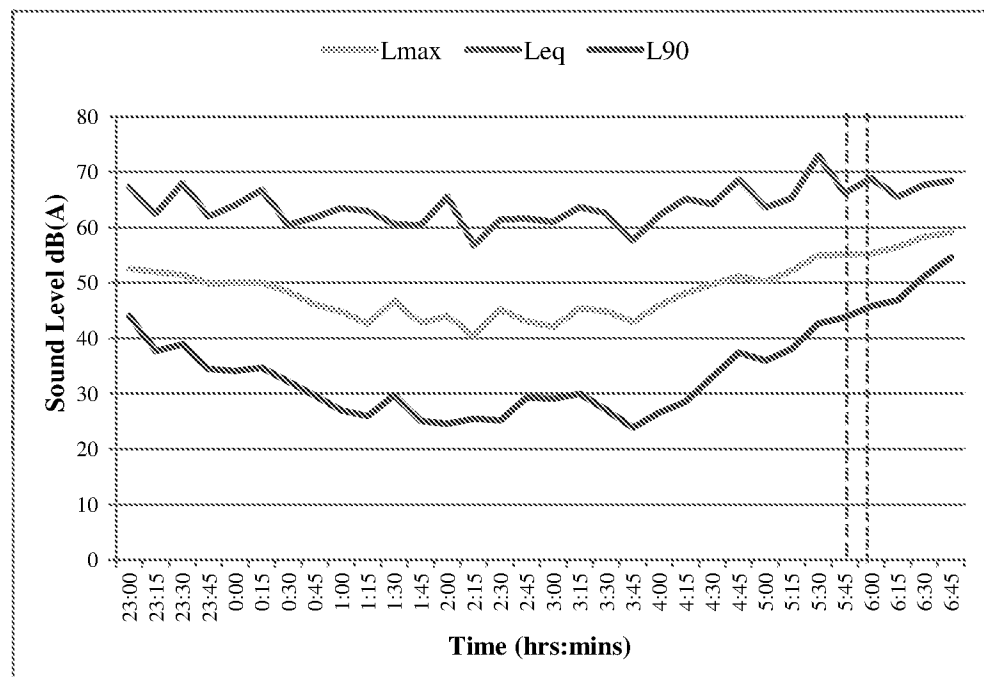
4.2.2 UKAS Calibration

UKAS accredited calibration certificates are available on request.

5.0 RESULTS

5.1 Noise Sensitive Receiver - 144 Littlehampton Road

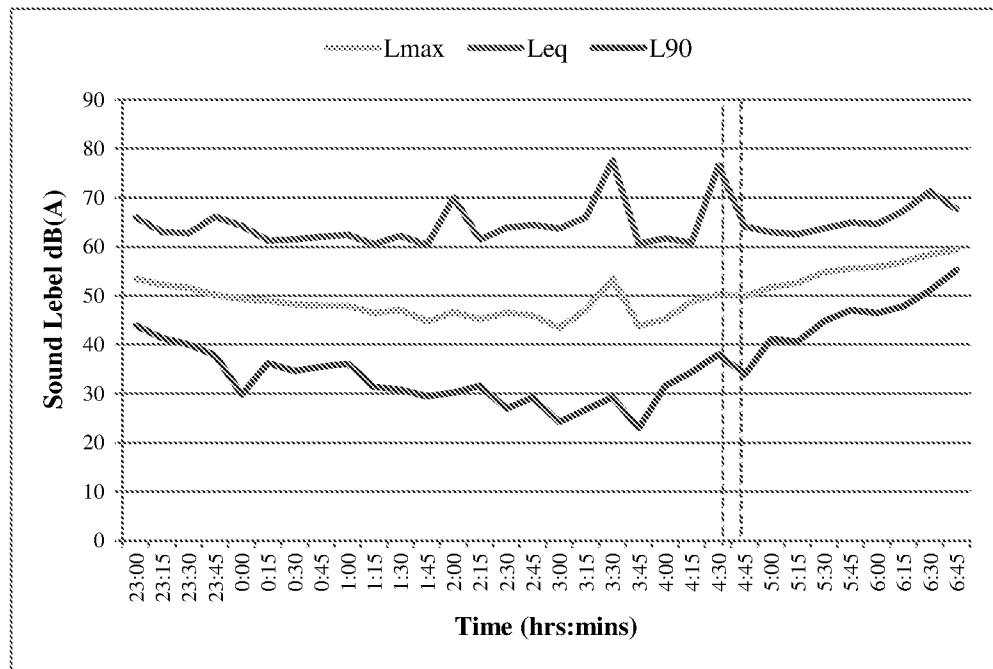
5.1.1 Night 1 (11/7/18)



Key:

----- Delivery time period: 05:51 - 06:01 (5 trolleys/cages)

5.1.2 Night 2 (12/7/18)



Key:

----- Delivery time period: 04:38 - 04:47 (2 trolleys/cages)

5.2 Delivery/Unloading Noise Measurements (Near Field Mock Test)

5.2.1 Overall Results

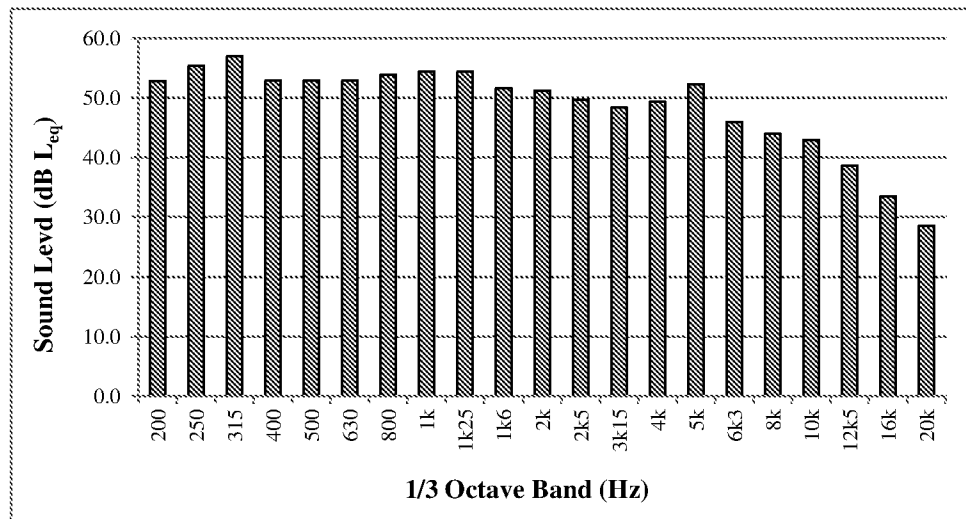
Measured Level (3.5m) 67.2 dB L_{Aeq}

Residual Level 64.8 dB L_{Aeq}

Specific (corrected) Level 63.5 dB L_{Aeq}



5.2.2 Frequency Analysis



5.3 Meteorological Conditions

Meteorological conditions acceptable in accordance with BS 7445: 2003.

Generally assisting sound propagation from source to receiver.

See APPENDIX 6

6.0 DISCUSSION

6.1 Noise Sensitive Receiver - 144 Littlehampton Road - Noise Measurements

6.1.1 The Night 1 and Night 2 measurement graphs in paragraphs 5.1.1 and 5.1.2 show no 'spikes' in level (L_{Aeq} or L_{A90}) during the delivery/unloading time periods.

6.1.2 The Night 2 measurement graph shows a L_{Amax} 'spike' just before delivery/unloading time period; Sound Planning will verify sound source by listening to audio files contemporaneously recorded - See paragraph 6.4.



6.2 Delivery/Unloading Noise - Near Field 'Mock' Tests

6.2.1 Overall Results

The measured and residual levels are relatively close (levels should be > 6 dB in order to accurately calculate 'specific' source noise levels); the on site noise consultant (Dan Thomas) could discern delivery/unloading noise, so it is assumed that the specific level calculated is relatively accurate at 63.5 dB L_{Aeq} .

6.2.2 Frequency Analysis

The frequency analysis graph in paragraph 5.2.2 does not indicate any acoustic features or 'tonality'.

6.3 Meteorological Conditions

The wind direction of N, NE would assist sound propagation from source to receiver.

6.4 Audio Evaluation

6.4.1 Night 1 (during and around delivery period): 05:51 - 06:01 hours

General ambient noise consisting of road traffic noise, bird calls (mainly Wood Pigeons) and a motorbike (loudest).

Possible trolley/cage rumbling was observed at 05:55 hours when ambient noise levels were at a lull i.e. < 40 dB L_{Aeq} . It should be noted that ambient levels were generally around 55 dB L_{Aeq} during this time period (road traffic noise).

6.4.2 Night 2 (during and around delivery period): 04:38 - 04:47 hours

General ambient noise consisting of road traffic noise and bird calls (Seagulls, Crows and Wood Pigeons).

The 'spike' L_{Amax} was clearly due to bird activity close to the microphone at 04:39 hours.



No delivery/unloading noise could be discerned from audio playback during this period.

7.0 NOISE EVALUATION

7.1 Predicted Delivery/Unloading Noise at NSR (based on near field 'mock' tests)

Specific delivery/unloading noise	63.5 dB L_{Aeq}
Distance to NSR	70 metres
Distance correction	63.5 - 20 log (70/3.5)
Levels at NSR	37 dB L_{Aeq}

7.2 Noise Levels at 144 Littlehampton Road (during deliveries)

- 7.2.1 The Night 1 and Night 2 measurement graphs in paragraphs 5.1.1 and 5.1.2 show no 'spikes' in level (L_{Aeq} or L_{A90}) during the delivery/unloading time periods.
- 7.2.2 The 'spike' L_{Amax} on Night 2 was clearly due to bird activity close to the microphone at 04:39 hours [verified by audio playback].
- 7.2.3 Possible trolley/cage rumbling was observed at 05:55 hours on Night 1 when ambient noise levels were at a lull i.e. < 40 dB L_{Aeq} . It should be noted that ambient levels were generally around 55 dB L_{Aeq} during this time period (road traffic noise).
- 7.2.4 The predicted delivery/unloading noise level at 144 Littlehampton Road is around 37 dB L_{Aeq} ; it is possible that delivery/unloading noise would be just discernible at this time period although it should be noted that background (L_{A90}) would be a similar level i.e. 37 dB L_{A90} and ambient levels (road traffic noise) were much higher at around 55 dB L_{Aeq} .



7.3 Subjective effect of changes in sound pressure level:

Change in Sound Level (dB)	Change in Power		Change in Apparent Loudness
	Decrease	Increase	
3	1/2	2	<i>Just Perceptible</i>
5	1/3	3	<i>Clearly Noticeable</i>
10	1/10	10	<i>Half or Twice as Loud</i>
20	1/100	100	<i>Much Quieter or Louder</i>

Source: Bies & Hansen – *Engineering Noise Control*, 3rd Edition, 2003.

7.4 Noise Evaluation

In consideration of all sound level measurements, audio recordings and sound level predictions, Sound Planning would suggest that the specific sound source (Quercus Nursery delivery/unloading) would have a low impact on the nearest noise sensitive receivers and should not cause sleep disturbance (particularly in the context of high ambient noise levels prevalent in this location due to road traffic noise).

8.0 CONCLUSIONS

- 8.1 Sound Planning has undertaken a noise impact assessment at Quercus Nurseries, measuring delivery/unloading noise levels and the impact on the nearest noise sensitive receivers in accordance with relevant national standards.

See Section 3.0 - METHODOLOGY

- 8.2 Sound Planning has carried out an overall sound level analysis, frequency analysis and audio analysis of key periods (Quercus Nurseries delivery/unloading during the night).

The noise evaluation suggests that the specific sound source (Quercus Nursery delivery/unloading) would have a low impact on the nearest noise sensitive receivers and should not cause sleep disturbance.



See Section 5.0 - RESULTS, Section 6.0 - DISCUSSION and Section 7.0 - NOISE EVALUATION

8.3 Salient Observations

- 8.3.1 The nearest noise sensitive receivers (including test location of 144 Littlehampton Road) are exposed to high levels of ambient noise (road traffic noise) during the day and night.
- 8.3.2 The high levels of ambient noise are particularly relevant to the BS 4142 evaluation procedure in terms of 'context'.
- 8.3.3 The predicted and measured levels (where trolley rumbling was possibly observed on audio playback) would not be considered to cause annoyance or sleep disturbance in accordance with either BS 8233 or WHO Guidelines.

See Section 2.0 - ASSESSMENT CRITERIA



APPENDIX 1

Glossary of Acoustic Terms

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2×10^{-5} pascals) and the threshold of pain is around 120 dB. The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

Noise Rating

The Noise Rating (NR) system is a set of octave band sound pressure level curves used for specifying limiting values for building services noise. The Noise Criteria (NC) and Preferred Noise Criteria (PNC) systems are similar.

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).



Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

- $L_{Aeq, T}$ *The most widely applicable unit is the equivalent continuous A-weighted sound pressure level ($L_{Aeq, T}$). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.*
- L_{AE} *Where the overall noise level over a given period is made up of individual noise events, the $L_{Aeq, T}$ can be predicted by measuring the noise of the individual noise events using the sound exposure level, L_{AE} (or SEL or L_{AX}). It is defined as the level that, if maintained constant for a period of one second, would deliver the same A-weighted sound energy as the actual noise event.*
- L_{Amax} *The maximum A-weighted sound pressure level that was measured during the measurement period.*
- L_{A10} *The level exceeded for 10% of the time is often used to describe road traffic noise.*
- L_{A90} *The level exceeded for 90% of the time is normally used to describe background noise.*

Sound Transmission Descriptors

- D_{nT} Standardised level difference
- $D_{nT, w}$ Weighted standardised level difference
- L_1 The average sound pressure level in the source room
- L_2 The average sound pressure level in the receiving room
- T Reverberation time (receiving room)
- T_0 Reference reverberation time = 0.5s
- C_{tr} Adaption spectrum which takes account for low to medium speed road/rail/air traffic; disco music; and factory noise (medium to low frequency noise).
- C Adaptation spectrum which takes account of domestic activities including speech, music, radio and television.



Frequency Analysis

Octave Band	<i>A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000 Hz...</i>
One Third Octave	<i>The logarithmic frequency interval between a lower frequency f_2, when f_2/f_1 equals $2^{1/3}$ apart. Frequencies include: 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000Hz.</i>

Sound Transmission in the Open Air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law.

In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB. Road traffic noise is a notable exception to this rule, as it approximates to a line source, which is represented by the line of the road. The sound energy radiated is inversely proportional to the area of a cylinder centred on the line. In decibel terms, every time the distance from a line source is doubled, the sound pressure level is reduced by 3 dB.

Factors Affecting Sound Transmission in the Open Air

Reflection

When sound waves encounter a hard surface, such as concrete, brickwork, glass, timber or plasterboard, it is reflected from it. As a result, the sound pressure level measured immediately in front of a building façade is approximately 3 dB higher than it would be in the absence of the façade.

Screening and Diffraction

If a solid screen is introduced between a source and receiver, interrupting the sound path, a reduction in sound level is experienced. This reduction is limited, however, by diffraction of the sound energy at the edges of the screen. Screens can provide valuable noise attenuation however. For example, a timber boarded fence built next to a motorway can reduce noise levels on the land beyond, typically by around 10 dB(A). The best results are obtained when a screen is situated close to the source or close to the receiver.

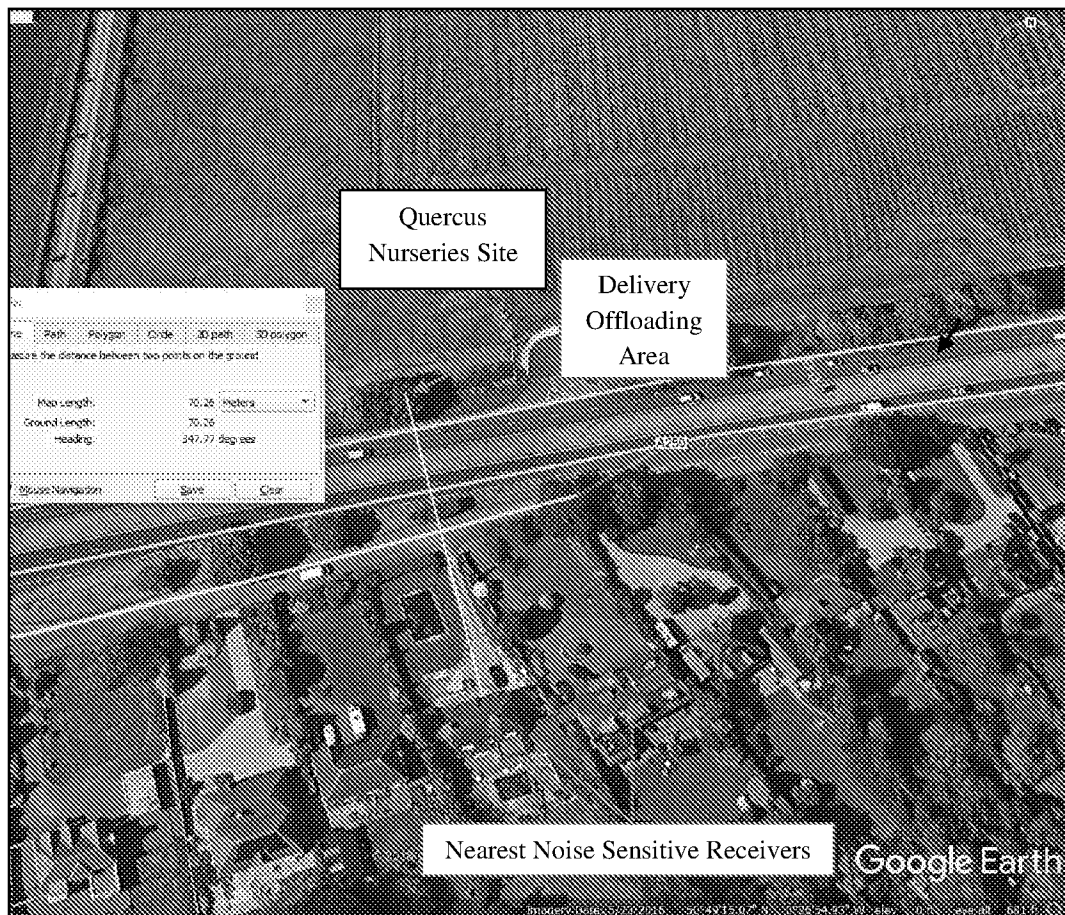


Meteorological Effects

Temperature and wind gradients affect noise transmission, especially over large distances. The wind effects range from increasing the level by typically 2 dB downwind, to reducing it by typically 10 dB upwind – or even more in extreme conditions. Temperature and wind gradient are variable and difficult to predict.

APPENDIX 2

Site Location/Plans

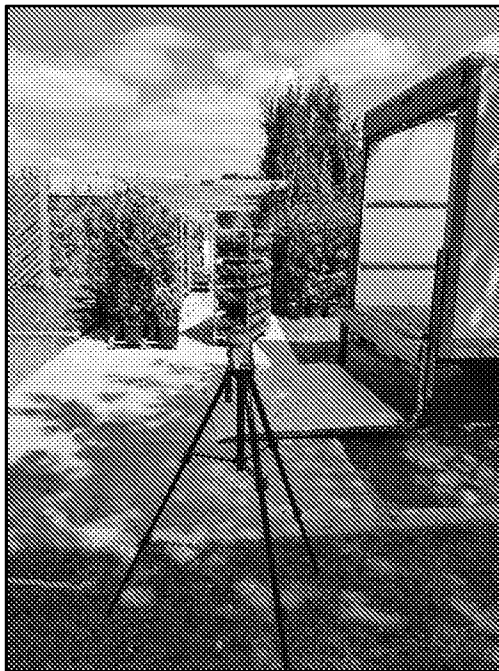


APPENDIX 3

Site Photographs

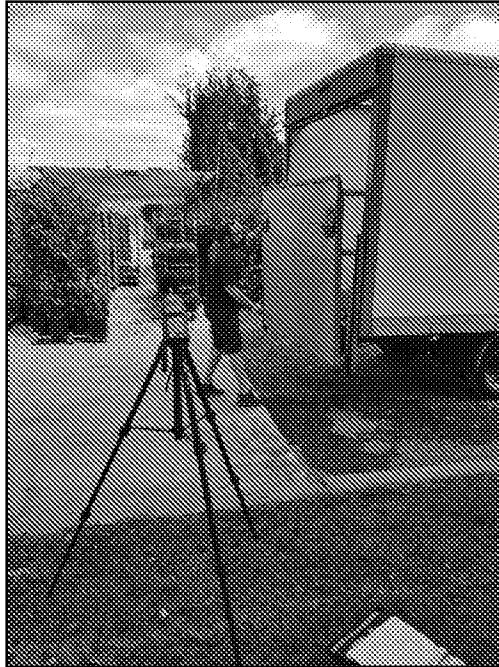


Unloading Measurements

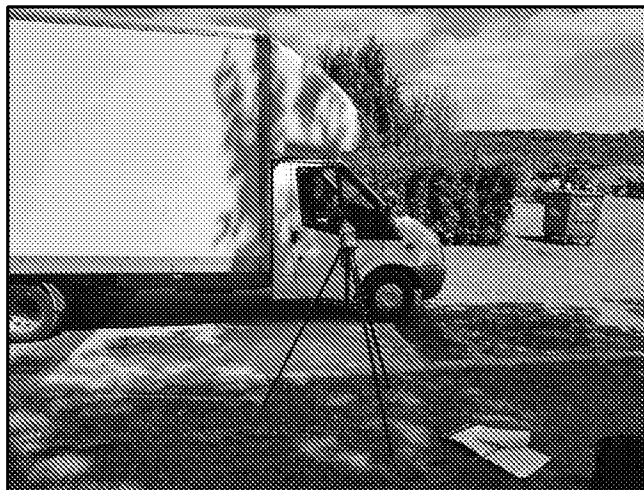


Unloading Measurements

Site Photographs

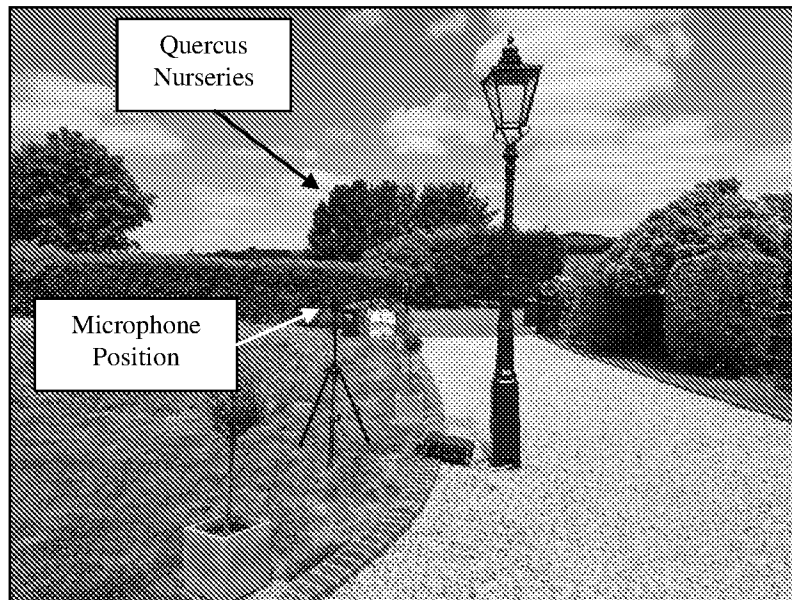


Unloading Measurements



Unloading Measurements

Site Photographs



Microphone Position - Noise Sensitive Receiver⁹



Microphone Position - Noise Sensitive Receiver

⁹ 144 Littlehampton Road (48 hour measurements)



APPENDIX 4

48 Hour Noise Measurements (NSR)

144 Littlehampton Road

Date	Time	L _{Aeq}	L _{AFmax}	L _{AFmin}	L _{AF50}	L _{AF90}	Delivery
10/7/2018	12:15	58.7	74.1	48.4	58.3	54.6	
10/7/2018	12:30	58.5	76.4	47.4	58.1	55.3	
10/7/2018	12:45	58.7	74.5	47.8	57.8	54.1	
10/7/2018	13:00	58.1	66.4	45.2	57.8	54	
10/7/2018	13:15	58.3	71.9	46.2	57.8	54.2	
10/7/2018	13:30	58.2	69.3	50.1	57.8	54.4	
10/7/2018	13:45	59.5	78.1	47.2	58.5	55.2	
10/7/2018	14:00	58.7	69.2	48.5	58.3	55	
10/7/2018	14:15	58.1	66.9	49.1	57.6	54.1	
10/7/2018	14:30	58.8	68.9	50.5	58.3	55.3	
10/7/2018	14:45	58.9	72.9	48	58.1	54.5	
10/7/2018	15:00	58.6	69.3	46.4	57.9	54.2	
10/7/2018	15:15	58.2	68.3	48.5	57.8	54.8	
10/7/2018	15:30	59	70	48.1	58.7	55.1	
10/7/2018	15:45	60.1	82.7	44.9	58.3	55.1	
10/7/2018	16:00	60.7	83.9	46	58.7	55.9	
10/7/2018	16:15	59.3	67.6	47	58.9	55.8	
10/7/2018	16:30	59.9	81.6	50.3	58.5	55.5	
10/7/2018	16:45	58.6	70.4	49	58	55	
10/7/2018	17:00	58.6	68	47.4	58.2	55.2	
10/7/2018	17:15	58.6	67.5	48	58.4	54.7	
10/7/2018	17:30	58.8	66.6	49.7	58.5	55.7	
10/7/2018	17:45	61	87.5	49.4	58	54.3	
10/7/2018	18:00	58.4	70.1	49.3	58	54.5	
10/7/2018	18:15	58.4	73.4	47.9	57.9	55	
10/7/2018	18:30	58.6	70.2	43.8	58	54.2	
10/7/2018	18:45	58.2	73	49.1	57.8	54.3	
10/7/2018	19:00	57.9	73.1	48.1	57	53.1	
10/7/2018	19:15	57.6	66.9	47.8	57.2	53.5	
10/7/2018	19:30	57.4	68.1	44.8	56.8	51.3	
10/7/2018	19:45	57.2	63.6	42.5	56.8	52.1	
10/7/2018	20:00	57.3	76.2	45.6	56.4	51.4	
10/7/2018	20:15	57	68.8	45.5	56.1	51.2	



soundplanning

10/7/2018	20:30	56.7	68.1	46.5	55.6	51.2	
10/7/2018	20:45	56.1	64.5	41.5	55.1	48.1	
10/7/2018	21:00	56.7	68.2	42.9	55.5	49.9	
10/7/2018	21:15	57	68.2	44.8	55.9	50.5	
10/7/2018	21:30	55.9	67.6	44.3	55.1	49.2	
10/7/2018	21:45	56	72.4	40.1	54	46.5	
10/7/2018	22:00	55.3	68.4	41.5	54.1	47.4	
10/7/2018	22:15	54.4	68.5	36.3	52.2	44.2	
10/7/2018	22:30	53.7	67	34.8	50.5	40.1	
10/7/2018	22:45	52.3	67.3	35.2	47.8	39.8	
10/7/2018	23:00	52.6	67.4	38.9	49.9	44	
10/7/2018	23:15	52	62.5	31.5	47.6	37.7	
10/7/2018	23:30	51.5	68	34.7	47.1	38.9	
10/7/2018	23:45	49.9	62	29.7	43.1	34.5	
11/7/2018	0:00	50	64.1	29.3	43.3	34.1	
11/7/2018	0:15	50	66.8	28.3	43.9	34.7	
11/7/2018	0:30	48.4	60.5	28.5	40	32.2	
11/7/2018	0:45	46.1	61.8	27.5	35	29.7	
11/7/2018	1:00	44.8	63.5	23.8	33.1	27	
11/7/2018	1:15	42.6	63	23.8	30.3	26	
11/7/2018	1:30	46.8	60.6	24.2	37.2	29.8	
11/7/2018	1:45	42.8	60.4	22.7	29.9	25.1	
11/7/2018	2:00	44	65.6	22.1	29.2	24.6	
11/7/2018	2:15	40.5	56.8	22.5	29.4	25.5	
11/7/2018	2:30	45.2	61.5	23.5	32.8	25.2	
11/7/2018	2:45	43.1	61.6	25.7	34.3	29.3	
11/7/2018	3:00	42.1	61	25.6	34	29.1	
11/7/2018	3:15	45.4	63.7	27	34.6	30	
11/7/2018	3:30	44.9	62.6	24.6	34.3	27.1	
11/7/2018	3:45	43	57.7	21.8	29.2	23.9	
11/7/2018	4:00	45.9	62.2	22.8	36.2	26.6	
11/7/2018	4:15	48.2	65.2	24.5	39.5	28.6	
11/7/2018	4:30	49.8	64.2	24.5	43.1	33.1	
11/7/2018	4:45	51.2	68.6	31.8	44.9	37.4	
11/7/2018	5:00	50.2	63.6	28.8	44.8	36	
11/7/2018	5:15	52.2	65.3	28.4	47.2	38.1	
11/7/2018	5:30	55	72.9	33.4	51.6	42.7	
11/7/2018	5:45	55.1	66.2	32.8	52.5	43.8	5 Trolleys
11/7/2018	6:00	55.3	68.9	36.5	54.1	45.8	
11/7/2018	6:15	56.5	65.5	39	55.4	46.9	
11/7/2018	6:30	58.3	67.7	43.9	57.6	51.2	
11/7/2018	6:45	59.1	68.4	49.9	58.8	54.6	



soundplanning

11/7/2018	7:00	59.7	66.3	47.3	59.3	54.7	
11/7/2018	7:15	60.5	75	49.5	60	56.5	
11/7/2018	7:30	62.7	85	52.9	60.5	57.6	
11/7/2018	7:45	60.7	72.1	51.1	60.4	57.3	
11/7/2018	8:00	62.8	84.2	52.3	60.2	57.3	
11/7/2018	8:15	59.8	69.4	49.2	59.4	56.1	
11/7/2018	8:30	59.3	68.7	45.1	59	55.4	
11/7/2018	8:45	59.4	66.3	48.3	59.1	55.4	
11/7/2018	9:00	59.2	72.3	50.3	58.8	55.6	
11/7/2018	9:15	59.8	75	44.7	59.3	55	
11/7/2018	9:30	58.5	75.3	49.2	58	55	
11/7/2018	9:45	58.8	79.8	50.3	58.2	55.3	
11/7/2018	10:00	58.1	65.1	48.4	57.9	54	
11/7/2018	10:15	59	72.3	47.8	58.5	55	
11/7/2018	10:30	58.6	68.8	48.6	58.2	55.4	
11/7/2018	10:45	58.5	65.6	44.4	58.3	54.7	
11/7/2018	11:00	58.4	66.9	47	58	54.1	
11/7/2018	11:15	57.4	69.2	45.5	56.8	53.5	
11/7/2018	11:30	57.8	68.9	49	57.4	54.6	
11/7/2018	11:45	57.9	66.8	47.1	57.5	54.4	
11/7/2018	12:00	57.2	69.6	42.8	56.7	53.4	
11/7/2018	12:15	57.5	70.3	49.3	56.8	53.8	
11/7/2018	12:30	57.1	68.9	44	56.5	53.5	
11/7/2018	12:45	58.4	76.9	47.8	57	53.6	
11/7/2018	13:00	58.6	73.3	50.4	57.9	54.9	
11/7/2018	13:15	57.6	69.5	50	57.3	54.6	
11/7/2018	13:30	58	65.8	47.5	57.6	54.8	
11/7/2018	13:45	57.8	73.1	48.8	57.5	54.9	
11/7/2018	14:00	57.8	67.7	49.8	57.5	54.9	
11/7/2018	14:15	58	74.7	49	57.1	54.2	
11/7/2018	14:30	57.4	69.7	48	56.9	54.3	
11/7/2018	14:45	57.4	77.5	47.4	56.4	53	
11/7/2018	15:00	57.2	69.2	45.4	56.6	53.5	
11/7/2018	15:15	57.4	68.5	49.3	56.9	54	
11/7/2018	15:30	58.8	83.5	47.5	57.1	54.6	
11/7/2018	15:45	57	64.5	46.9	56.6	53.1	
11/7/2018	16:00	57.7	70.1	46.5	57.4	53.9	
11/7/2018	16:15	58	73.3	47.9	57.4	54.2	
11/7/2018	16:30	58.5	79.5	47.4	57.6	54.4	
11/7/2018	16:45	58.6	80.2	47.6	57.6	54.7	
11/7/2018	17:00	57.9	69.5	47	57.4	54.4	
11/7/2018	17:15	58.2	70	47.7	57.7	54.3	



soundplanning

11/7/2018	17:30	58.4	67.6	49.9	58.1	55.3	
11/7/2018	17:45	58.1	71.1	48.8	57.3	54.3	
11/7/2018	18:00	59	76.5	48.5	58.2	55	
11/7/2018	18:15	58.8	70.5	50.1	58.3	55.5	
11/7/2018	18:30	57.3	69.6	46.1	56.8	52.5	
11/7/2018	18:45	60.8	76.6	42.7	57.3	52.4	
11/7/2018	19:00	56.2	65.7	44	55.6	50.3	
11/7/2018	19:15	55.4	63.8	44.4	54.3	49	
11/7/2018	19:30	54.5	65.2	37	53.2	46.4	
11/7/2018	19:45	55.2	67.2	39.2	53.8	47.3	
11/7/2018	20:00	56.1	77.9	39.6	53.6	47	
11/7/2018	20:15	54.2	67.5	37.8	51.9	44	
11/7/2018	20:30	53.1	61.9	36.5	50.9	43.5	
11/7/2018	20:45	53.4	64.3	35.4	50.7	42.1	
11/7/2018	21:00	54.1	66	37	52.1	42.8	
11/7/2018	21:15	52.2	63.1	32	48.8	40.6	
11/7/2018	21:30	53.6	64.3	32.6	50.6	42.5	
11/7/2018	21:45	58.1	68.5	47.7	57.7	53.5	
11/7/2018	22:00	59.8	82.1	47.2	56.7	51.5	
11/7/2018	22:15	56.3	72.1	43.3	54.7	48.4	
11/7/2018	22:30	54.3	62.6	38.2	52.7	45.5	
11/7/2018	22:45	54.1	74	37.3	51	44.4	
11/7/2018	23:00	53.4	66	35.7	50.9	43.9	
11/7/2018	23:15	52.2	63	31.9	48.9	41.3	
11/7/2018	23:30	51.6	62.7	32.2	47.6	40	
11/7/2018	23:45	50.1	66.1	27.5	45.2	37.8	
12/7/2018	0:00	49.3	64.2	25.9	41.4	29.8	
12/7/2018	0:15	48.9	61.2	31.2	43	36.2	
12/7/2018	0:30	48.2	61.5	26.5	42.6	34.6	
12/7/2018	0:45	47.9	62	26.8	42	35.5	
12/7/2018	1:00	47.9	62.4	31.6	42.1	36.1	
12/7/2018	1:15	46.4	60.5	26.4	40.1	31.4	
12/7/2018	1:30	47.1	62.2	25.7	39	30.8	
12/7/2018	1:45	44.7	60.3	24.1	35.1	29.4	
12/7/2018	2:00	46.6	70	23.9	36.9	30.2	
12/7/2018	2:15	45.1	61.4	26.6	37.6	31.6	
12/7/2018	2:30	46.5	63.8	23.7	39.2	26.9	
12/7/2018	2:45	45.9	64.4	25.9	37.4	29.2	
12/7/2018	3:00	43.4	63.7	21.8	31.1	24.2	
12/7/2018	3:15	47	65.9	21.6	39.4	26.7	
12/7/2018	3:30	53.4	77.5	20.9	40.6	29.2	
12/7/2018	3:45	43.8	60.6	21.2	32.5	23	



soundplanning

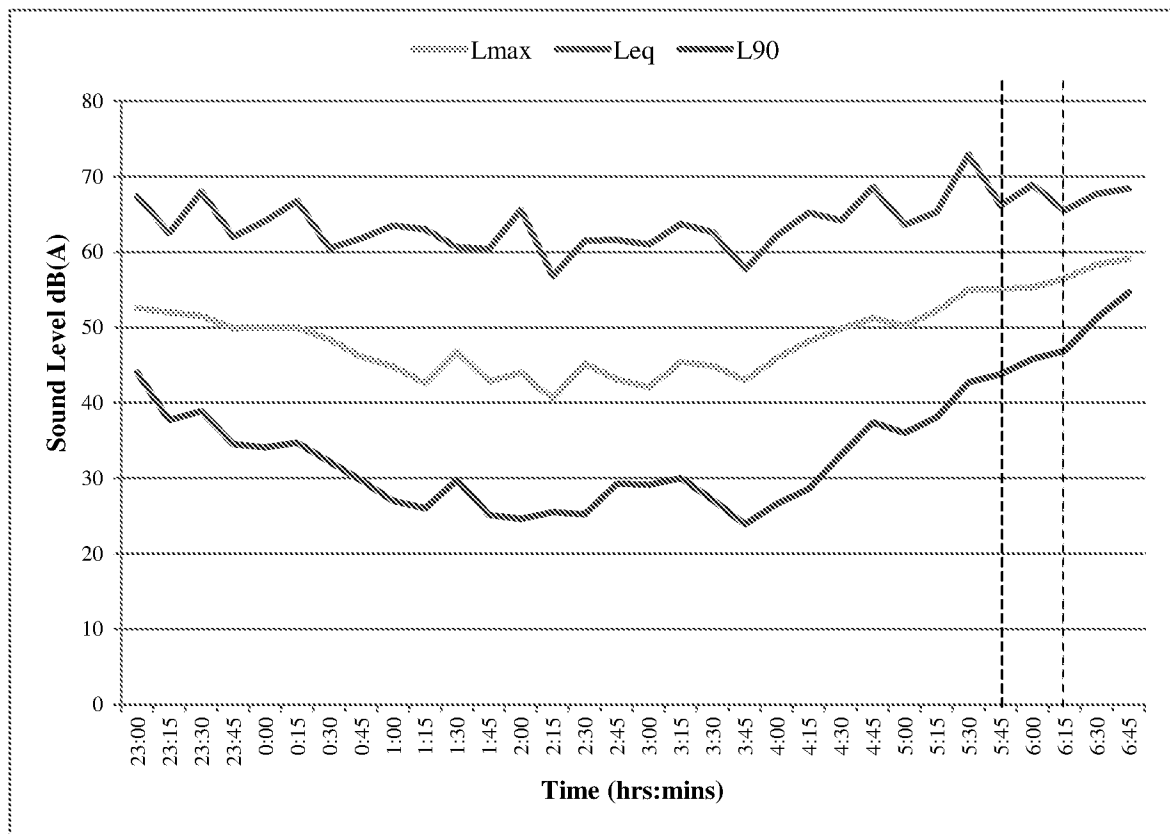
12/7/2018	4:00	45.2	61.7	25	38.9	31.6	
12/7/2018	4:15	48.8	60.8	24.1	43.7	34.4	
12/7/2018	4:30	50.2	76.5	33.2	44.7	38	2 trollies
12/7/2018	4:45	49.8	64.1	28.2	44.2	33.9	
12/7/2018	5:00	51.7	62.9	31.1	47.6	41.1	
12/7/2018	5:15	52.6	62.5	32.3	49.1	40.6	
12/7/2018	5:30	54.8	63.7	36	51.8	44.8	
12/7/2018	5:45	55.5	64.9	40.1	54.1	47	
12/7/2018	6:00	55.8	64.6	36.8	54.2	46.4	
12/7/2018	6:15	56.9	67.3	38.8	55.8	47.8	
12/7/2018	6:30	58.4	71.3	40	57.7	51.1	
12/7/2018	6:45	59.3	67.6	49.7	58.8	55.2	
12/7/2018	7:00	59.2	68.7	48.4	58.8	54.7	
12/7/2018	7:15	60	65.3	51.2	59.7	56.8	
12/7/2018	7:30	59.9	69.1	49	59.6	56.6	
12/7/2018	7:45	59.7	67.4	47.7	59.5	56.3	
12/7/2018	8:00	59.3	67.4	47.2	59.2	56.1	
12/7/2018	8:15	59	69.4	47.3	58.7	54.9	
12/7/2018	8:30	58.2	65.3	45.5	57.9	54.5	
12/7/2018	8:45	58.4	70.2	44.2	57.8	54.2	
12/7/2018	9:00	58.3	69.5	48.6	57.9	54.6	
12/7/2018	9:15	58.2	70.6	48.8	57.7	54.9	
12/7/2018	9:30	57.3	65.4	45.5	56.9	52.8	
12/7/2018	9:45	59.3	85.3	47.5	57.9	54.7	
12/7/2018	10:00	60.1	87.6	44.9	57	53.8	
12/7/2018	10:15	57.3	66.2	45.9	56.8	53.6	
12/7/2018	10:30	57.1	66.1	47.5	56.6	53.7	
12/7/2018	10:45	58	76.1	43.7	57.1	54.2	
12/7/2018	11:00	57.1	68.2	44.7	56.4	53.3	
12/7/2018	11:15	57.3	67.6	48.2	56.8	54.1	
12/7/2018	11:30	57.5	68.3	44	56.7	53.5	
12/7/2018	11:45	57	67.4	48.2	56.5	53.5	
12/7/2018	12:00	56.8	65	45.3	56.3	53.1	
12/7/2018	12:15	57	74.6	48.4	56.4	53.6	



48 Hour Noise Measurements

**144 Littlehampton Road
- Graph**

Night 1



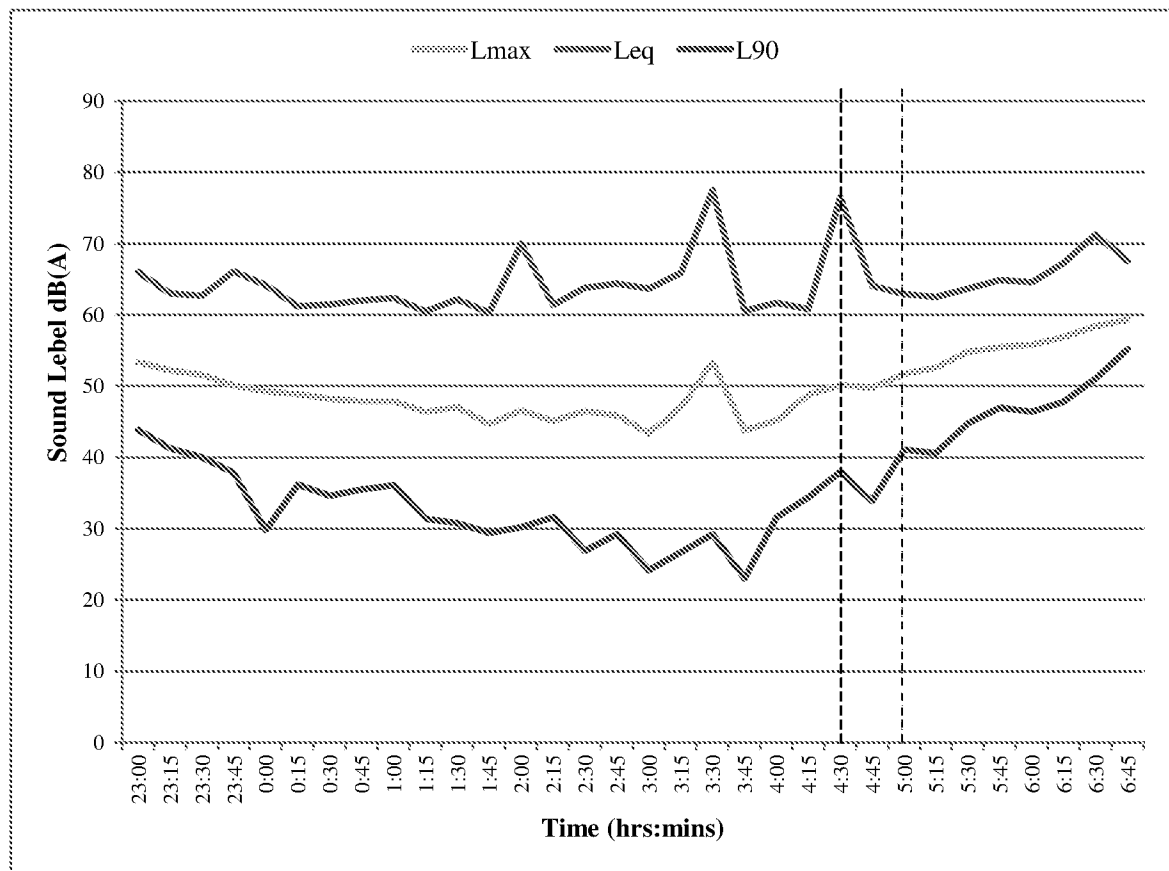
Key:

----- Delivery Time Period

48 Hour Noise Measurements

*144 Littlehampton Road
- Graph*

Night 2



Key:

----- Delivery Time Period



APPENDIX 5

Delivery Noise Measurements

Near Field (3.5m)

Period 1

Hz	dB	dB	dB	dB	dB	dB
Band	L _{Fmax}	L _{Fmin}	L _{eq}	L _{F10}	L _{F50}	L _{F90}
Z	89.6	68.8	78.4	81.5	76.5	72
C	83.6	66.4	74.6	77	73.5	69.5
A	74.9	58.2	66.3	69	66	59.5
12	77.9	41.1	64.6	67.5	56.5	50
16	82.3	42.7	65.2	67.5	58.5	51.5
20	77.4	45.9	63.3	67	59	53
25	75.2	48.4	67.2	70	66.5	58
32	78.3	50.1	68.9	71	68.5	61
40	80.6	48.3	65.2	66.5	59.5	54
50	76.9	49.1	65	68	62	55
63	72.8	53.2	64.1	67	63	58.5
80	81.6	50.2	66.4	69.5	61.5	55.5
100	73.5	47.7	61	63.5	58.5	53.5
125	75.4	47.2	62.2	64.5	59.5	53.5
160	72.4	47.7	60.7	63.5	58	52.5
200	66.3	45.8	57.8	61.5	56.5	49.5
250	67.6	44.7	58.4	62	57	49.5
315	63.8	44.1	56	59.5	55	48.5
400	63.4	42.6	54.1	57	53	46.5
500	63.5	44.5	54.8	57.5	53.5	47.5
630	65.6	45.4	55.4	58.5	54	48
800	68.6	47.2	57.3	60.5	56.5	49.5
1k	65.7	48.7	59.5	62.5	59	51.5
1k25	68.2	48.7	58.5	61.5	58	51
1k6	64.6	47	55.4	58.5	54.5	49.5
2k	65.8	45.5	54	56.5	52.5	48
2k5	63.1	44.3	51.7	54	50	46
3k15	60.7	41.2	49.7	53.5	47	43
4k	60.8	39	47.8	50.5	44.5	41.5
5k	57.2	36	45.3	49.5	41.5	38.5
6k3	58.3	32.8	43.2	48	38.5	35.5
8k	56.2	29.4	39.9	42.5	36	32.5
10k	56.6	24.7	36.8	39.5	31	27.5
12k5	51.2	19.2	32	34	26.5	22.5
16k	51	14.8	28	29	21.5	17
20k	48	11.2	23.6	23.5	16	12.5



Delivery Noise Measurements

Near Field (3.5m)

Period 2

Hz	dB	dB	dB	dB	dB	dB
Band	L _{Fmax}	L _{Fmin}	L _{eq}	L _{F10}	L _{F50}	L _{F90}
Z	87.5	69.7	77.7	80.5	76.5	73.5
C	87	67.3	74.3	76.5	73.5	71
A	77.2	60	67.2	70.5	66	62
12	76.1	37.6	63.4	68	57	48.5
16	74.4	42.7	61.5	65	57	50.5
20	73.1	43.8	61.9	66	58	52
25	75.5	56.8	67.7	70	67	63
32	73.2	60.6	69.2	71.5	69	65
40	68.7	49	60.1	63.5	58.5	54
50	76.6	54	64.4	67.5	63	58.5
63	71.8	55.1	63.6	66.5	62.5	59
80	78.9	50.8	63.9	66.5	61	56.5
100	84.8	49.7	63.3	63	59.5	55
125	77.8	50.2	60.8	63	59	55
160	72.8	49.7	59.7	62	58	53
200	71.8	46.2	58.7	62	57	51
250	70.3	45.8	59.7	63.5	57.5	51
315	74.7	47.5	59.1	62	56	51
400	69	45.6	56	59	54	49
500	68.2	46	56.3	59.5	54	49.5
630	69.2	47.8	56.9	60.5	55	50.5
800	71.4	49.5	58.8	62	57	52.5
1k	68.3	51.9	60.3	63.5	59	54.5
1k25	73.6	50.5	58.7	61.5	57	53
1k6	66.7	48.2	55.3	58	54	51
2k	64.9	46.6	53.7	56.5	52	49.5
2k5	62.3	45.4	51.8	54.5	50.5	47.5
3k15	60.7	42.7	50	53	48.5	45.5
4k	65.7	41.5	50.1	52.5	47	43.5
5k	71.4	38.4	52.5	52.5	45	40.5
6k3	60.7	35.4	46.4	50.5	42	37.5
8k	63.3	32.6	44.3	47	39	34.5
10k	60.4	27	43.1	45.5	36	29
12k5	61	22.5	38.8	39.5	31	25
16k	52.5	17	33.7	35.5	25.5	19.5
20k	49.7	12.1	28.9	29.5	19.5	14



Delivery Noise Measurements

Near Field (3.5m)

Residual

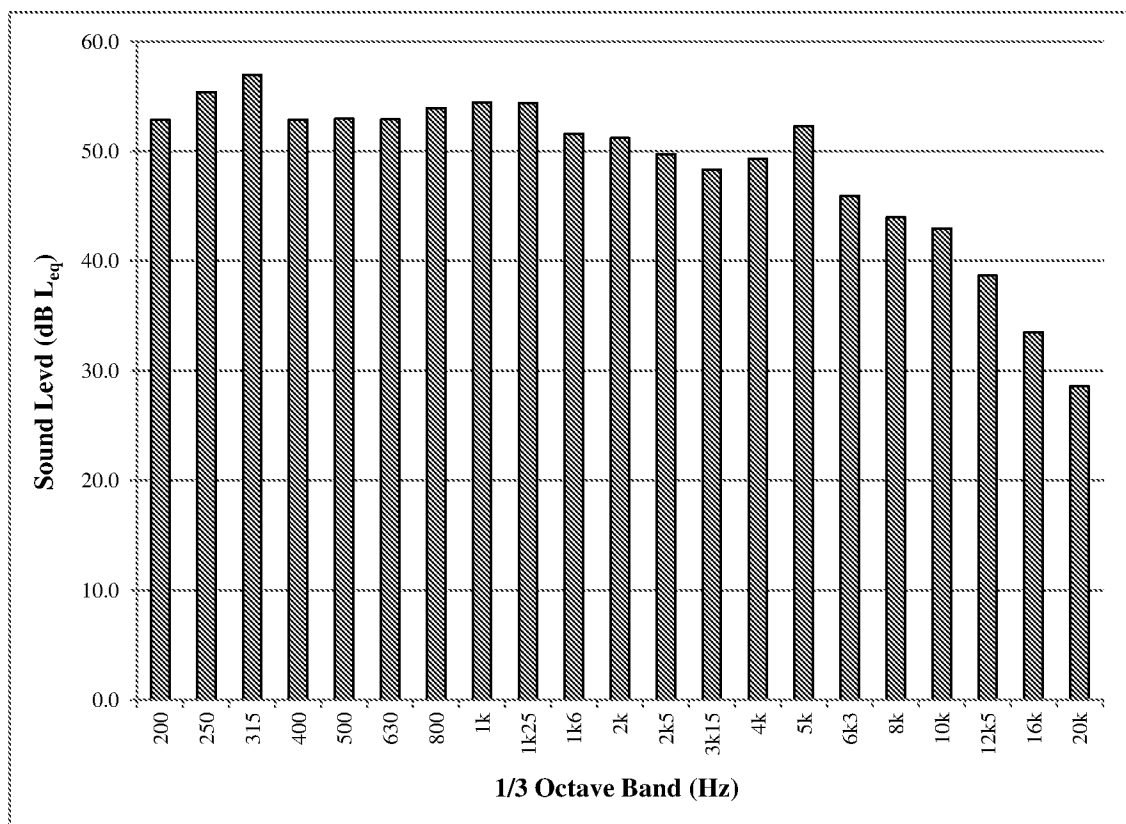
Hz	dB	dB	dB	dB	dB	dB
Band	L _{Fmax}	L _{Fmin}	L _{eq}	L _{F10}	L _{F50}	L _{F90}
Z	94.2	62	79	82.5	75.5	70.5
C	84.6	60.9	72.7	75.5	71.5	67
A	72.2	52.6	64.8	68	64	57.5
12	90.2	34.9	69.2	72	61	49
16	86.4	37.5	67.8	71	60.5	51
20	81.8	39.3	66	70	60.5	53
25	81.1	41	64.5	67.5	60	53.5
32	77.8	42.2	62.6	66	59	53.5
40	78.3	44.1	62.5	65.5	59	53.5
50	79.3	46.1	63.5	67	60	55
63	75.3	47.1	63.1	66	60.5	55.5
80	76.4	46.4	62.3	65.5	60	54.5
100	76.1	44.5	60.6	63.5	58.5	52
125	81.7	42.2	62	62.5	57.5	51
160	68.1	40.8	57.5	60.5	56.5	49
200	66	40.1	57.4	60.5	56	48.5
250	68	40.1	57.7	61.5	56	47
315	68.7	38.6	55	58.5	53.5	44.5
400	68.1	37	53.1	56.5	51	43.5
500	67.5	39	53.6	57	51.5	44.5
630	70.9	39.7	54.7	57.5	52.5	45.5
800	67	42.1	57.1	60.5	55.5	48.5
1k	66.4	45.4	59	62.5	58	51
1k25	65.2	43.7	56.7	60	55.5	49.5
1k6	62.1	42.3	52.9	55.5	52	47
2k	63.4	39.8	50.1	52.5	49	44.5
2k5	62.5	36.5	47.6	50	46.5	41.5
3k15	61.1	32.9	45	47.5	43.5	39
4k	58.6	29.6	42.2	44.5	40.5	36
5k	57.4	25.4	39.5	41.5	37.5	33.5
6k3	50.9	22.2	36.5	38.5	34.5	29.5
8k	48	19.2	32.8	35	31	25.5
10k	43.8	16	28.4	30.5	26.5	21
12k5	39.2	14.5	23.9	26.5	21.5	17
16k	32.3	13.5	20	23.5	17.5	15
20k	30	10.6	17.4	21.5	12.5	11.5



Delivery Noise Measurements

Near Field (3.5m)

Specific Delivery Sound Level Frequency Analysis



APPENDIX 6

Meteorological Reports¹⁰

Weather History for Brighton, [IBRIGHT06]

 Previous Daily Mode July 10 2018 

Summary July 10, 2018

	High	Low	Average		High	Low	Average
Temperature	25.6 °C	15.5 °C	20.5 °C	Wind Speed	17 km/h	--	5 km/h
Dew Point	17.8 °C	10.7 °C	14 °C	Wind Gust	28 km/h	--	--
Humidity	55%	45%	71%	Wind Direction	--	--	ENE
Precipitation	0 mm	--	--	Pressure	1025 hPa	1023 hPa	--

Weather History for Brighton, [IBRIGHT06]

 Previous Daily Mode July 11 2018 

Summary July 11, 2018

	High	Low	Average		High	Low	Average
Temperature	27.6 °C	14 °C	20.7 °C	Wind Speed	11 km/h	--	3 km/h
Dew Point	18.6 °C	13.8 °C	15.3 °C	Wind Gust	16 km/h	--	--
Humidity	99%	51%	82%	Wind Direction	--	--	ENE
Precipitation	0 mm	--	--	Pressure	1023 hPa	1021 hPa	--

Weather History for Brighton, [IBRIGHT06]

 Previous Daily Mode July 12 2018 

Summary July 12, 2018

	High	Low	Average		High	Low	Average
Temperature	27.2 °C	14.2 °C	20.7 °C	Wind Speed	9 km/h	--	2 km/h
Dew Point	20.2 °C	14.1 °C	17.1 °C	Wind Gust	16 km/h	--	--
Humidity	99%	55%	85%	Wind Direction	--	--	East
Precipitation	0 mm	--	--	Pressure	1023 hPa	1022 hPa	--

¹⁰ Source: Wunderground.com



Meteorological Reports¹¹

Key Periods

11 July 2018

5:51 - 06:01

Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate	Precip. Amount
5:04 AM	14.1 °C	13.2 °C	99 %	NE	6.1 kph	8.7 kph	1022.5 hPa	0 mm	0 mm
5:09 AM	14.1 °C	13.3 °C	99 %	SSE	2.8 kph	5 kph	1022.8 hPa	0 mm	0 mm
5:14 AM	14.1 °C	13.9 °C	99 %	East	3.5 kph	7.2 kph	1022.5 hPa	0 mm	0 mm
5:19 AM	14.2 °C	14.1 °C	99 %	ESE	7.2 kph	11.1 kph	1022.8 hPa	0 mm	0 mm
5:24 AM	14.2 °C	14.1 °C	99 %	North	3.5 kph	5 kph	1022.5 hPa	0 mm	0 mm
5:29 AM	14.2 °C	14.1 °C	99 %	NW	5 kph	7.2 kph	1022.8 hPa	0 mm	0 mm
5:34 AM	14.3 °C	14.2 °C	99 %	NW	5 kph	11.1 kph	1023 hPa	0 mm	0 mm
5:39 AM	14.4 °C	14.2 °C	99 %	East	6.1 kph	9.7 kph	1023 hPa	0 mm	0 mm
5:44 AM	14.4 °C	14.2 °C	99 %	North	3.5 kph	5 kph	1023 hPa	0 mm	0 mm
5:49 AM	14.4 °C	14.2 °C	99 %	NNE	2.8 kph	5.1 kph	1023 hPa	0 mm	0 mm
5:54 AM	14.4 °C	14.2 °C	99 %	NW	2.8 kph	6.1 kph	1023.1 hPa	0 mm	0 mm
5:59 AM	14.4 °C	14.2 °C	99 %	North	2.8 kph	3.5 kph	1023 hPa	0 mm	0 mm
6:04 AM	14.5 °C	14.3 °C	99 %	NE	2.8 kph	5 kph	1023 hPa	0 mm	0 mm
6:09 AM	14.6 °C	14.4 °C	99 %	East	3.5 kph	5 kph	1023 hPa	0 mm	0 mm

¹¹ Source: Wunderground.com



Meteorological Reports¹²

Key Periods

12 July 2018

04:38 - 04:47

4:23 AM	14.6 °C	14.7 °C	89 %	SE	1.1 mph	2.6 mph	1021.6 hPa	0 mm	0 mm
4:26 AM	14.6 °C	14.7 °C	89 %	East	2.6 mph	5 mph	1021.7 hPa	0 mm	0 mm
4:34 AM	14.7 °C	14.6 °C	89 %	ENE	2.6 mph	5 mph	1021.6 hPa	0 mm	0 mm
4:39 AM	14.7 °C	14.6 °C	89 %	East	1.1 mph	3.5 mph	1021.7 hPa	0 mm	0 mm
Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate	Precip. Accum.
4:46 AM	14.7 °C	14.6 °C	89 %	East	2.6 mph	5 mph	1021.7 hPa	0 mm	0 mm
4:49 AM	14.6 °C	14.6 °C	89 %	East	2.6 mph	5 mph	1021.7 hPa	0 mm	0 mm
4:54 AM	14.6 °C	14.6 °C	89 %	East	3.5 mph	6.1 mph	1021.8 hPa	0 mm	0 mm
4:58 AM	14.5 °C	14.3 °C	88 %	NEE	5 mph	8.7 mph	1021.8 hPa	0 mm	0 mm
5:04 AM	14.5 °C	14.3 °C	88 %	NE	6.1 mph	9.7 mph	1021.8 hPa	0 mm	0 mm

¹² Source: Wunderground.com