Proposed Residential Development (Phase 1 & 2)
Land North of B4265
Boverton
Vale of Glamorgan

Environmental Noise Survey
3309/ENS1_Rev1

8th April 2015

For: **Mr David Lloyd**

Barratt Homes, South Wales Division
Oak House, Village Way
Tongwynlais
Cardiff
CF15 7NE

Email: david.j.lloyd@barratthomes.co.uk

Hunter Acoustics
Henstaff Court Business Centre
Llantrisant Road, Pontyclun
Cardiff CF72 8NG

Tel: 02920 891 020
Fax: 02920 891 870

Email: info@hunteracoustics.co.uk

Hunter Acoustics is the trading name of Hunter Acoustics Ltd
Registered Office: Henstaff Court Business Centre, Llantrisant Road, Cardiff CF72 8NG
Registered Number: 4587925

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1.0 Introduction

A residential development is proposed on land north of B4265, Boverton, Vale of Glamorgan.

The site is bounded by the B4265 road to the south and the Vale of Glamorgan train line to the north. Existing dwellings lie on the opposite side of the train line to the northeast of the site.

This report has been commissioned to assess existing ambient and background noise levels impinging on the site from local road traffic and rail noise. Survey results have been used for comparison with Local Authority Planning Conditions and planning guidance.

Appendix A contains graphs, tables and diagrams referenced in this report.

Appendix B explains acoustic terminology used in this report.

Appendix C contains noise maps referenced in this report.

2.0 Planning Guidance

2.1 Technical Advice Note (Wales) 11

Table 1 from Annex A of TAN 11 defines four noise exposure categories with advice as follows:

TABLE 1: NOISE EXPOSURE CATEGORIES	
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

Noise bands defining categories A-D of TAN 11 are set in terms of L_{Aeq}(16-hour) daytime, and (8-hour) night time levels for road traffic noise, free field 1.2 – 1.5m above ground level as follows;

Table 1. Recommended noise exposure categories for new dwellings near existing noise sources (ref Table 2 of TAN 11 (Wales) October 1997)					
Noise Source	**Time**	**Noise Exposure Categories**			
		A	**B**	**C**	**D**
Road Traffic	07:00-23:00	<55	55-63	63-72	>72
	23:00-07:00	<45	45-57	57-66	>66
Rail Traffic	07:00-23:00	<55	55-66	66-74	>74
	23:00-07:00	<45	45-59	59-66	>66
Air Traffic	07:00-23:00	<57	57-66	66-72	>72
	23:00-07:00	<48	48-57	57-66	>66
Mixed Sources	07:00-23:00	<55	55-63	63-72	>72
	23:00-07:00	<45	45-57	57-66	>66

Note: In addition, sites where individual noise events regularly exceed 82dB(A) L_{max}(slow), several times in any night time hour should be treated as being in NEC C, unless the L_{eq}(8 hour) already puts the site in NEC D.

In addition BS 8233:2014 states: *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values."*

Reference is therefore made to World Health Organisation (WHO) 'Guidelines for Community Noise, 1999' which states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991)".*

2.2 Typical Planning Conditions

The following typical planning conditions have been issued by a neighbouring Local Planning Authority relating to road and railway noise, based on guidance from TAN 11 quoted above.

Noise levels in the planning conditions quoted below relate to the boundary between NEC B / C in TAN 11 – i.e. additional acoustic insulation and mechanical ventilation is proposed for NEC C facades.

2.2.1 Road Noise

Prior to commencement of development a scheme shall be submitted to and approved in writing by the Local Planning Authority to provide that all habitable rooms exposed to external road noise in excess of 63 dBA L_{eq} 16 hour (free field) during the day (07.00 to 23.00 hours) or 57 dBA L_{eq} 8 hour (free field) at night (23.00 to 07.00 hours) shall be subject to sound insulation measures to ensure that all such rooms achieve an internal noise level of 40 dBA L_{eq} 16 hour during the day and 35 dBA L_{eq} 8 hour at night. The submitted scheme shall ensure that habitable rooms subject to sound insulation measures shall be able to be effectively ventilated without opening windows. No dwelling shall be occupied until the approved sound insulation and ventilation measures have been installed to that property in accordance with the approved details. The approved measures shall be retained thereafter in perpetuity.

Reason: To ensure that the amenities of future occupiers are protected.

2.2.2 Railway Noise

"Prior to commencement of development a scheme shall be submitted to and approved in writing by the Local Planning Authority to provide that all habitable rooms exposed to external railway noise in excess of 66 dBA Leq 16 hour (free field) during the day (07.00 to 23.00 hours) or 59 dBA Leq 8 hour (free field) at night (23.00 to 07.00 hours) shall be subject to sound insulation measures to ensure that all such rooms achieve an internal noise level of 40 dBA Leq 16 hour during the day and 35 dBA Leq 8 hour at night. The submitted scheme shall ensure that habitable rooms subject to sound insulation measures shall be provided with acoustically treated active ventilation units. Each ventilation unit (with air filter in position), by itself or with an integral air supply duct and cowl (or grille), shall be capable of giving variable ventilation rates ranging from –

1. *an upper rate of not less than 37 litres per second against a back pressure of 10 newtons per square metre and not less than 31 litres per second against a back pressure of 30 newtons per square metre,*

to

2. *a lower rate of between 10 and 17 litres per second against zero back pressure.*

No habitable room shall be occupied until the approved sound insulation and ventilation measures have been installed in that room. Gardens shall be designed to provide an area which is at least 50% of the garden area for sitting out where the maximum day time noise level does not exceed 55 dBA Leq 16 hour [free field].

REASON: To ensure that the amenities of future occupiers are protected."

2.2.3 Railway Vibration

The following condition is based on guidance of BS 6472 'Guide to evaluation of human exposure to vibration in buildings'.

Prior to commencement of development a scheme shall be submitted to and approved in writing by the Local Planning Authority to provide that the dwellings are designed and constructed so as to ensure that vibration dose values do not exceed 0.4m/s$^{1.75}$ between 07.00 and 23.00 hours, and 0.26m/s$^{1.75}$ between 23.00 and 07.00 hours, as calculated in accordance with BS 6472-1:2008, entitled "Guide to Evaluation of Human Exposure to Vibration in Buildings", [1Hz to 80Hz]. The dwellings shall be constructed in accordance with the approved scheme.

Reason: To ensure that the amenities of future occupiers are protected.

2.2.4 Garden Noise

Prior to the commencement of development a scheme shall be submitted to and approved in writing by the Local Planning Authority to provide that the maximum day time noise level in outdoor living areas exposed to external road or railway noise shall not exceed 55 dBA L_{eq} 16 hour [free field] in 50% of the garden area. The scheme of noise mitigation as approved shall be constructed in its entirety prior to the first occupation of any dwelling and shall be retained thereafter in perpetuity.

Reason: To ensure that the amenities of future occupiers are protected.

2.3 Planning Policy Wales / Vale of Glamorgan Adopted UDP

As well as noise impinging on the development, the Planning Policy Wales (PPW) Edition 5 document Policy Section 13.15 and the Vale of Glamorgan Council's Adopted Unitary Development Plan (UDP) HOUS 8 also include guidance on noise emissions from new developments to neighbouring environments. As a residential development, noise emissions from the developed site to the neighbouring environment would not be significant.

2.4 General Comments

- A central ventilation MVHR system designed to the latest Building Regulations Part F may be considered as an alternative to the mechanical vents quoted above – to be confirmed with Local Planning Authority/EHO.
- Garden Criterion – BS 8233:2014 states: *"It is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs to be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

  'Health effect based noise assessment methods: A review and feasibility study' (National Physics Laboratory Report CMAM 16 1998) adds: *"In addition there is no evidence that anything other than a small minority of the population exposed at such noise levels find them to be particularly onerous in the context of their daily lives."*

3.0 Environmental Noise Surveys

Note: From previous work in the area and from information provided by Network Rail, we understand normal freight usage along this line is from the Aberthaw Power Station, however maintenance on the South Wales Main Line means that freight trains are re-routed down the Vale of Glamorgan line every night for approximately 1 week in every 6 (according to Network Rail).

We have liaised with Network Rail to ensure this survey was undertaken during a period when the South Wales Main Line was closed during the night to ensure a worst case scenario in terms of night-time freight train movements.

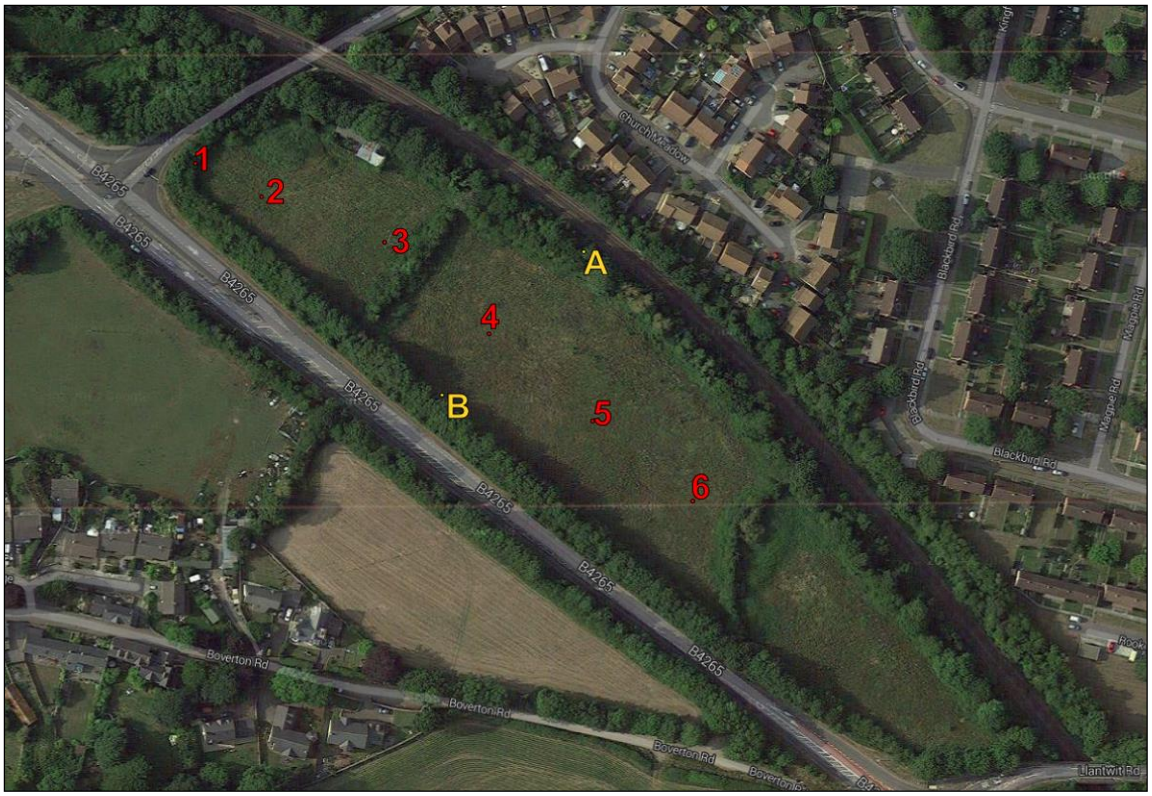
As maintenance may be carried out over several nights in any month, (averaging at around 1 week in 6), we have specified external building fabric performance requirements based on the levels measured during our survey.

3.1 Procedures – Phase 1

3.1.1 Continuous Monitoring

Continuous noise monitoring was carried out from 1300hrs on 29/01/2014 at Positions A and B. Data including L_{max}, L_{eq} and background L_{90} were logged at 5-minute intervals over the monitoring period.

3309/SP1 – Site Plan showing Monitoring Locations



Site Plan 3309/SP1 shows the development site and continuous monitoring positions used, namely:

Position A	Located on north-eastern boundary approximately 10m from rail line at 1.5m above local ground level with full line of site to rail line.
Position B	Located on south-western boundary approximately 15m from B4265 at 1.5m above local ground level with full line of sight of B4265. Local ground level is elevated approximately 4m above road height.

3.1.2 CRTN Measurements

Sample measurements were taken at Position 1 on 30/01/2014 in accordance with the shortened measurement procedures outlined in Department of Transports "Calculation of Road Traffic Noise 1988" (CRTN) over a 3-hour period to gather noise data in the north western corner of the site. Site Plan 3309/SP1 shows the sample measurement position used, namely:

Position 1	Located on north-western boundary approximately 10m from road, 1.5m above local ground level. Full line of site to road. Local ground level is elevated approximately 2m above road height.

3.1.3 Sample Measurements

Sample noise measurements were taken over 5-minute periods around the site to aid calibration of a noise map. Site Plan 3309/SP1 shows the measurement positions used, namely:

Position 2	Located approximately 15m from south western boundary
Position 3	Located approximately 30m from south western boundary
Position 4	Located approximately 30m from south western boundary
Position 5	Located approximately 30m from south western boundary
Position 6	Located approximately 30m from south western boundary

Parameters recorded include L_{max} and L_{eq} levels including 1/3-octave band L_{eq} spectra.

3.1.4 Continuous Vibration Monitoring

Continuous vibration monitoring was carried out from 1300hrs on 29/01/2014 to 1300hrs on 30/01/2014 covering rail traffic movements on the Vale of Glamorgan train line.

Vibration levels were monitored in three orthogonal axes: radial (horizontal, perpendicular to line of tracks), tangential (horizontal, parallel to line of tracks) and vertical.

Consecutive 1 minute 1/3-octave RMS acceleration spectra (arms) were recorded via the accelerometer as well as hourly VDVs at Position A;

Position A	Located at the base of concrete fence post, approximately 10 metres from closest rail line.

3.2 Procedures – Phase 2

Phase 2 of the site is now included with the planning application.

Noise surveys undertaken for Phase 1 covered source noise measurements of the B4265 however no measurements were undertaken of Llantwit Road, as this was not identified as being a significant source on the Phase 1 land.

The survey outlined below was undertaken to gather source noise data for Llantwit Road to allow our noisemap model to be updated to include the Phase 2 land.

3.2.1 CRTN Sample Measurements

Sample measurements were taken at Positions X and Y on 30/03/2015 in accordance with the shortened measurement procedures outlined in Department of Transports "Calculation of Road Traffic Noise 1988" (CRTN) over a 3-hour period to gather noise data in the south eastern corner of the site from Llantwit Road.

Site Plan 3309/SP3 shows the sample measurement position used, namely:

Position X	Located at Starling Road and Llantwit Road T-Junction approximately 7m from Llantwit Road, 1.2m above local ground level. Full line of sight to Llantwit Road. Line of sight to B4265 removed.
Position Y	Located at the entrance to land of Phase 2. Approximately 5m from Llantwit Road. 1.2m above local ground level. Partial line of sight to B4265 and full line of sight to Llantwit Road.

3309/SP3 – Site Plan showing Monitoring Locations for Phase 2

3.3 Equipment Used

The following equipment was used:

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
Norsonic AS	Type 1 - Integrating - averaging Sound Level Meter	140	1403003	16-Sep-13	U14448
Norsonic AS	Preamplifier	1209	12403	16-Sep-13	U14448
Norsonic AS	Microphone	1225	91797	16-Sep-13	11927
Norsonic AS	Calibrator (114.11dB @ 1001.90Hz)	1251	31826	16-Sep-13	U14446
Norsonic AS	Type 1 - Integrating - averaging Sound Level Meter	118	31808	28-Aug-12	U11929
Norsonic AS	Preamplifier	1206	30892	28-Aug-12	U11929
Norsonic AS	Microphone	1225	62659	28-Aug-12	11927
Norsonic AS	Calibrator (114.06dB @ 999.34Hz)	1251	24202	02-Sep-13	U14368
Larson Davis	Type 1 - Sound Level Meter	820	1334	09-May-13	20437
Larson Davis	Preamplifier	828	1960	09-May-13	20437
PCB	Microphone 1/2" Prepolarized FF	377B02	LW135480	09-May-13	20437
Svantek	Type 1 - Sound & Vibration Data Logger	SVAN 948	6962	12-Aug-13	1308348
Dytran	Tri-axial Accelerometer	3233A	158	12-Aug-13	1108348
Dytran	Cable	6483A09	-	12-Aug-13	1108346

The measurement systems were calibrated before and after the surveys, no variation occurred.

The following equipment was used for the Phase 2 survey:

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
Norsonic AS	Type 1 - Integrating - averaging Sound Level Meter	140	1403003	16-Sep-13	U14448
Norsonic AS	Preamplifier	1209	12403	16-Sep-13	U14448
Norsonic AS	Microphone	1225	91797	16-Sep-13	11927
Norsonic AS	Calibrator (114.11dB @ 1001.90Hz)	1251	31826	11-Sep-14	U17057

The measurement systems were calibrated before and after the surveys, no variation occurred.

3.4 Weather Conditions

Phase 1 & 2: Weather conditions were damp and cold with a light breeze throughout both survey periods.

4.0 Results

4.1 Continuous Monitoring

Time history graphs 3309/TH1 & TH2 show L_{max}, L_{eq} and L_{90} sound pressure levels measured over consecutive 5-minute periods at Positions A & B respectively.

The following L_{eq} 16-hour daytime and 8-hour night-time noise levels have been measured;

Position A					
Daytime	0700-2300hrs	Leq,16hr	=	52.8	NEC A
Night-time	2300-0700hrs	Leq,8hr	=	53.1	NEC B

Position B					
Daytime	0700-2300hrs	Leq,16hr	=	68.5	NEC C
Night-time	2300-0700hrs	Leq,8hr	=	60.3	NEC C

There were 2 $L_{max,F}$ events over 82dB at position A and 3 over 82dB at position B during the night-time period (2300-0700hrs).

These events were spread out across the 8 hour night-time period and therefore 'individual noise events are not exceeding 82dB(A) $L_{max(slow)}$, several times in any night-time hour' when comparing with TAN 11 L_{max} guidance, as shown in 3309/TH1 & TH2.

L_{eq} and L_{max} spectra for sprinter and freight pass-bys are shown in graphs 3309/G1 & G2 respectively.

4.2 CRTN Source Measurement

Results of the road traffic noise survey at position 1 are shown in table 3309/T1 below. The table goes on to predict the $L_{eq,16hr}$ daytime road traffic source noise level using methodology specified in CRTN and TAN 11.

3309/T1 – $L_{eq,16hr}$ Daytime Road Traffic Noise Prediction

CRTN Position 1	L_{Aeq} (dB)	L_{A10} (dB)	$L_{Amax,F}$ (dB)
1100-1200hrs	58.7	62.5	71.4
1200-1300hrs	60.3	63.6	76.6
1300-1400hrs	59.4	62.6	77.1

Mean L_{10}	62.9
**16hr L_{eq}	59.9

**Predicted in accordance with CRTN and TAN11

Typical spectra measured during CRTN measurement is shown in graph 3309/G3.

4.3 Sample Measurements

On site sample measurements were taken at positions 2-6 to aid calibration of a noise map. Results of measurements are shown in Table 3309/T2 below.

3309/T2 – Sample Measurements

Position	Time (hrs:mins)	Duration (Secs)	LAeq (dB)	LAmax,F (dB)
2	11:11	300	57.4	74.3
3	11:29	300	49.8	55.4
4	11:43	300	52.6	59.6
5	11:55	300	54.6	63.0
6	12:01	300	54.5	62.7

4.4 Continuous Vibration Monitoring

Table 3309/T3 shows hourly vibration dose values measured at Position A, together with the daytime (0700-2300hrs) and night-time (2300-0700hrs) VDV levels for comparison with criteria quoted in the typical local authority planning condition.

Graphs 3309/G4 & G5 show 1/3-octave band RMS vibration spectra for typical sprinter and freight train pass-by respectively. These include the old BS 6472:1992 curves (for information only).

For train movements the vertical axis of vibration is assessed as critical, therefore vertical VDV_b figures are assessed.

VDVs for comparison with the typical planning condition are as follows:

$VDV_{b,day(0700\text{-}2300hrs)}$ = 0.040 $m/s^{1.75}$ Limit = 0.4 $m/s^{1.75}$

$VDV_{b,night(2300\text{-}0700hrs)}$ = 0.013 $m/s^{1.75}$ Limit = 0.26 $m/s^{1.75}$

Train vibration levels are therefore within the 0.4$m/s^{1.75}$ day and 0.26$m/s^{1.75}$ night criteria discussed in section 2.2.3 of this report.

4.5 CRTN Source Measurements - Phase 2

Results of the road traffic noise survey at positions X and Y are shown in table 3309/T5 below. The table goes on to predict the $L_{eq,16hr}$ daytime road traffic source noise level using methodology specified in CRTN and TAN 11.

3309/T5 – $L_{eq,16hr}$ Daytime Road Traffic Noise Prediction

CRTN Position X	L_{Aeq} (dB)	L_{A10} (dB)	$L_{Amax,F}$ (dB)
1200-1300hrs	57.8	61.0	73.8
1300-1400hrs	58.8	62.7	76.4
1400-1500hrs	56.6	59.6	71.8

Mean L_{10}	61.1
**16hr L_{eq}	58.1

CRTN Position Y	L_{Aeq} (dB)	L_{A10} (dB)	$L_{Amax,F}$ (dB)
1200-1300hrs	62.6	66.0	80.9
1300-1400hrs	61.8	65.9	79.9
1400-1500hrs	60.7	65.6	72.8

Mean L_{10}	65.8
**16hr L_{eq}	62.8

**Predicted in accordance with CRTN and TAN11

5.0 Noise Predictions

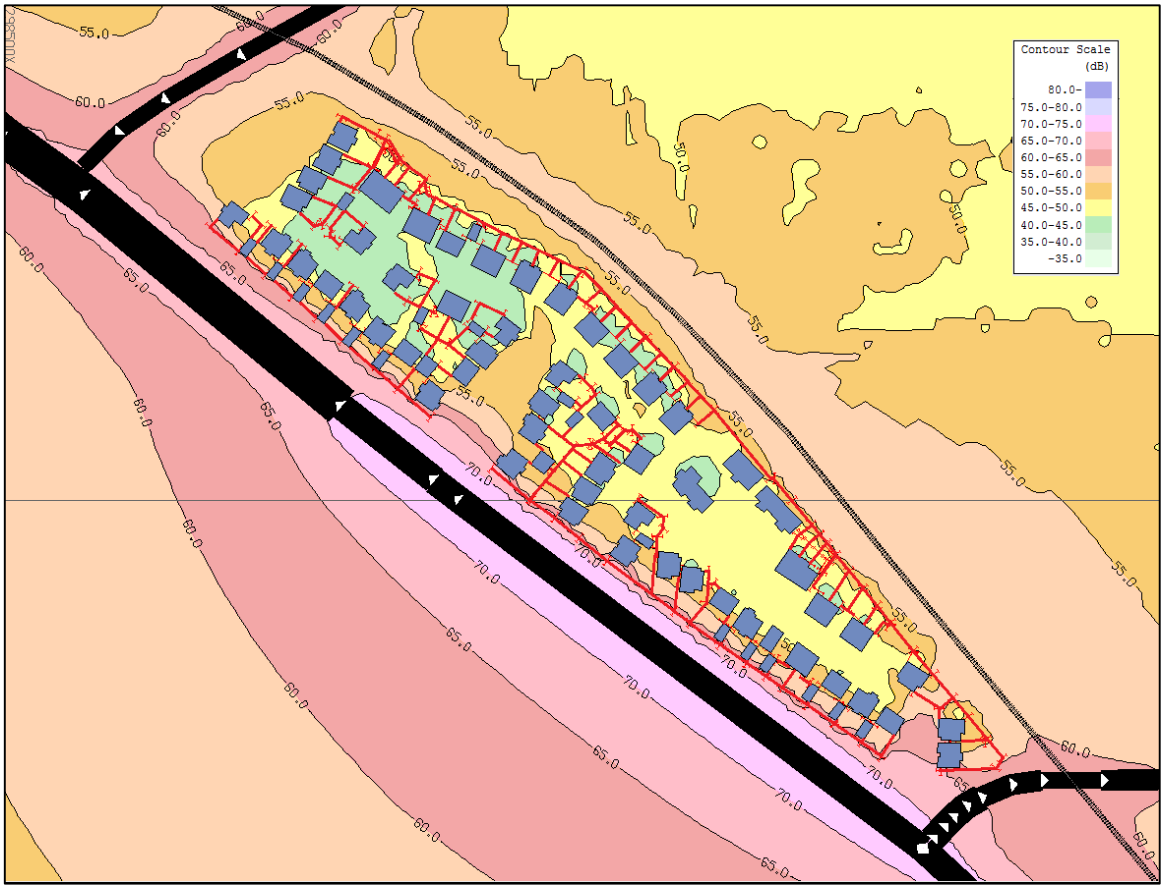
Results from the noise surveys discussed above have been used to aid calibration of the noise maps. Noise maps have been plotted using NoiseMap Five software (version 5.0.17) which in turn uses methodology from Department of Transport's Calculation of Road Traffic Noise (CRTN) and Calculation of Rail Noise (CRN).

Noise Maps 3309/NM1a & NM2a in Appendix C show predicted daytime and night-time noise levels respectively at 1.5m above local ground level on the undeveloped site.

These noise maps show the majority of the site falls under NEC A/B of TAN 11 daytime with only the south-western boundary with the B4265 falling under NEC C. Night-time, the majority of the site falls under NEC B, with only the south-western boundary falling under NEC C.

Noise Map 3309/NM3a below shows predicted daytime noise levels at 1.5m above local ground level across the developed site. Garden fences have been modelled as 1.8m high closed boarded fences.

3309/NM3a – $L_{eq,16hr}$ Daytime (0700 – 2300hrs); Developed Site (Ground Floor Level)



Note: Red line indicates 1.8m high closed boarded fences that have been included in the noise map models.

Noise Map 3309/NM4a shows predicted night-time noise levels at 1.5m above local ground level across the developed site.

3309/NM4a – $L_{eq,8hr}$ Night (2300 – 0700hrs); Developed Site (Ground Floor Level)

Noise maps 3309/NM5a & NM6a in Appendix C show predicted noise at first floor level during the daytime and night-time respectively.

5.1 Daytime

Noise maps indicate the B4265 road is the most critical noise source.

Plots 1, 64 and 78 are indicated to exceed the 'trigger levels' given in section 2.0 for additional sound insulation measures at both ground and first floor level – refer to section 6.0 below. Plots 50, 51, 53, 54, 79-85 and 8-14 are indicated to exceed the 'trigger level' at first floor level.

5.2 Night-time

Noise maps indicates the site falls into NEC B with the boundary to the B4265 falling into NEC C.

The same plots from daytime are indicated to exceed the 'trigger levels' given in Section 2.0 during the night-time however first floor bedrooms on plots facing the railway line and the road are indicated to require additional sound insulation measures to protect against $L_{max,F}$ events. For additional sound insulation measures refer to section 6.0 below.

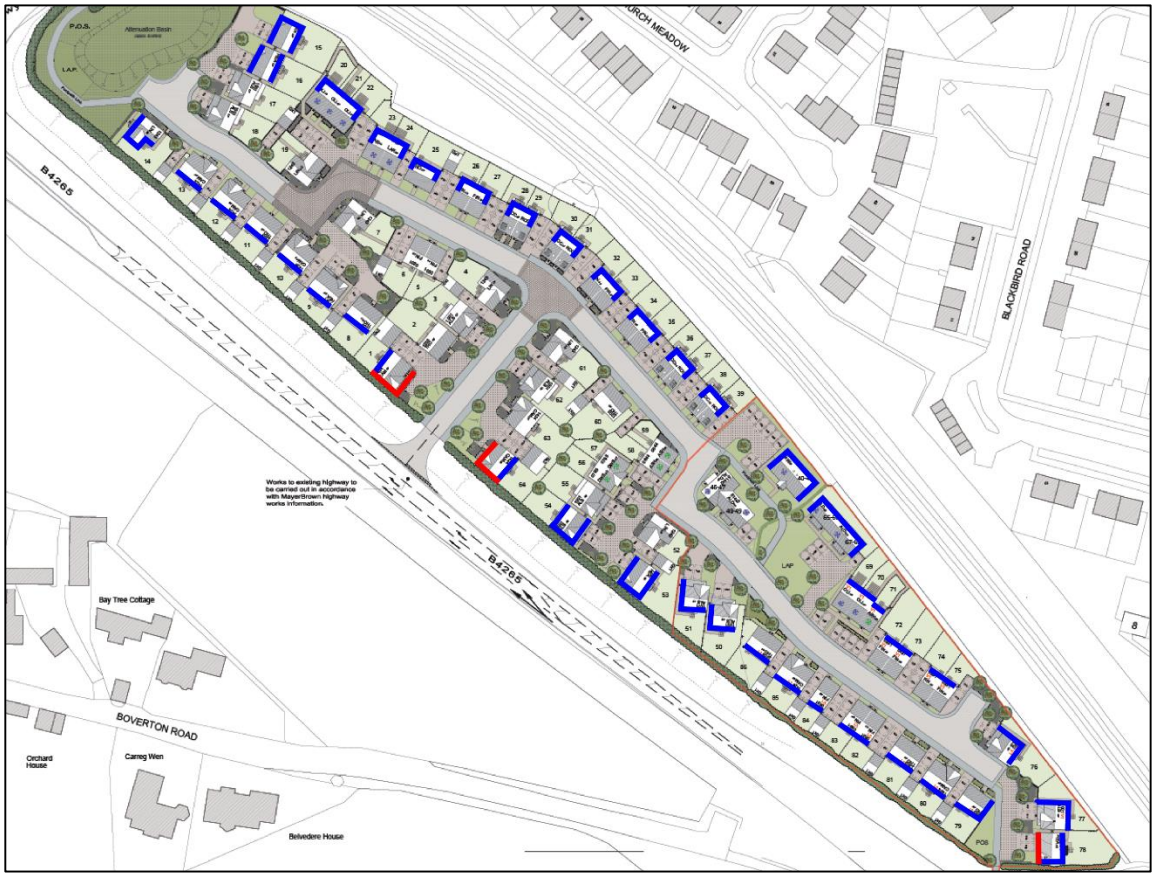
6.0 External Building Fabric Assessment

Based on survey results and the standard planning conditions, we have carried out an external building fabric assessment to control noise intrusion on critical façades.

Red lines indicate facades of habitable rooms at both ground and first floor level need treating and **blue** lines indicate bedroom facades at first floor level only need treating. These are shown on site plan 3309/SP2a below.

The external building fabric has been designed so that dwellings achieve the internal noise levels quoted in typical planning conditions discussed in section 2.2 of this report.

3309/SP2a – Façades Requiring Acoustic Glazing and Ventilation



All habitable rooms on the façades highlighted require up-rated acoustic glazing and/or ventilation as specified below:

The following constructions have been used in our external building fabric assessment;

Roof: Pitched tiled roof, timber trusses, plasterboard ceiling with 100mm mineral wool insulation.

Walls: Brick / Cavity / Block including NIR vent

The following SRI performance figures are taken from BS 8233 for "*tiles on felt roof with 100mm mineral wool on plasterboard ceiling"* (roof) and BRE's Sound Control for Homes 1999 for "*plastered solid brickwork (480kg/m^2) including NIR ventilator"* (wall).

Note: Habitable rooms include bedrooms, lounges, dining rooms and kitchen/diners but not kitchens or bathrooms.

There should be no rooms in roof/mansard sections included on critical plots.

These figures have been used in our assessment however your preferred wall and roof supplier shall confirm their proposed systems meet these figures:

3309/T3 – Wall and Roof Sound Reduction Index Figures

Element	Description	Sound Reduction Index (SRI: BS EN ISO 140) at Octave Band Centre Frequency (Hz)				
		125	250	500	1k	2k
Wall	Plastered solid brickwork with NIR vent in wall	32	41	48	52	53
Roof	Pitched tiled roof, timber trusses, plasterboard ceiling with 100mm mineral wool	28	34	40	45	49

6.1 Ventilation

All habitable rooms on facades highlighted in **red** require mechanical ventilation at ground and first floor levels or a whole house ventilation system. All first floor bedrooms on facades highlighted in **blue** require mechanical ventilation.

- Mechanical acoustic ventilators meeting requirements of the Noise Insulation Regulations 1988 or,
- A whole house ventilation system (meeting the requirements of Part F of the Building Regulations) – to be confirmed acceptable by the local planners/EHO.

Do not include trickle ventilation within window frames on critical facades.

6.2 Glazing

Site plan 3309/SP2a shows façades where windows require up-rating. The following sound reduction index figures shall be met for window glazing on these critical façades:

3309/T4 – Window Glazing Sound Reduction Index Figures

Element	Description	Sound Reduction Index (SRI: BS EN ISO 140) at Octave Band Centre Frequency (Hz)				
		125	250	500	1k	2k
Window Glazing	For budgetary guidance, based on Pilkington 10/6-20/6	24	24	32	37	37

For initial budgetary guidance, 10/6-20/6 glazing should be capable of achieving these figures based on Pilkington test data, however;

The successful glazing suppliers shall provide independent laboratory test data confirming their proposed systems (including frames/seals) meet the quoted octave band sound reduction performance figures above.

This glazing specification should also be suitable to control typical L_{max} events from vehicle pass-bys and trains to within the 45dB(A) $L_{max,F}$ bedroom standard quoted in BS 8233.

For all other façades standard thermal double-glazing and trickle ventilation should be sufficient.

6.3 Gardens

Noise Map 3309/NM3a indicates that the majority of gardens on the proposed development should meet the 55dB(A) in 50% of garden area during the daytime with the inclusion of 1.8m high closed boarded garden fences.

However, gardens facing the B4265 on the southern-most Phase 2 part of the site are indicated to fall in the range of 55-60dB(A).

It is recognised that guideline values for garden noise levels are not achievable in all circumstances. Reference is made to BS 8233:2014 and 'Health effect based noise assessment methods: A review and feasibility study' (National Physics Laboratory Report CMAM 16 1998) as quoted in section 2.4 of this report.

7.0 Conclusions

An environmental noise survey has been carried out to assess existing ambient and background noise levels impinging on the proposed development site at land north of B4265, Boverton, Vale of Glamorgan from local road traffic and rail noise.

A noise map has been plotted to allow the noise climate to be predicted across the site in its undeveloped and developed state.

The site is its undeveloped state is indicated to fall mainly into NEC A/B of TAN 11 during the daytime and NEC B during the night-time, with only part of the south-western boundary with the B4265 falling under NEC C of TAN 11.

A 1.8m high closed boarded fence is proposed along the south-western boundary to the B4265. Additional sound insulation measures in the form of up-rated glazing and acoustic ventilation are proposed on critical façades overlooking the B4265 and to bedroom façades along the north eastern boundary facing the rail line.

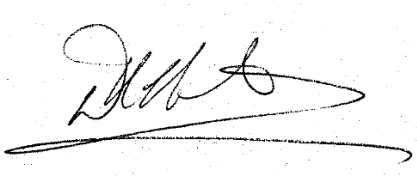
Rail vibration levels have also been measured over a 24-hour period for comparison with daytime and night time criteria quoted in BS 6472 'Guide to evaluation of human exposure to vibration in buildings'. Measured levels are well below the criteria – vibration is not indicated to be an issue on this site.

As a residential development, noise emissions from the developed site to the neighbouring environment would not be significant.

Prepared by:

Meirion Townsend
BSc(Hons) MIOA
Hunter Acoustics

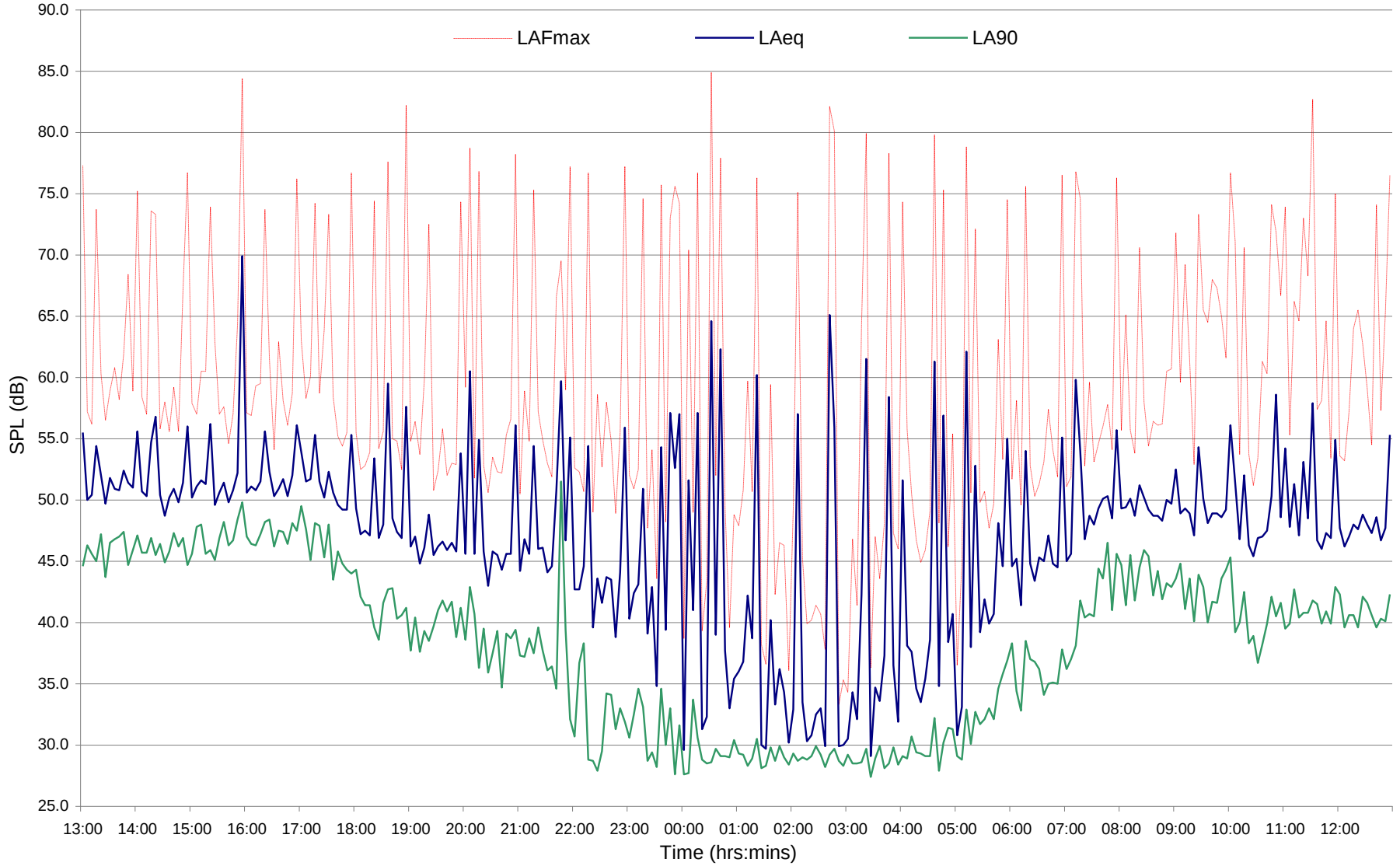
Checked by:



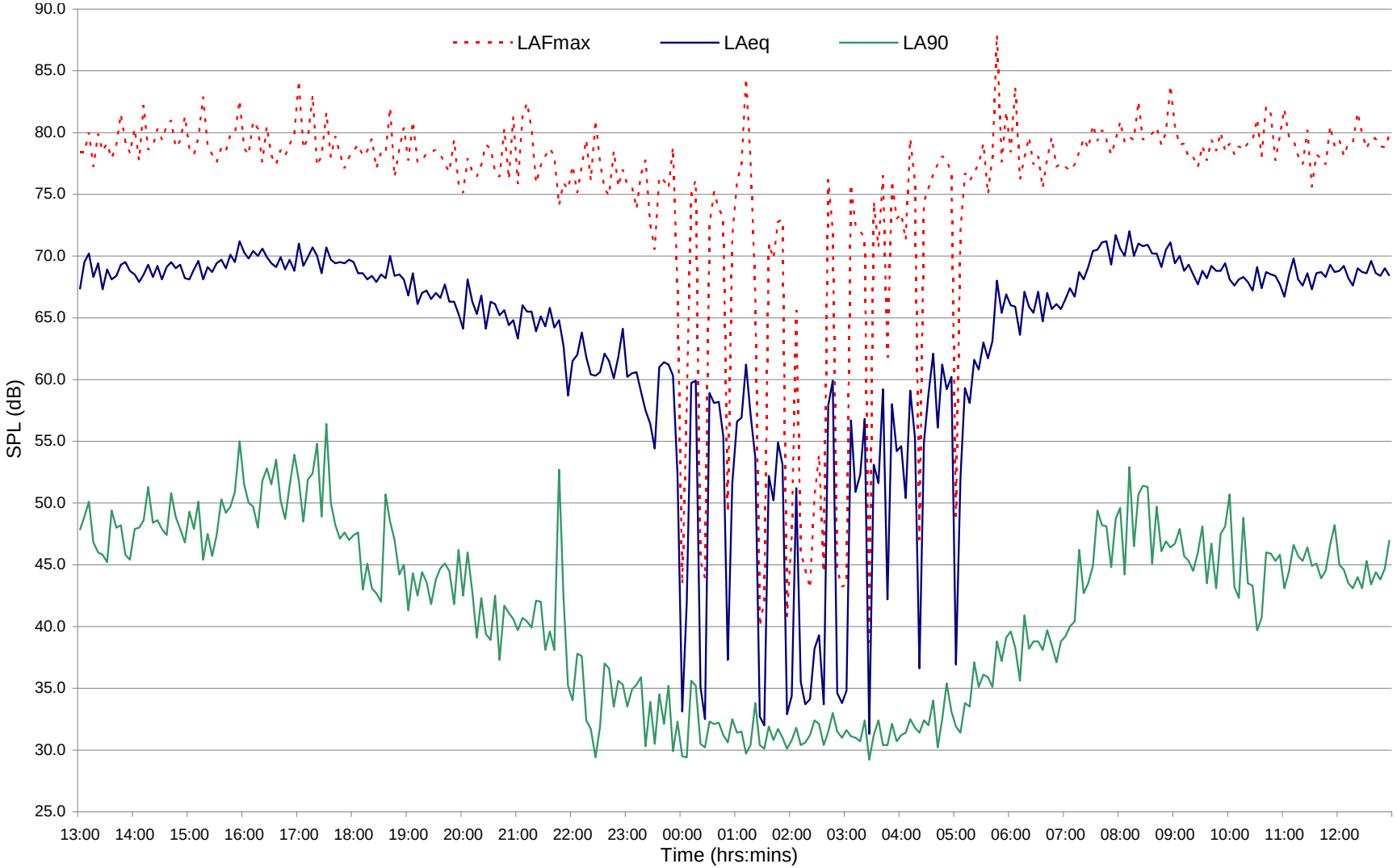
David Hunter
BSc(Hons) MSc MIOA
Hunter Acoustics

Appendix A – Graphs, Tables and Diagrams

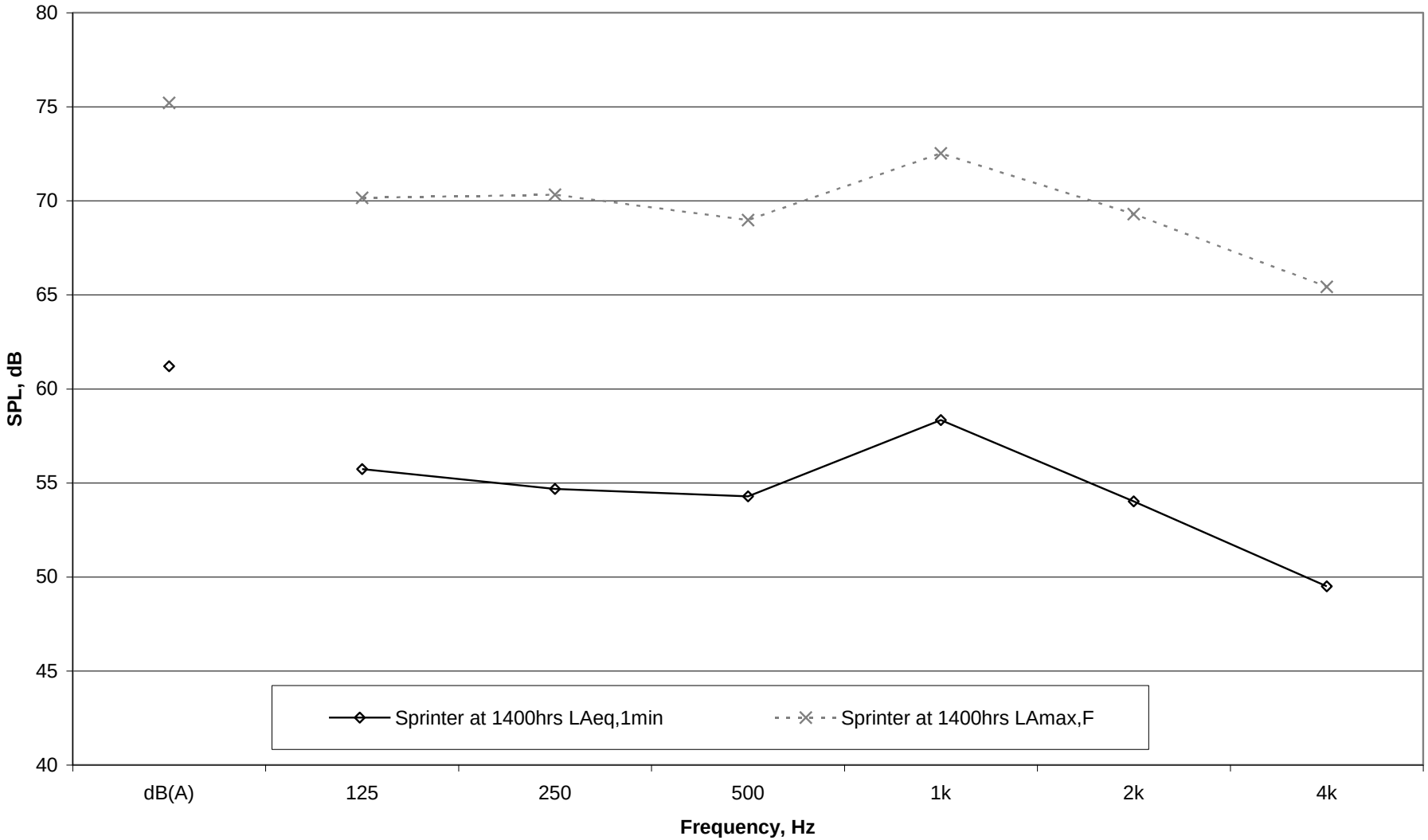
3309/TH1 – Continuous Monitoring Time History: Position A



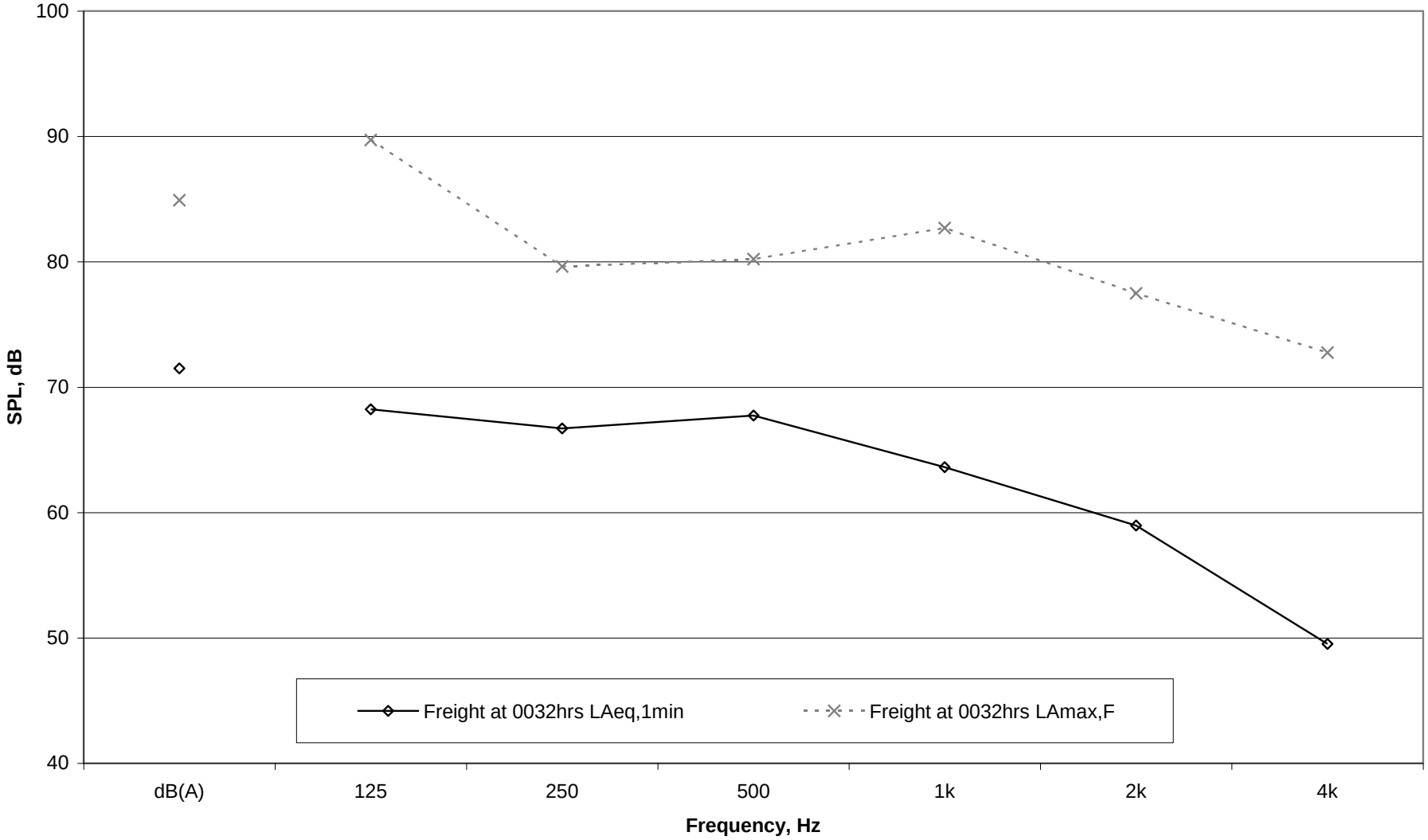
3309/TH2 – Continuous Monitoring Time History: Position B



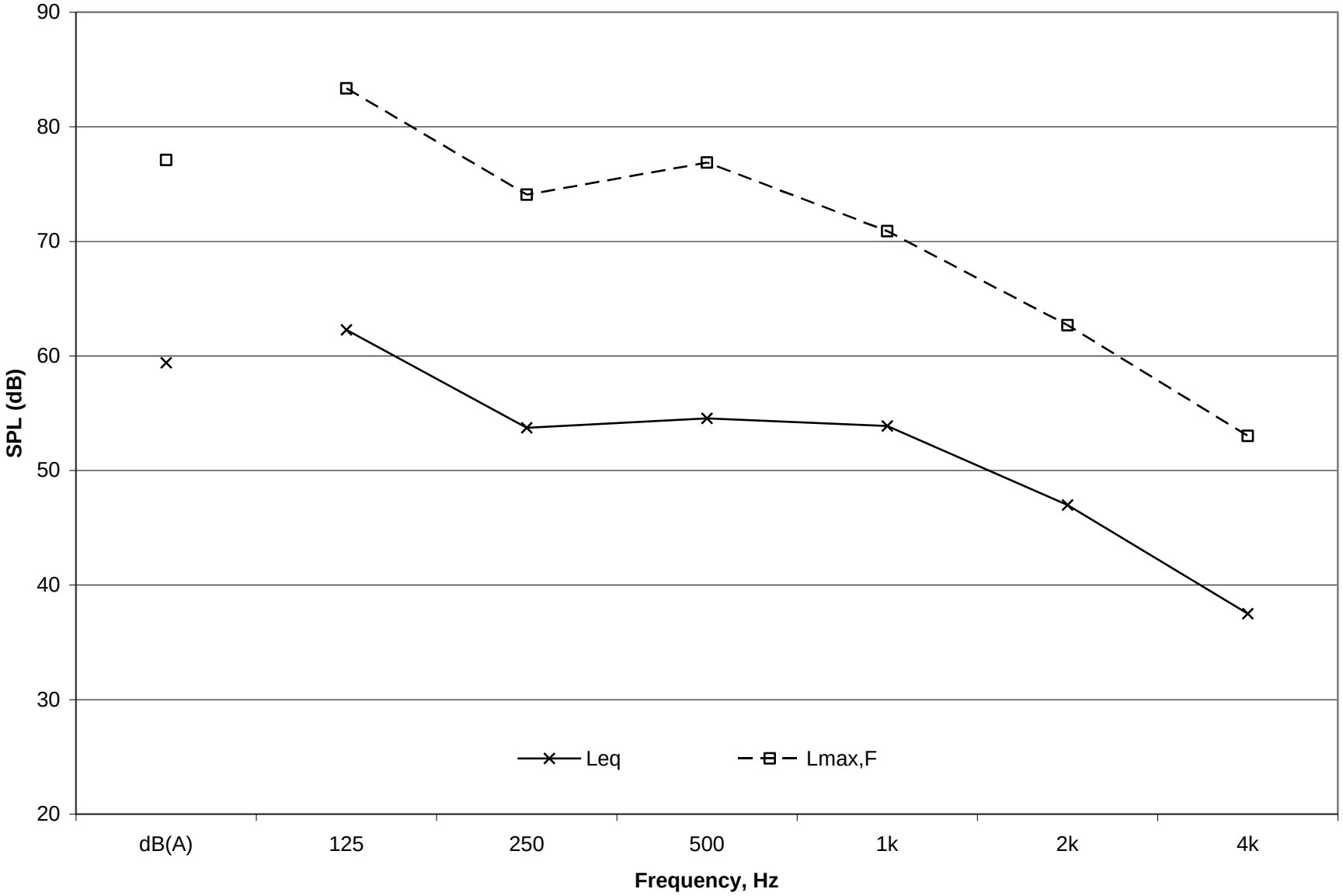
3309/G1 – Sprinter Pass-by at Position A



3309/G2 – Freight Pass-by at Position A



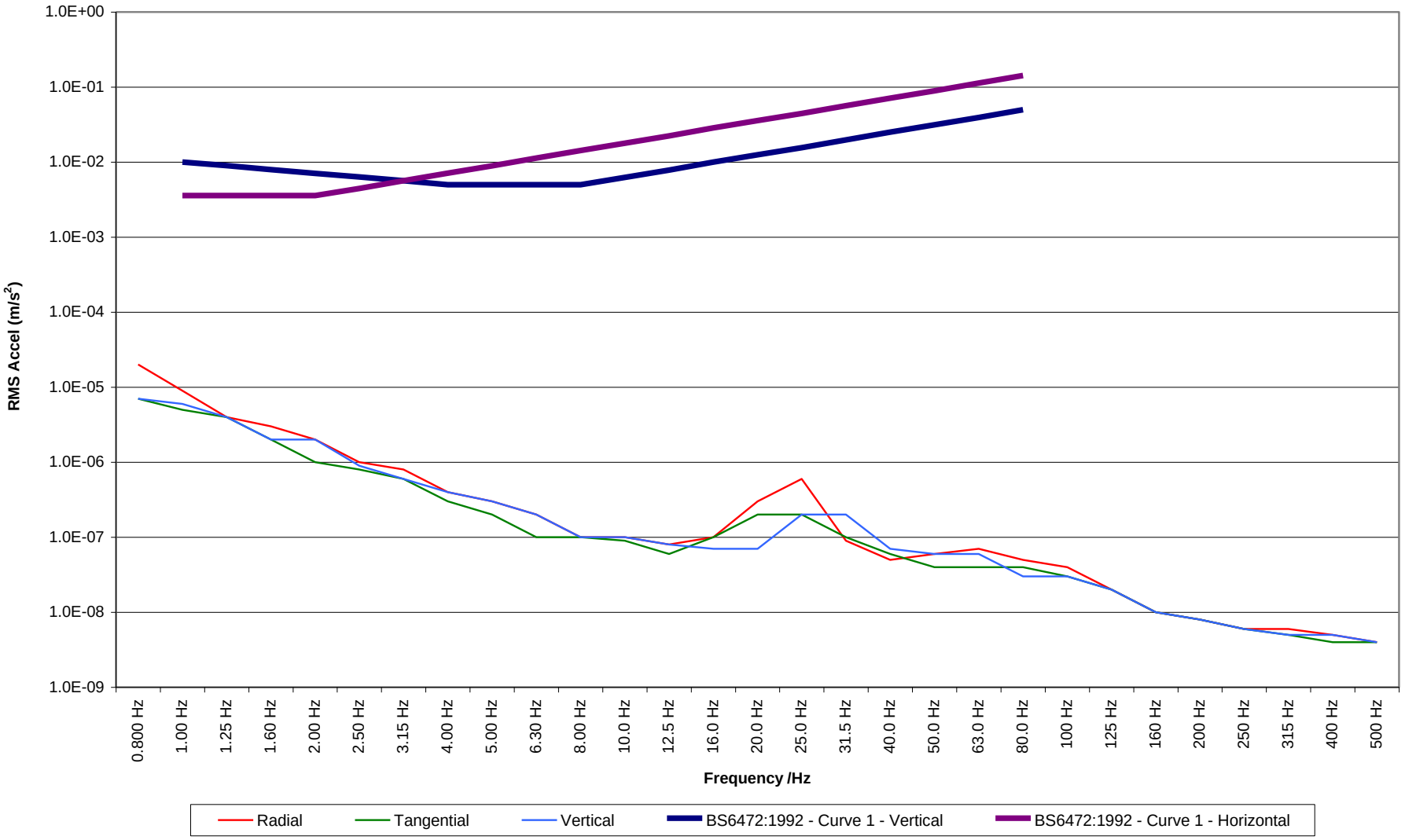
3309/G3 – Road Traffic Spectra at Position 1



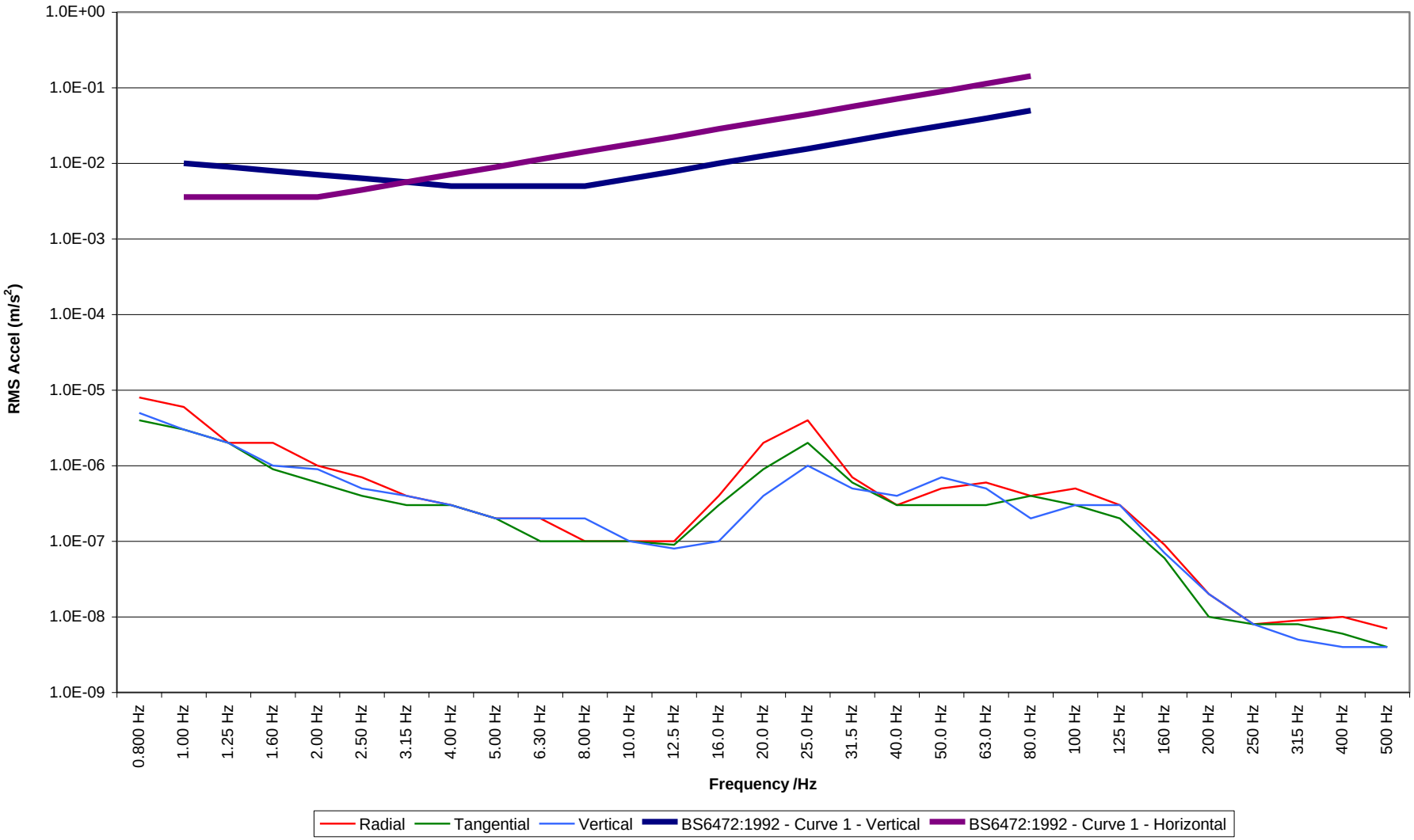
3309/T2 – Hourly Vibration Dose Values at Position A

Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$	Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$
29/01/2014	13:00	Radial	W_d	1.54E-02	29/01/2014	01:00	Radial	W_d	1.04E-02
29/01/2014	13:00	Tangential	W_d	1.58E-02	29/01/2014	01:00	Tangential	W_d	6.54E-03
29/01/2014	13:00	Vertical	W_b	1.92E-02	29/01/2014	01:00	Vertical	W_b	7.68E-03
29/01/2014	14:00	Radial	W_d	3.90E-02	30/03/2010	02:00	Radial	W_d	2.44E-02
29/01/2014	14:00	Tangential	W_d	2.81E-02	30/03/2010	02:00	Tangential	W_d	6.89E-03
29/01/2014	14:00	Vertical	W_b	3.90E-02	30/03/2010	02:00	Vertical	W_b	7.74E-03
29/01/2014	15:00	Radial	W_d	9.90E-03	30/03/2010	03:00	Radial	W_d	2.18E-02
29/01/2014	15:00	Tangential	W_d	1.03E-02	30/03/2010	03:00	Tangential	W_d	7.10E-03
29/01/2014	15:00	Vertical	W_b	1.24E-02	30/03/2010	03:00	Vertical	W_b	8.36E-03
29/01/2014	16:00	Radial	W_d	8.50E-03	30/03/2010	04:00	Radial	W_d	2.32E-02
29/01/2014	16:00	Tangential	W_d	7.77E-03	30/03/2010	04:00	Tangential	W_d	6.92E-03
29/01/2014	16:00	Vertical	W_b	9.97E-03	30/03/2010	04:00	Vertical	W_b	8.26E-03
29/01/2014	17:00	Radial	W_d	7.52E-03	30/03/2010	05:00	Radial	W_d	9.42E-03
29/01/2014	17:00	Tangential	W_d	7.31E-03	30/03/2010	05:00	Tangential	W_d	7.01E-03
29/01/2014	17:00	Vertical	W_b	8.95E-03	30/03/2010	05:00	Vertical	W_b	8.18E-03
29/01/2014	18:00	Radial	W_d	1.93E-02	30/03/2010	06:00	Radial	W_d	7.37E-03
29/01/2014	18:00	Tangential	W_d	1.03E-02	30/03/2010	06:00	Tangential	W_d	5.98E-03
29/01/2014	18:00	Vertical	W_b	1.64E-02	30/03/2010	06:00	Vertical	W_b	7.56E-03
29/01/2014	19:00	Radial	W_d	1.04E-02	30/03/2010	07:00	Radial	W_d	1.25E-02
29/01/2014	19:00	Tangential	W_d	6.31E-03	30/03/2010	07:00	Tangential	W_d	5.63E-03
29/01/2014	19:00	Vertical	W_b	7.69E-03	30/03/2010	07:00	Vertical	W_b	6.57E-03
29/01/2014	20:00	Radial	W_d	7.60E-03	30/03/2010	08:00	Radial	W_d	8.56E-03
29/01/2014	20:00	Tangential	W_d	7.17E-03	30/03/2010	08:00	Tangential	W_d	5.90E-03
29/01/2014	20:00	Vertical	W_b	8.75E-03	30/03/2010	08:00	Vertical	W_b	7.23E-03
29/01/2014	21:00	Radial	W_d	1.03E-02	30/03/2010	09:00	Radial	W_d	9.54E-03
29/01/2014	21:00	Tangential	W_d	6.29E-03	30/03/2010	09:00	Tangential	W_d	6.42E-03
29/01/2014	21:00	Vertical	W_b	7.57E-03	30/03/2010	09:00	Vertical	W_b	7.76E-03
29/01/2014	22:00	Radial	W_d	7.95E-03	30/03/2010	10:00	Radial	W_d	1.00E-02
29/01/2014	22:00	Tangential	W_d	5.61E-03	30/03/2010	10:00	Tangential	W_d	6.38E-03
29/01/2014	22:00	Vertical	W_b	6.59E-03	30/03/2010	10:00	Vertical	W_b	7.63E-03
29/01/2014	23:00	Radial	W_d	1.23E-02	30/03/2010	11:00	Radial	W_d	9.42E-03
29/01/2014	23:00	Tangential	W_d	6.45E-03	30/03/2010	11:00	Tangential	W_d	6.89E-03
29/01/2014	23:00	Vertical	W_b	7.80E-03	30/03/2010	11:00	Vertical	W_b	7.72E-03
29/01/2014	00:00	Radial	W_d	2.36E-02	30/03/2010	12:00	Radial	W_d	1.02E-02
29/01/2014	00:00	Tangential	W_d	7.24E-03	30/03/2010	12:00	Tangential	W_d	6.19E-03
29/01/2014	00:00	Vertical	W_b	8.22E-03	30/03/2010	12:00	Vertical	W_b	7.57E-03
					VDV_b (Day : 0700-2300hrs)			0.040	$ms^{-1.75}$
					VDV_b (Night : 2300-0700hrs)			0.013	$ms^{-1.75}$

3309/G4 – 1/3-Octave Band RMS Vibration Spectra for Typical Sprinter Pass-by (1400hrs)



3309/G5 – 1/3-Octave Band RMS Vibration Spectra for Typical Freight Pass-by (0032hrs)



Appendix B – Acoustic Terminology

Human response to noise depends on a number of factors including; loudness, frequency content, and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'. The following units have been used in this report:

dB(A): The sound pressure level weighted to correspond with the frequency response of the human ear, and therefore a person's subjective response to frequency content.

L_{eq}: The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period.

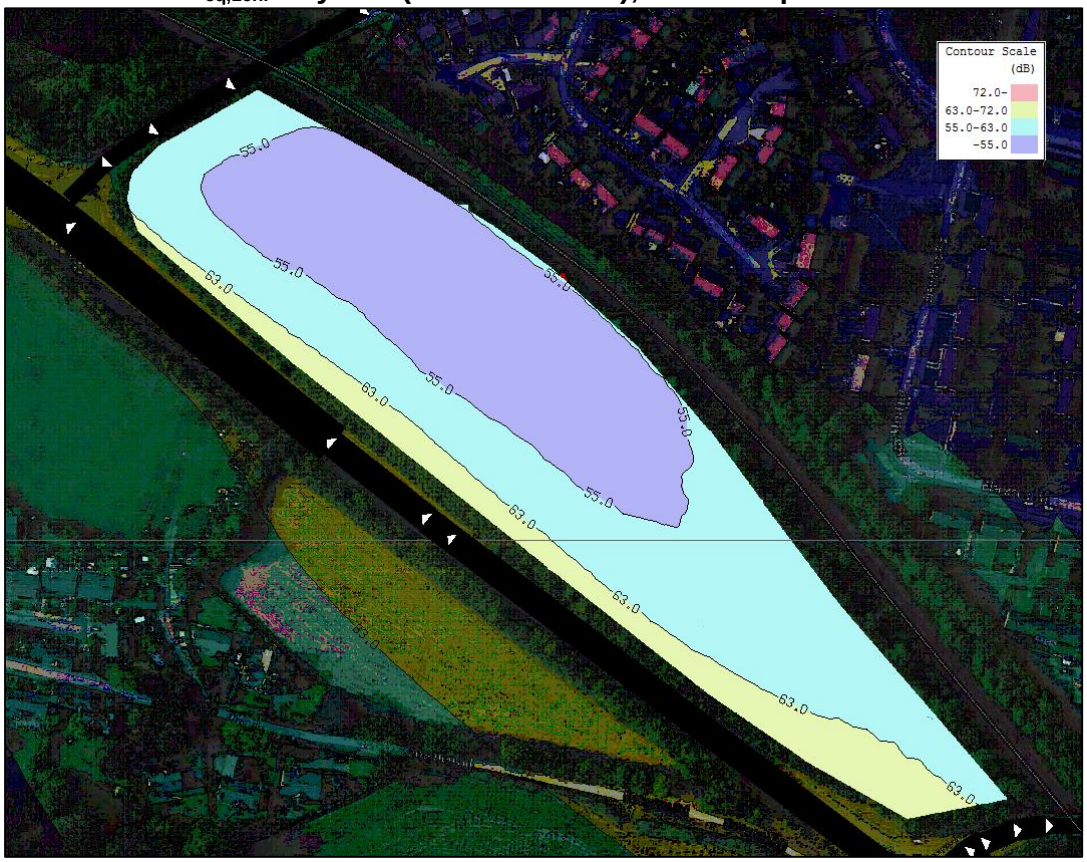
L_{90}: The sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54-minutes of a 1-hour measurement. It is often used to define the background noise level.

L_{10}: The sound level which is exceeded for 10% of the measurement period. i.e. The level exceeded for 6-minutes of a 1-hour measurement

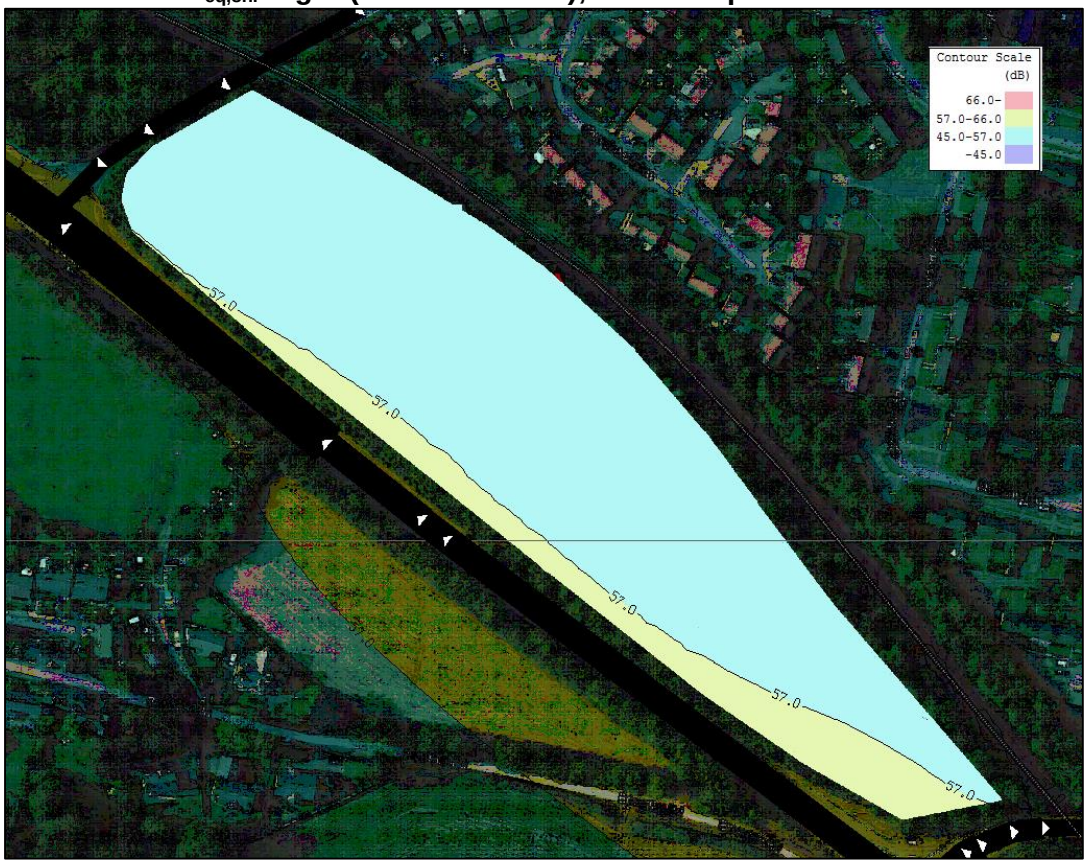
SEL: 'Sound Exposure Level', the dB(A) level which, if it lasted 1-second, would produce the same sound energy as the event in question (e.g. a train pass-by).

Appendix C – Noise Maps

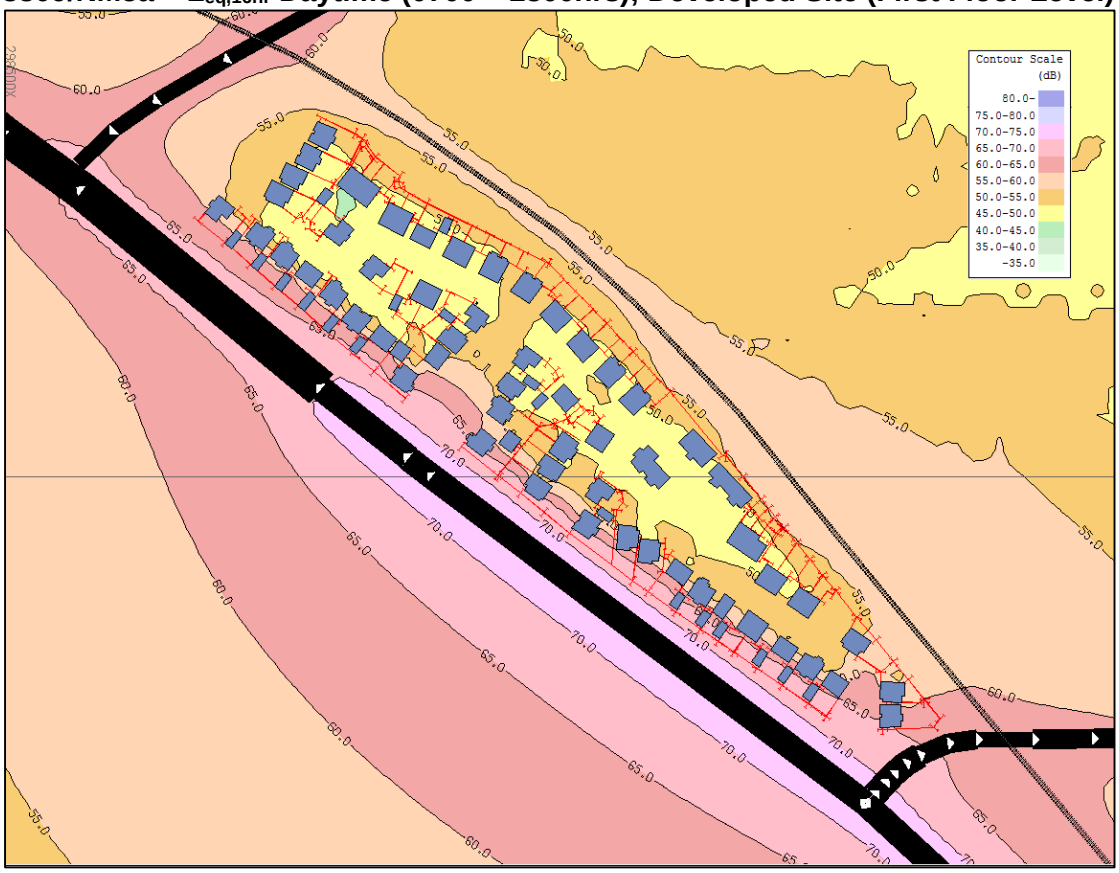
3309/NM1a – $L_{eq,16hr}$ Daytime (0700 – 2300hrs); Undeveloped Site



3309/NM2a – $L_{eq,8hr}$ Night (2300 – 0700hrs); Undeveloped Site



3309/NM5a – $L_{eq,16hr}$ Daytime (0700 – 2300hrs); Developed Site (First Floor Level)



3309/NM6a – $L_{eq,8hr}$ Night-time (2300 – 0700hrs); Developed Site (First Floor Level)