

Noise Impact Assessment

Wood Walk, Barnsley

Presented to **Yelcon Limited**

Issued: August 2021

Delta-Simons Project No. 16-0406.08

deltasimons



Report Details

Client	Yelcon Limited
Report Title	Noise Impact Assessment
Site Address	Wood Walk, Barnsley
Project No.	16-0406.08
Delta-Simons Contact	Gabor Antony (Gabor.Antony@deltasimons.com)

Quality Assurance

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
1	Issue	10th August 2021	-			
				Martyn Parker AMIOA	**John Goodwin MIOA**	**Dan Boote MIOA**

About us

Delta-Simons is a trusted, multidisciplinary environmental consultancy, focused on delivering the best possible project outcomes for customers.

Specialising in Environment, Health & Safety and Sustainability, Delta-Simons provide support and advice within the property development, asset management, corporate and industrial markets. Operating from across the UK we employ over 120 environmental professionals, bringing experience from across the private consultancy and public sector markets.

Delta-Simons is proud to be a founder member of the Inogen Environmental Alliance, enabling us to efficiently deliver customer projects worldwide by calling upon over 5000 resources in our global network of consultants, each committed to providing superior EH&S and sustainability consulting expertise to our customers. Inogen Environmental Alliance offers its clients more consultants, with more services in more countries than the traditional multinational consultancy.

Delta-Simons is a '***Beyond Net-Zero'*** company. We have set a Science-Based Target to reduce our Scope 1 and Scope 2 carbon emissions in line with the Paris Agreement and are committed to reducing Scope 3 emissions from our supply chain. Every year we offset our residual emissions by 150% through verified carbon removal projects linked to the UN Sustainable Development Goals.

Therefore, our consultancy services to you are carbon positive.

If you would like support in calculating your carbon footprint and playing your part in tackling the global climate crisis, please get in touch with your Delta-Simons contact above who will be happy to help.

Executive Summary

Site and Report Context	Delta-Simons, working with our approved technical specialist Professional Consult, was instructed by Yelcon Limited to prepare a Noise Impact Assessment in support of a planning application for a proposed residential development located on a parcel of land off Wood Walk in Hoyland, Barnsley S74. The Site comprises open land in a semi-rural location bound by the A6195 Dearne Valley Parkway to the north, the B6096 to the east and south and existing residential dwellings and open land to the west. It is understood that planning permission is sought for 84 residential dwellings with associated infrastructure.
Summary	This assessment has been undertaken to identify the key noise sources which have the potential to impact upon the proposed noise-sensitive residential development. Accordingly, this assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance and BS8233:2014.
Conclusions and Recommendations	This assessment has shown that compliance with the internal noise criteria limits can be achieved with standard thermal double glazing for the majority of the plots and upgraded glazing for a minority of plots which lie closest to the main roads. A scheme of alternative ventilation has also been recommended in order to permit background ventilation whilst maintaining façade sound insulation performance. This assessment has shown that, through good acoustic design of various plots and by use of acoustic fences of varying height across the Site, the resultant noise levels are the lowest practicable within garden areas. It should be noted that the proposed layout has been optimised for noise control and it is not possible to make any further noise-related design enhancements to the layout due to other master planning design considerations. Subject to the incorporation of the specified mitigation measures, it is considered reasonable to suggest that future noise levels within habitable areas of the proposed dwelling plots accord with the 'No Observed Adverse Effect Level' as detailed in the PPG and **negligible** noise impacts will prevail.
This is intended as a summary only. Further detail and limitations of the assessment is provided within the main body of the Report.	

Table of Contents

1.0 INTRODUCTION....4
1.1 Appointment....4
1.2 Site Location and Context....4
2.0 LEGISLATION AND POLICY....5
2.1 Planning Policy....5
2.2 Local Planning Policy....6
2.3 Guidance....6
3.0 SCOPE AND METHODOLOGY....9
3.1 Scope....9
3.2 Methodology....9
3.3 Significance criteria....9
4.0 BASELINE....10
4.1 Introduction....10
5.0 ASSESSMENT....12
5.1 Road Traffic Noise....12
6.0 MITIGATION AND RESIDUAL EFFECTS....14
6.1 Road Traffic Noise....14
7.0 SUMMARY AND CONCLUSIONS....15

Figures

Figure 1 - Site Location and Noise Measurement Positions

Appendices

Appendix A - Limitations
Appendix B - Glossary
Appendix C - Daytime Grid Noise Map
Appendix D - Night-time Grid Noise Map
Appendix E - Daytime Grid Noise Map - Mitigated
Appendix F - Daytime Façade Noise Levels
Appendix G - Night-time Façade Noise Levels

1.0 Introduction

1.1 Appointment

1.1.1 Delta-Simons, working with our approved technical specialist Professional Consult, was instructed by Yelcon Limited (the 'Client') to prepare a Noise Impact Assessment in support of a planning application for a proposed residential development (the 'Proposed Development'), located on a parcel of land off Wood Walk in Hoyland, Barnsley S74 (the 'Site'). Reference should be made to **Figure 1** for a map of the Site and surrounding area.

1.2 Site Location and Context

1.2.1 The Site comprises open land in a semi-rural location bound by the A6195 Dearne Valley Parkway to the north, the B6096 to the east and south and existing residential dwellings and open land to the west.

1.2.2 It is understood that planning permission is sought for 84 residential dwellings with associated infrastructure.

1.2.3 This assessment has been undertaken to identify the key noise sources which have the potential to impact upon the proposed noise-sensitive residential development. Accordingly, this assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance and BS8233:2014.

1.2.4 The standard limitations associated with this assessment are presented in **Appendix A.**

1.2.5 A glossary of terms used in this report is provided in **Appendix B**.

2.0 Legislation and Policy

2.1 Planning Policy

2.1.1 A summary of the national and local planning policy relevant to the Proposed Development is provided below.

National Planning Policy Framework and National Planning Practice Guidance

2.1.2 The Government published the revised National Planning Policy Framework (NPPF) in July 2021, and the National Planning Practice Guidance (NPPG) in July 2019. Together, the NPPF and NPPG set out what the Government expects of local authorities. The overall aim is to ensure the planning system allows land to be used for new homes and jobs, while protecting valuable natural and historic environments.

2.1.3 The NPPG adds further context to the NPPF, and it is intended that the two documents should be read together.

2.1.4 Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

2.1.5 Local planning authorities' plan-making and decision making should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

2.1.6 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

2.1.7 The Observed Effect Levels are as follows:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

2.1.8 **Table 1** summarises the noise exposure hierarchy, based on the likely average response.

Table 1 - Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Adverse Effect Level			
Not Noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required

Perception	Examples of Outcomes	Increasing Effect Level	Action
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.2 Local Planning Policy

Barnsley Metropolitan Borough Council

2.2.1 Barnsley Metropolitan Borough Council adopted its local plan in January 2019 and Policy GD1 'General Development Proposals' for development will be approved if:

> 'There will be no significant adverse effect on the living conditions and residential amenity of existing and future residents';

2.2.2 Further policy advice is provided under 'Living Conditions' of Policy GD1 which states:

> 'We want to make sure that the living conditions and residential amenity of people are protected, that development is set within high quality landscaping and that land is used efficiently by making sure that new development does not reduce development opportunities on neighbouring land. We will assess impact on living conditions and residential amenity in relation to: Noise, smell, dust, vibration, light, air, surface water, groundwater or other pollution and disturbance from any proposed activity, including traffic related noise and the comings and goings of visitors to premises particularly when late evening activity is involved. Planning conditions will be used to control the construction process'

2.3 Guidance

BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Noise Criteria Limits

2.3.1 The scope of this Standard is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

2.3.2 The Standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in **Table 2**.

Table 2 - BS8233:2014 Internal Target Noise Levels

Criterion	Typical Situation	Design $L_{Aeq,T}$ (dB)
Suitable resting / sleeping conditions	Living Room	35
	Bedroom*	30
*For a Reasonable standard in bedrooms at night, individual noise evens (measured with fast time weighting) should not exceed 45dB L_{Amax}		

2.3.3 BS8233 goes on to recommend noise levels for gardens as follows:

> 'It is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, 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 might be warranted'.

2.3.4 BS8233 goes on to say:

> 'In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited'.

Ventilation Requirements

2.3.5 Where a partially open window cannot be relied upon to provide an adequate level of façade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS8233 states:

> 'The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.
>
> Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans.'

2.3.6 Section 7.7.2 states:

> 'NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.'

World Health Organisation (WHO): 1999: Guidelines for Community Noise

2.3.7 WHO Guidelines for Community Noise (1999) provides information about the effects of noise that may occur at certain levels of exposure. For dwellings, the critical effects of noise are taken to be sleep disturbance, annoyance and speech interference.

2.3.8 Indoor guideline values are provided for bedrooms with the aim of protecting against sleep disturbance, a guideline value of 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for single sound events is recommended.

2.3.9 The external and internal ambient noise levels L_{Aeq} criteria in BS 8233:2014 is in line with those contained within the WHO guidelines. Therefore, for the purpose of this assessment, and in absence of any specific $L_{Amax,fast}$ criterion being detailed within BS 8233:2014, the WHO 45dB $L_{Amax,fast}$ criterion has been adopted.

2.3.10 With respect to the night-time $L_{Amax,fast}$ noise levels, the WHO states:

> "For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night"

2.3.11 On this basis, for the purpose of assessing night-time $L_{Amax,fast}$ noise events, it is considered appropriate to adopt the 10th highest $L_{Amax,fast}$ noise event.

Barnsley Metropolitan Brough Council's Environmental Health Department

2.3.12 The following consultation was provided to Barnsley Metropolitan Borough Council on 11th February 2021 which stated:

> 'We have been appointed by a client to complete a Noise Impact Assessment for the construction of 84 residential dwellings on a parcel of land located off Wood Walk in Hoyland, Barnsley. The proposed development lies adjacent to the A6195 Dearne Valley Parkway and the 6096 Wombwell Road both of which may produce significant noise impacts upon the proposed noise-sensitive use and so it is expected that Barnsley Metropolitan Borough Council will request that a Noise Impact Assessment accompanies the scheme planning application.
>
> The following noise surveys will be completed:
>
> 2 x Road Traffic Noise Surveys for the A6195 and the A6096 in line with the guidance presented in Calculation of Road Traffic Noise.
>
> Professional Consult will complete the following assessments:
>
> Road Traffic Noise: Given the current situation with reduced road traffic flows due to lockdown, the Noise Impact Assessment will add 3dB on to the measured average road traffic noise levels which accounts for up to a halving of vehicles on the road which is considered to be robust. The road traffic noise levels will be compared to the criteria presented in BS8233:2014 for internal habitable rooms and external amenity space.'

2.3.13 The following response was received on 11th February 2021:

> 'Thank you for contacting us regarding the Noise Impact Assessment for the proposed development. I will be the officer reviewing any NIA's in this area. What you are suggesting is appropriate for this application.'

3.0 Scope and Methodology

3.1 Scope

3.1.1 The scope of the assessment has been determined in the following way:

- Analysis of the Site and the surrounding area was completed using available aerial photography in order to identify the location of potential noise sources which may impact upon the proposed residential amenity; and
- Professional Consult consulted with Barnsley Metropolitan Borough Council in order to agree the scope and methodology of the Noise Survey and Noise Impact Assessment.

3.2 Methodology

3.2.1 A Noise Survey has been completed at the Site in order to measure road traffic.

3.2.2 The measured road traffic noise levels were then compared against criteria from BS8333:2014 to determine if residential amenity would be adversely affected.

3.2.3 A noise model has also been built to determine noise levels in open spaces (gardens) across the site.

3.3 Significance criteria

3.3.1 Where the noise level from any off-site noise sources adversely impacts the noise level criteria (set out in Table 2) at the proposed residential dwellings, a substantial adverse impact will be observed depending on the context and level of exceedance.

4.0 Baseline

4.1 Introduction

Road Traffic Noise Surveys

4.1.1 Two road traffic noise surveys have been completed in line with the shortened measurement procedure set out in Calculation of Road Traffic Noise (CRTN), as follows:

- Noise Measurement Position 1 (NMP1): 10:00 - 13:00 on Friday 12th February 2021. The microphone of the sound level meter was located 7m from the nearside kerbstone of Wood Walk in free-field conditions. The dominant noise source at the microphone location was intermittent vehicle pass-bys on Wood Walk; and
- Noise Measurement Position 2 (NMP2): 10:25 - 13:25 on Friday 12th February 2021. The microphone of the sound level meter was located 10m from the nearside kerbstone of Dearne Valley Parkway in free-field conditions. The dominant noise source at the microphone location was intermittent vehicle pass-bys on Dearne Valley Parkway.

4.1.2 **Table 3** summarises the measured noise levels for Wood Walk.

Table 3 - Summary of Measured Road Traffic Noise Levels

Road	Measurement Period	Measured Free-Field Sound Pressure Level (dB)			Measurement Distance from Centre of Road (m)
		$L_{Aeq,1hr}$	$L_{A10,1hr}$	10th Highest $L_{Amax,fast}$	
Wood Walk	12/02/2021 10:00	67.0	71.1	78.5	10.5
	12/02/2021 11:00	67.6	71.1		
	12/02/2021 12:00	67.3	71.1		

4.1.3 **Table 4** summarises the measured noise levels for Dearne Valley Parkway.

Table 4 - Summary of Measured Road Traffic Noise Levels

Road	Measurement Period	Measured Free-Field Sound Pressure Level (dB)			Measurement Distance from Centre of Road (m)
		$L_{Aeq,1hr}$	$L_{A10,1hr}$	10th Highest $L_{Amax,fast}$	
Dearne Valley Parkway	12/02/2021 10:25	79.0	82.6	88.4	13.5
	12/02/2021 11:25	79.0	82.8		
	12/02/2021 12:25	79.6	83.1		

4.1.4 It was noted during the noise surveys that road traffic conditions appeared to be typical of normal conditions with a generally high volume of road traffic using Dearne Valley Parkway.

Survey Equipment

4.1.5 The following equipment was used for the Noise Surveys.

Table 5 - Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer and Type No	Serial No.	Calibration Due Date
NMP1	Sound Level Meter	01dB Fusion	11755	3rd July 2022
	Pre-amplifier	01dB PRE22	1707173	
	Microphone	GRAS 40CE	291693	
	Calibrator	01dB CAL-31	84086	2nd July 2021

NMP2	Sound Level Meter	01dB Fusion	12586	24th June 2022
	Pre-amplifier	01dB PRE22	367351	
	Microphone	GRAS 40CD	2004163	
	Calibrator	01dB CAL-31	92222	1st April 2021

4.1.6 The sound level meters were field calibrated prior to and following the survey and no significant drift was identified.

4.1.7 During the noise surveys the weather conditions were conducive to the measurement of environmental noise, i.e. wind speeds of no more than 5m/s and dry conditions.

Table 6 - Range of Measured Wind Speeds

Period	Range of Measured Wind Speeds (m/s)	Rainfall Recorded?
10:00 - 13:30 Friday 12th February 2021	0 – 1.5	No

5.0 Assessment

5.1 Road Traffic Noise

5.1.1 For the purposes of this assessment, the daytime and night-time average ($L_{Aeq,T}$) noise levels have been calculated based on the shortened measurement procedure detailed in Calculation of Road Traffic Noise (CRTN). The respective daytime and night-time noise levels have been derived using the following calculations:

- Calculation of the $L_{A10,18hr}$ noise level by using the following formula:

  $L_{A10,18hr} = L_{A10,3hr}$ - 1dB

- Calculation of the $L_{Aeq,16hr}$ noise level by using the following formula:

  $L_{Aeq,16hr} = L_{A10,18hr}$ - 2dB

- Calculation of the night-time $L_{Aeq,8hr}$ noise level by using the following formula:

  L_{night} ($L_{Aeq,8hr}$) = 0.90 x $L_{A10,18hr}$ - 3.77dB

5.1.2 **Table 7** calculates the daytime and night-time noise levels at Noise Measurement Positions 1 and 2.

Table 7 - Calculation of Road Traffic Noise Levels

Measurement Position	Period	Calculated $L_{Aeq,T}$ (dB)	10th Highest Measured $L_{Amax,fast}$ (dB)	Distance from Centre of Road (m)
NMP1	Daytime (07:00 - 23:00)	68.1	-	10.5
	Night-time (23:00 - 07:00)	59.3	78.5	
NMP2	Daytime (07:00 - 23:00)	79.8	-	13.5
	Night-time (23:00 - 07:00)	69.9	88.4	
*10th highest maximum noise level from the CRTN shortened measurement procedure				

5.1.3 It was stated in correspondence with Barnsley Metropolitan Borough Council that a correction of 3dB would be applied to the measured average road traffic noise levels which would allow for up to a halving of vehicles using the local road network however, as discussed in the previous section, road traffic flows appeared to be typical of normal conditions with a high volume of vehicles using Dearne Valley Parkway. Accordingly, a 3dB correction has not been applied.

External Noise Impact in Garden Areas

5.1.4 In order to assess noise levels in external amenity areas across the Site, a noise map was calculated in the noise model. The noise map (Figure 1 of Appendix C) shows a number of garden areas with noise levels above 55dB $L_{Aeq,16hr}$. Therefore, Section 6.0 considers mitigation measures to reduce the noise levels in gardens to the lowest practicable.

Internal Noise Impact in Habitable Rooms

5.1.5 With regards to internal noise levels, BS8233:2014 suggests that standard thermal double glazing will afford 33dB R_w of sound reduction, however this is for the pink noise spectrum and the same configuration will afford 30dB R_w+C_{tr} for average noise levels from road traffic noise and so this value has been used to calculate internal noise levels. With regard to the maximum noise level ($L_{Amax,fast}$), the value of 33dB R_w has been used. BS8233:2014 also goes on to suggest that a partially open window provides approximately 15dB of noise attenuation.

5.1.6 Professional Consult uses a library database of glazing configurations issued by Saint Gobain and the glazing configuration 6mm glass / 12mm air space / 6mm glass affords 30dB $R_w + C_{tr}$ and 33dB R_w respectively.

5.1.7 Appendix F calculates the average daytime noise levels at the various facades of the plots and determines the requirement for upgraded glazing or alternative ventilation for living rooms. Appendix F indicates that standard thermal double glazing will be adequate in controlling external noise to meet the internal noise criteria limits for the majority of plots, however upgraded glazing will be required for a minority of living rooms. In addition, Appendix F indicates that with a partially open window, the internal noise criteria limit for living rooms will be exceeded in various plots and so Section 6.0 considers appropriate noise mitigation.

5.1.8 Appendix G calculates the average night-time noise levels at the various facades of the plots and determines the requirement for upgraded glazing or alternative ventilation for living rooms. Appendix G indicates that standard thermal double glazing will be adequate in controlling external noise to meet the internal noise criteria limits for the majority of plots, however upgraded glazing will be required for a minority of bedrooms. In addition, Appendix G indicates that with a partially open window, the internal noise criteria limit for bedrooms will be exceeded in various plots and so Section 6.0 considers appropriate noise mitigation.

5.1.9 In addition to the average noise levels, it is also necessary to consider maximum noise levels for the night-time period in addition to the average noise levels. With regards to road traffic movements along the A6195, the measured 10th highest maximum noise level was 88.4dB at 13.5m from the centre of the road and the closest proposed dwelling lies at 45.5m from the centre of the road which gives a maximum external noise level of 78dB $L_{Amax,fast}$. Allowing 33dB for a closed bedroom window gives an internal noise level of 45dB which meets the internal noise criteria of 45dB $L_{Amax,fast}$ and so standard thermal glazing will be adequate in controlling maximum noise levels in bedrooms for dwellings on the northern Site boundary. Allowing 15dB for a partially open window will result in a maximum internal noise level of 63dB and so Section 6.0 considers appropriate noise mitigation for bedrooms.

5.1.10 With regards to road traffic movements along Wood Walk, the measured 10th highest maximum noise level was 78.5dB at 10.5m from the centre of the road and the closest proposed dwelling lies at 11m from the centre of the road which gives a maximum external noise level of 78dB $L_{Amax,fast}$. Allowing 33dB for a closed bedroom window gives an internal noise level of 45dB which meets the internal noise criteria of 45dB $L_{Amax,fast}$ and so standard thermal glazing will be adequate in controlling maximum noise levels in bedrooms for dwellings on the southern Site boundary. Allowing 15dB for a partially open window will result in a maximum internal noise level of 63dB and so Section 6.0 considers appropriate noise mitigation for bedrooms.

6.0 Mitigation and Residual Effects

6.1 Road Traffic Noise

External Amenity Areas

6.1.1 With regards to external noise levels, the previous section has indicted that a number of garden areas have noise levels which exceed 55dB $L_{Aeq,16hr}$ before mitigation. Appendix E details the grid noise map for the scheme with acoustic fences at 2.5m in height around gardens closest to the edge of the scheme, and 1.8m high for gardens within the scheme. With the acoustic fences in place, the scheme has the following split of noise levels in gardens:

- 24 gardens below 55dB (32%);
- 32 gardens between 55dB – 60dB (43%); and
- 18 gardens over 60dB, but below 63dB (25%).

6.1.2 It should be noted that the client has been advised on the principles of good acoustic design and the scheme layout presented has been optimised for achieving noise levels in garden areas which are as low as practically possible. Due to other master planning design considerations, it is not possible to orientate the gardens closest to Dearne Valley Parkway onto the opposite side of the dwellings.

Internal Habitable Rooms

6.1.3 With regards to internal noise, Appendices F and G have identified the plots which require upgraded glazing and alternative ventilation which allows the various living room and bedroom windows to remain closed whilst allowing background ventilation. Accordingly, this method of ventilation can take the form of an acoustic trickle ventilator which accords with the Building Regulations. Such a trickle ventilator is as follows:

- Greenwoods EAR42W (affords up to 42dB $D_{n,e,w}+C_{tr}$).

6.1.4 The previous section has indicated that maximum noise levels from Dearne Valley Parkway can be adequately attenuated using standard thermal glazing for bedrooms however with an open window, the internal target noise level will be exceeded. Calculation indicates that any bedroom window located within 355m of the centre of Dearne Valley Parkway with either full or partial line of sight to the road will require the above acoustic trickle ventilator. With regards to maximum noise levels associated with road traffic using Wood Walk, any bedroom window located within 85m of the centre of Wood Walk will require the above acoustic trickle ventilator.

6.1.5 It should be noted that all habitable room windows remain openable at the occupant's discretion and to afford purge ventilation if required.

Residual Effects

6.1.6 Where mitigation is put in place as per the recommendations made above, then a **negligible** impact will be observed for future occupants of the Site.

7.0 Summary and Conclusions

7.1.1 Delta-Simons, working with our approved technical specialist Professional Consult, was instructed by Yelcon Limited to prepare a Noise Impact Assessment in support of a planning application for a proposed residential development located on a parcel of land off Wood Walk in Hoyland, Barnsley S74.

7.1.2 The Site comprises open land in a semi-rural location bound by the A6195 Dearne Valley Parkway to the north, the B6096 to the east and south and existing residential dwellings and open land to the west.

7.1.3 It is understood that planning permission is sought for 84 residential dwellings with associated infrastructure.

7.1.4 This assessment has been undertaken to identify the key noise sources which have the potential to impact upon the proposed noise-sensitive residential development. Accordingly, this assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance and BS8233:2014.

7.1.5 This assessment has shown that compliance with the internal noise criteria limits can be achieved with standard thermal double glazing for the majority of the plots and upgraded glazing for a minority of plots which lie closest to the main roads. A scheme of alternative ventilation has also been recommended in order to permit background ventilation whilst maintaining façade sound insulation performance.

7.1.6 This assessment has shown that, through good acoustic design of various plots and by use of acoustic fences of varying height across the Site, the resultant noise levels are the lowest practicable within garden areas. It should be noted that the proposed layout has been optimised for noise control and it is not possible to make any further noise-related design enhancements to the layout due to other master planning design considerations.

7.1.7 Subject to the incorporation of the specified mitigation measures, it is considered reasonable to suggest that future noise levels within habitable areas of the proposed dwelling plots accord with the 'No Observed Adverse Effect Level' as detailed in the PPG and **negligible** noise impacts will prevail.

Figures

Figure 1 - Site Location and Noise Measurement Positions



Appendices

Appendix A - Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons' conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

Appendix B - Glossary

Glossary

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

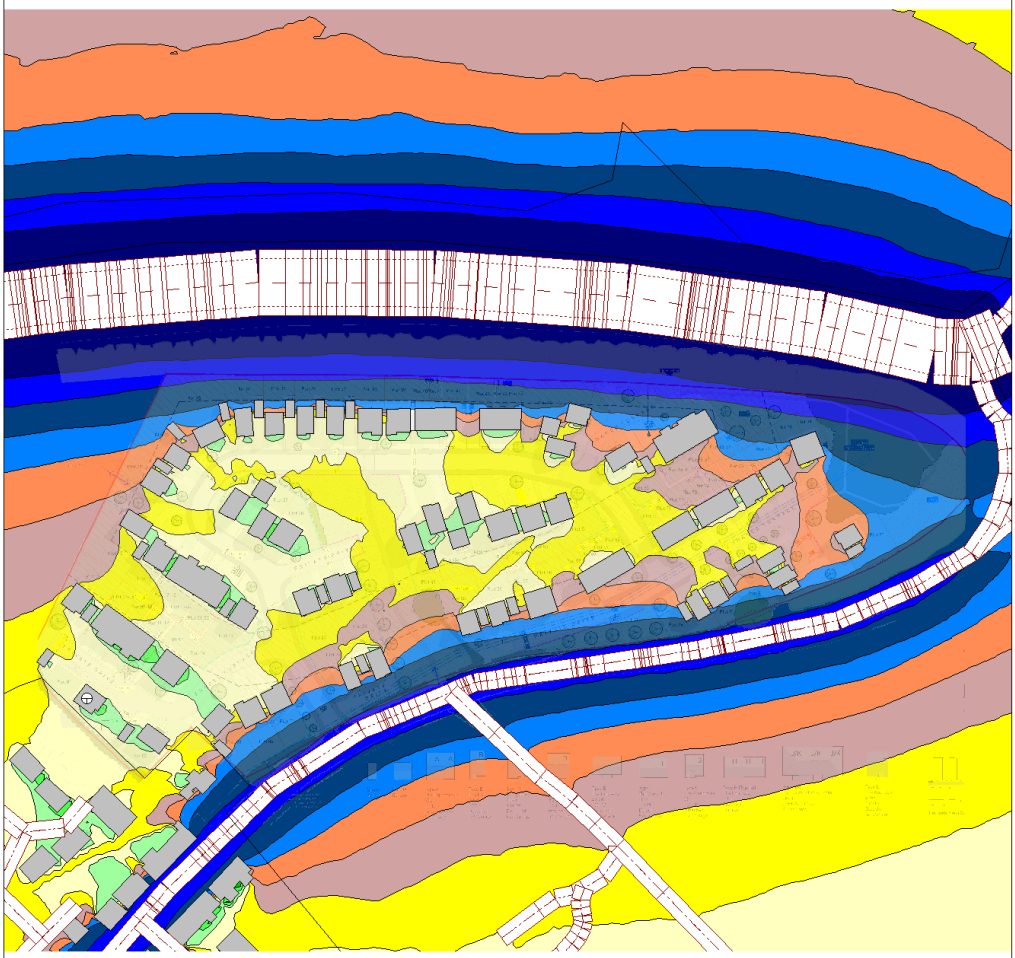
Table B1 - Typical Sound Pressure Levels

Sound Pressure Level (dB)	Location/Example
0	Threshold of hearing
20 - 30	Quiet bedroom at night
30 - 40	Living room during the day
40 - 50	Typical office
50 - 60	Inside a car
60 - 70	Typical high street
70 - 90	Inside factory
100 - 110	Burglar alarm at 1m away
110 - 130	Jet aircraft on take off
140	Threshold of pain

Table B2 - Terminology

Descriptor	Explanation
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} & L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Fast	A time weighting used in the root mean square section of a sound level meter with a 125millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000millisecond time constant.

Appendix C - Daytime Grid Noise Map



Noise Map Objects

- Road
- Building
- Barrier
- Building Evaluation
- Calculation Area

Level LAeq 16 hour
in dB(A)

- ... < 45.0
- 45.0 <= ... < 47.5
- 47.5 <= ... < 50.0
- 50.0 <= ... < 52.5
- 52.5 <= ... < 55.0
- 55.0 <= ... < 57.5
- 57.5 <= ... < 60.0
- 60.0 <= ... < 62.5
- 62.5 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ...

Title:
Daytime Grid Noise Map
1.5m above ground level

Built by: MP

Checked by: JG

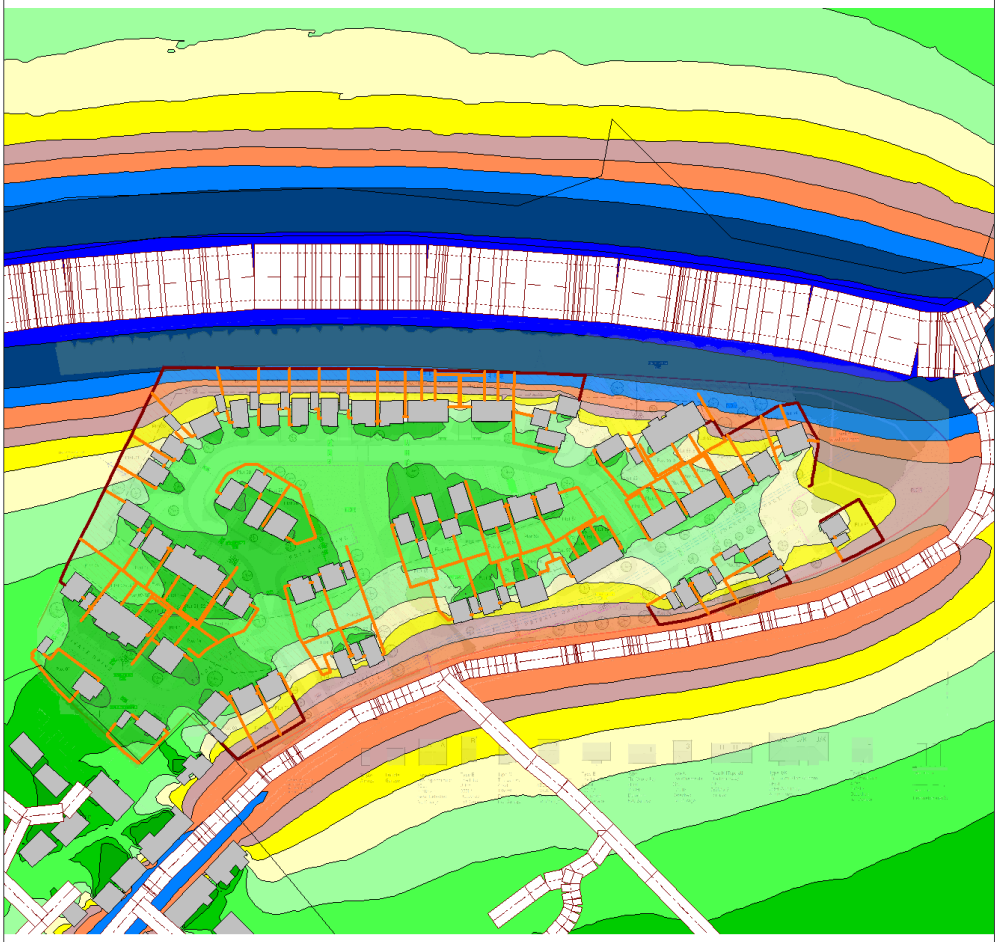
Project No: 20.176

Figure 1

Date : 02/08/2021

PROFESSIONAL CONSULT
FUTURE ENVIRONMENTS

Appendix D - Night-time Grid Noise Map



Noise Map Objects

- Road
- Building
- Barrier
- Calculation Area

Barrier Height (m)

- 1.8m
- 2.5m

Level LAeq 8hr
in dB(A)

- ... < 45.0
- 45.0 <= ... < 47.5
- 47.5 <= ... < 50.0
- 50.0 <= ... < 52.5
- 52.5 <= ... < 55.0
- 55.0 <= ... < 57.5
- 57.5 <= ... < 60.0
- 60.0 <= ... < 62.5
- 62.5 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ...

Title :
Night-Time Grid Noise Map at 4.5m above ground level with Proposed Barriers

Project No: 20.176

Figure 1

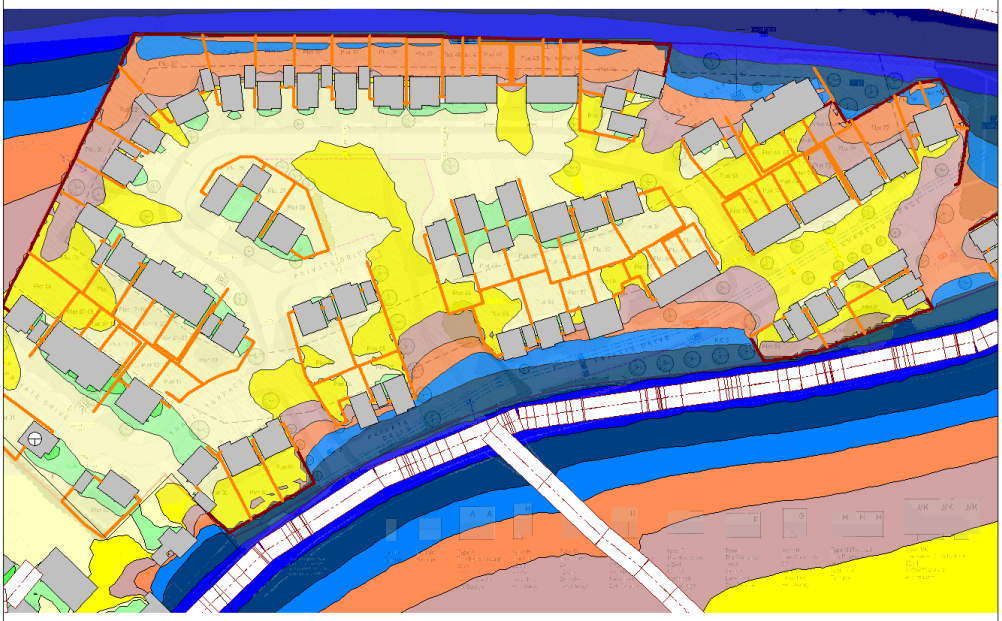
Date : 10/08/2021

Drawn By: MP

Checked By: JG

PROFESSIONAL CONSULT
FUTURE ENVIRONMENTS

Appendix E - Daytime Grid Noise Map - Mitigated



Noise Map Objects

- Road
- Building
- Barrier
- Building Evaluation
- Calculation Area

Barrier Heights

- 1.8m
- 2.5m

Level LAeq 16hr
in dB(A)

- ... < 45.0
- 45.0 <= ... < 47.5
- 47.5 <= ... < 50.0
- 50.0 <= ... < 52.5
- 52.5 <= ... < 55.0
- 55.0 <= ... < 57.5
- 57.5 <= ... < 60.0
- 60.0 <= ... < 62.5
- 62.5 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ...

Title:
Daytime Grid Noise Map
1.5m above ground level - with Proposed Barriers

Project No: 20.176

Figure 1

Date : 02/08/2021

Built by: MP

Checked by: JG

PROFESSIONAL CONSULT
FUTURE ENVIRONMENTS

Appendix F - Daytime Façade Noise Levels

Plot	Floor	Façade Direction	Calculated $L_{Aeq,16hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 1	Ground	E	49.5	30	19.5	35	-15.5	14.5	6/12/6	34.5	No
Plot 1	Ground	N	53.8	30	23.8	35	-11.2	18.8	6/12/6	38.8	**Yes**
Plot 1	Ground	W	54.4	30	24.4	35	-10.6	19.4	6/12/6	39.4	**Yes**
Plot 1	Ground	S	51.1	30	21.1	35	-13.9	16.1	6/12/6	36.1	**Yes**
Plot 2	Ground	N	53.9	30	23.9	35	-11.1	18.9	6/12/6	38.9	**Yes**
Plot 2	Ground	E	53.5	30	23.5	35	-11.5	18.5	6/12/6	38.5	**Yes**
Plot 2	Ground	S	51.4	30	21.4	35	-13.6	16.4	6/12/6	36.4	**Yes**
Plot 2	Ground	W	52.6	30	22.6	35	-12.4	17.6	6/12/6	37.6	**Yes**
Plot 3	Ground	N	51.7	30	21.7	35	-13.3	16.7	6/12/6	36.7	**Yes**
Plot 3	Ground	E	53.9	30	23.9	35	-11.1	18.9	6/12/6	38.9	**Yes**
Plot 3	Ground	S	52.9	30	22.9	35	-12.1	17.9	6/12/6	37.9	**Yes**
Plot 3	Ground	W	52.4	30	22.4	35	-12.6	17.4	6/12/6	37.4	**Yes**
Plot 4	Ground	E	50.9	30	20.9	35	-14.1	15.9	6/12/6	35.9	**Yes**
Plot 4	Ground	S	57.6	30	27.6	35	-7.4	22.6	6/12/6	42.6	**Yes**
Plot 4	Ground	W	53.7	30	23.7	35	-11.3	18.7	6/12/6	38.7	**Yes**
Plot 4	Ground	N	53.2	30	23.2	35	-11.8	18.2	6/12/6	38.2	**Yes**
Plot 5	Ground	W	51.6	30	21.6	35	-13.4	16.6	6/12/6	36.6	**Yes**
Plot 5	Ground	S	58.6	30	28.6	35	-6.4	23.6	6/12/6	43.6	**Yes**
Plot 5	Ground	E	59.1	30	29.1	35	-5.9	24.1	6/12/6	44.1	**Yes**
Plot 5	Ground	N	53.2	30	23.2	35	-11.8	18.2	6/12/6	38.2	**Yes**
Plot 6	Ground	E	49.4	30	19.4	35	-15.6	14.4	6/12/6	34.4	No
Plot 6	Ground	N	56.5	30	26.5	35	-8.5	21.5	6/12/6	41.5	**Yes**
Plot 6	Ground	W	57.3	30	27.3	35	-7.7	22.3	6/12/6	42.3	**Yes**
Plot 6	Ground	S	52.8	30	22.8	35	-12.2	17.8	6/12/6	37.8	**Yes**
Plot 6	Ground	S	48.8	30	18.8	35	-16.2	13.8	6/12/6	33.8	No
Plot 7-12	Ground	E	49	30	19	35	-16	14	6/12/6	34	No
Plot 7-12	Ground	N	55.1	30	25.1	35	-9.9	20.1	6/12/6	40.1	**Yes**
Plot 7-12	Ground	W	52.8	30	22.8	35	-12.2	17.8	6/12/6	37.8	**Yes**
Plot 7-12	Ground	S	52.2	30	22.2	35	-12.8	17.2	6/12/6	37.2	**Yes**
Plot 13-14	Ground	E	50.1	30	20.1	35	-14.9	15.1	6/12/6	35.1	**Yes**
Plot 13-14	Ground	N	53.7	30	23.7	35	-11.3	18.7	6/12/6	38.7	**Yes**
Plot 13-14	Ground	W	50.8	30	20.8	35	-14.2	15.8	6/12/6	35.8	**Yes**
Plot 13-14	Ground	S	51.7	30	21.7	35	-13.3	16.7	6/12/6	36.7	**Yes**
Plot 15	Ground	N	57.1	30	27.1	35	-7.9	22.1	6/12/6	42.1	**Yes**
Plot 15	Ground	E	50.7	30	20.7	35	-14.3	15.7	6/12/6	35.7	**Yes**
Plot 15	Ground	S	54.1	30	24.1	35	-10.9	19.1	6/12/6	39.1	**Yes**
Plot 15	Ground	W	58.9	30	28.9	35	-6.1	23.9	6/12/6	43.9	**Yes**
Plot 16	Ground	E	49.2	30	19.2	35	-15.8	14.2	6/12/6	34.2	No
Plot 16	Ground	S	52.6	30	22.6	35	-12.4	17.6	6/12/6	37.6	**Yes**
Plot 16	Ground	W	52.3	30	22.3	35	-12.7	17.3	6/12/6	37.3	**Yes**
Plot 16	Ground	N	53.2	30	23.2	35	-11.8	18.2	6/12/6	38.2	**Yes**
Plot 17-22	Ground	W	49.9	30	19.9	35	-15.1	14.9	6/12/6	34.9	No
Plot 17-22	Ground	S	52.9	30	22.9	35	-12.1	17.9	6/12/6	37.9	**Yes**
Plot 17-22	Ground	E	49.6	30	19.6	35	-15.4	14.6	6/12/6	34.6	No
Plot 17-22	Ground	N	53.8	30	23.8	35	-11.2	18.8	6/12/6	38.8	**Yes**
Plot 23	Ground	N	52.8	30	22.8	35	-12.2	17.8	6/12/6	37.8	**Yes**
Plot 23	Ground	W	50.5	30	20.5	35	-14.5	15.5	6/12/6	35.5	**Yes**
Plot 23	Ground	S	53.4	30	23.4	35	-11.6	18.4	6/12/6	38.4	**Yes**
Plot 23	Ground	E	54.1	30	24.1	35	-10.9	19.1	6/12/6	39.1	**Yes**
Plot 24	Ground	W	53.6	30	23.6	35	-11.4	18.6	6/12/6	38.6	**Yes**
Plot 24	Ground	S	55.1	30	25.1	35	-9.9	20.1	6/12/6	40.1	**Yes**
Plot 24	Ground	E	50.1	30	20.1	35	-14.9	15.1	6/12/6	35.1	**Yes**
Plot 24	Ground	N	53.5	30	23.5	35	-11.5	18.5	6/12/6	38.5	**Yes**

Plot	Floor	Façade Direction	Calculated $L_{Aeq,16hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 25	Ground	N	53.6	30	23.6	35	-11.4	18.6	6/12/6	38.6	**Yes**
Plot 25	Ground	W	51	30	21	35	-14	16	6/12/6	36	**Yes**
Plot 25	Ground	S	55.5	30	25.5	35	-9.5	20.5	6/12/6	40.5	**Yes**
Plot 25	Ground	E	51.6	30	21.6	35	-13.4	16.6	6/12/6	36.6	**Yes**
Plot 26	Ground	E	59	30	29	35	-6	24	6/12/6	44	**Yes**
Plot 26	Ground	S	65.8	30	35.8	35	0.8	30.8	4/16/6.4	50.8	**Yes**
Plot 26	Ground	W	60.7	30	30.7	35	-4.3	25.7	6/12/6	45.7	**Yes**
Plot 26	Ground	N	52.9	30	22.9	35	-12.1	17.9	6/12/6	37.9	**Yes**
Plot 27	Ground	E	61.6	30	31.6	35	-3.4	26.6	6/12/6	46.6	**Yes**
Plot 27	Ground	S	66.2	30	36.2	35	1.2	31.2	4/16/6.4	51.2	**Yes**
Plot 27	Ground	W	58.1	30	28.1	35	-6.9	23.1	6/12/6	43.1	**Yes**
Plot 27	Ground	N	52.7	30	22.7	35	-12.3	17.7	6/12/6	37.7	**Yes**
Plot 28	Ground	S	51.5	30	21.5	35	-13.5	16.5	6/12/6	36.5	**Yes**
Plot 28	Ground	W	49.9	30	19.9	35	-15.1	14.9	6/12/6	34.9	No
Plot 28	Ground	N	53.4	30	23.4	35	-11.6	18.4	6/12/6	38.4	**Yes**
Plot 28	Ground	E	51	30	21	35	-14	16	6/12/6	36	**Yes**
Plot 29	Ground	N	53.7	30	23.7	35	-11.3	18.7	6/12/6	38.7	**Yes**
Plot 29	Ground	W	52.3	30	22.3	35	-12.7	17.3	6/12/6	37.3	**Yes**
Plot 29	Ground	S	53.5	30	23.5	35	-11.5	18.5	6/12/6	38.5	**Yes**
Plot 29	Ground	S	52	30	22	35	-13	17	6/12/6	37	**Yes**
Plot 29	Ground	E	49.8	30	19.8	35	-15.2	14.8	6/12/6	34.8	No
Plot 30	Ground	N	54.5	30	24.5	35	-10.5	19.5	6/12/6	39.5	**Yes**
Plot 30	Ground	W	55.1	30	25.1	35	-9.9	20.1	6/12/6	40.1	**Yes**
Plot 30	Ground	S	53.4	30	23.4	35	-11.6	18.4	6/12/6	38.4	**Yes**
Plot 30	Ground	E	51	30	21	35	-14	16	6/12/6	36	**Yes**
Plot 31	Ground	N	55.7	30	25.7	35	-9.3	20.7	6/12/6	40.7	**Yes**
Plot 31	Ground	W	60.4	30	30.4	35	-4.6	25.4	6/12/6	45.4	**Yes**
Plot 31	Ground	S	55.9	30	25.9	35	-9.1	20.9	6/12/6	40.9	**Yes**
Plot 31	Ground	E	51.8	30	21.8	35	-13.2	16.8	6/12/6	36.8	**Yes**
Plot 32	Ground	N	57.8	30	27.8	35	-7.2	22.8	6/12/6	42.8	**Yes**
Plot 32	Ground	W	60.9	30	30.9	35	-4.1	25.9	6/12/6	45.9	**Yes**
Plot 32	Ground	S	55	30	25	35	-10	20	6/12/6	40	**Yes**
Plot 32	Ground	E	52.2	30	22.2	35	-12.8	17.2	6/12/6	37.2	**Yes**
Plot 33	Ground	E	56	30	26	35	-9	21	6/12/6	41	**Yes**
Plot 33	Ground	N	61.6	30	31.6	35	-3.4	26.6	6/12/6	46.6	**Yes**
Plot 33	Ground	W	58.1	30	28.1	35	-6.9	23.1	6/12/6	43.1	**Yes**
Plot 33	Ground	S	51.6	30	21.6	35	-13.4	16.6	6/12/6	36.6	**Yes**
Plot 34	Ground	W	56.7	30	26.7	35	-8.3	21.7	6/12/6	41.7	**Yes**
Plot 34	Ground	N	61.5	30	31.5	35	-3.5	26.5	6/12/6	46.5	**Yes**
Plot 34	Ground	E	55.8	30	25.8	35	-9.2	20.8	6/12/6	40.8	**Yes**
Plot 34	Ground	S	51.9	30	21.9	35	-13.1	16.9	6/12/6	36.9	**Yes**
Plot 35	Ground	W	55	30	25	35	-10	20	6/12/6	40	**Yes**
Plot 35	Ground	N	60.4	30	30.4	35	-4.6	25.4	6/12/6	45.4	**Yes**
Plot 35	Ground	E	55.2	30	25.2	35	-9.8	20.2	6/12/6	40.2	**Yes**
Plot 35	Ground	S	51.9	30	21.9	35	-13.1	16.9	6/12/6	36.9	**Yes**
Plot 36	Ground	E	55.3	30	25.3	35	-9.7	20.3	6/12/6	40.3	**Yes**
Plot 36	Ground	N	61.5	30	31.5	35	-3.5	26.5	6/12/6	46.5	**Yes**
Plot 36	Ground	W	55.6	30	25.6	35	-9.4	20.6	6/12/6	40.6	**Yes**
Plot 36	Ground	S	52.3	30	22.3	35	-12.7	17.3	6/12/6	37.3	**Yes**
Plot 37	Ground	W	55.1	30	25.1	35	-9.9	20.1	6/12/6	40.1	**Yes**
Plot 37	Ground	N	61.6	30	31.6	35	-3.4	26.6	6/12/6	46.6	**Yes**
Plot 37	Ground	E	55.4	30	25.4	35	-9.6	20.4	6/12/6	40.4	**Yes**
Plot 37	Ground	S	52.3	30	22.3	35	-12.7	17.3	6/12/6	37.3	**Yes**

Plot	Floor	Façade Direction	Calculated $L_{Aeq,16hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 38	Ground	N	61.6	30	31.6	35	-3.4	26.6	6/12/6	46.6	Yes
Plot 38	Ground	W	55.4	30	25.4	35	-9.6	20.4	6/12/6	40.4	Yes
Plot 38	Ground	S	52.1	30	22.1	35	-12.9	17.1	6/12/6	37.1	Yes
Plot 38	Ground	E	54.6	30	24.6	35	-10.4	19.6	6/12/6	39.6	Yes
Plot 39	Ground	N	61.8	30	31.8	35	-3.2	26.8	6/12/6	46.8	Yes
Plot 39	Ground	W	54.3	30	24.3	35	-10.7	19.3	6/12/6	39.3	Yes
Plot 39	Ground	S	52	30	22	35	-13	17	6/12/6	37	Yes
Plot 39	Ground	E	54.4	30	24.4	35	-10.6	19.4	6/12/6	39.4	Yes
Plot 40-42	Ground	N	62	30	32	35	-3	27	6/12/6	47	Yes
Plot 40-42	Ground	W	54.6	30	24.6	35	-10.4	19.6	6/12/6	39.6	Yes
Plot 40-42	Ground	S	51.7	30	21.7	35	-13.3	16.7	6/12/6	36.7	Yes
Plot 40-42	Ground	E	57.4	30	27.4	35	-7.6	22.4	6/12/6	42.4	Yes
Plot 43-45	Ground	E	58.1	30	28.1	35	-6.9	23.1	6/12/6	43.1	Yes
Plot 43-45	Ground	N	62.3	30	32.3	35	-2.7	27.3	6/12/6	47.3	Yes
Plot 43-45	Ground	W	57.8	30	27.8	35	-7.2	22.8	6/12/6	42.8	Yes
Plot 43-45	Ground	S	51.7	30	21.7	35	-13.3	16.7	6/12/6	36.7	Yes
Plot 46	Ground	W	59.5	30	29.5	35	-5.5	24.5	6/12/6	44.5	Yes
Plot 46	Ground	N	64	30	34	35	-1	29	6/12/6	49	Yes
Plot 46	Ground	E	64.1	30	34.1	35	-0.9	29.1	6/12/6	49.1	Yes
Plot 46	Ground	S	52	30	22	35	-13	17	6/12/6	37	Yes
Plot 47	Ground	N	58.4	30	28.4	35	-6.6	23.4	6/12/6	43.4	Yes
Plot 47	Ground	W	54.8	30	24.8	35	-10.2	19.8	6/12/6	39.8	Yes
Plot 47	Ground	S	51.8	30	21.8	35	-13.2	16.8	6/12/6	36.8	Yes
Plot 47	Ground	E	58.6	30	28.6	35	-6.4	23.6	6/12/6	43.6	Yes
Plot 48	Ground	W	54.4	30	24.4	35	-10.6	19.4	6/12/6	39.4	Yes
Plot 48	Ground	S	54.6	30	24.6	35	-10.4	19.6	6/12/6	39.6	Yes
Plot 48	Ground	E	51.1	30	21.1	35	-13.9	16.1	6/12/6	36.1	Yes
Plot 48	Ground	N	53.8	30	23.8	35	-11.2	18.8	6/12/6	38.8	Yes
Plot 49	Ground	E	52.2	30	22.2	35	-12.8	17.2	6/12/6	37.2	Yes
Plot 49	Ground	S	52.9	30	22.9	35	-12.1	17.9	6/12/6	37.9	Yes
Plot 49	Ground	W	53.1	30	23.1	35	-11.9	18.1	6/12/6	38.1	Yes
Plot 49	Ground	N	54.6	30	24.6	35	-10.4	19.6	6/12/6	39.6	Yes
Plot 50	Ground	E	53.8	30	23.8	35	-11.2	18.8	6/12/6	38.8	Yes
Plot 50	Ground	N	55	30	25	35	-10	20	6/12/6	40	Yes
Plot 50	Ground	W	52	30	22	35	-13	17	6/12/6	37	Yes
Plot 50	Ground	S	50.4	30	20.4	35	-14.6	15.4	6/12/6	35.4	Yes
Plot 51-52	Ground	E	51.1	30	21.1	35	-13.9	16.1	6/12/6	36.1	Yes
Plot 51-52	Ground	N	54.7	30	24.7	35	-10.3	19.7	6/12/6	39.7	Yes
Plot 51-52	Ground	W	52	30	22	35	-13	17	6/12/6	37	Yes
Plot 51-52	Ground	S	53.1	30	23.1	35	-11.9	18.1	6/12/6	38.1	Yes
Plot 53	Ground	E	52.5	30	22.5	35	-12.5	17.5	6/12/6	37.5	Yes
Plot 53	Ground	N	55.5	30	25.5	35	-9.5	20.5	6/12/6	40.5	Yes
Plot 53	Ground	W	50.8	30	20.8	35	-14.2	15.8	6/12/6	35.8	Yes
Plot 53	Ground	S	54.4	30	24.4	35	-10.6	19.4	6/12/6	39.4	Yes
Plot 54	Ground	E	55	30	25	35	-10	20	6/12/6	40	Yes
Plot 54	Ground	N	56.4	30	26.4	35	-8.6	21.4	6/12/6	41.4	Yes
Plot 54	Ground	W	51.7	30	21.7	35	-13.3	16.7	6/12/6	36.7	Yes
Plot 54	Ground	S	52.2	30	22.2	35	-12.8	17.2	6/12/6	37.2	Yes
Plot 55	Ground	E	54.2	30	24.2	35	-10.8	19.2	6/12/6	39.2	Yes
Plot 55	Ground	N	53.5	30	23.5	35	-11.5	18.5	6/12/6	38.5	Yes
Plot 55	Ground	W	62	30	32	35	-3	27	6/12/6	47	Yes
Plot 55	Ground	S	65	30	35	35	0	30	6/12/6	50	Yes
Plot 56	Ground	N	53.6	30	23.6	35	-11.4	18.6	6/12/6	38.6	Yes

Plot	Floor	Façade Direction	Calculated $L_{Aeq,16hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 56	Ground	W	54.6	30	24.6	35	-10.4	19.6	6/12/6	39.6	Yes
Plot 56	Ground	S	64.2	30	34.2	35	-0.8	29.2	6/12/6	49.2	Yes
Plot 56	Ground	E	55.1	30	25.1	35	-9.9	20.1	6/12/6	40.1	Yes
Plot 57-58	Ground	E	58.2	30	28.2	35	-6.8	23.2	6/12/6	43.2	Yes
Plot 57-58	Ground	N	53.7	30	23.7	35	-11.3	18.7	6/12/6	38.7	Yes
Plot 57-58	Ground	W	59.5	30	29.5	35	-5.5	24.5	6/12/6	44.5	Yes
Plot 57-58	Ground	S	63.3	30	33.3	35	-1.7	28.3	6/12/6	48.3	Yes
Plot 59-62	Ground	E	53.5	30	23.5	35	-11.5	18.5	6/12/6	38.5	Yes
Plot 59-62	Ground	N	54.4	30	24.4	35	-10.6	19.4	6/12/6	39.4	Yes
Plot 59-62	Ground	W	57.1	30	27.1	35	-7.9	22.1	6/12/6	42.1	Yes
Plot 59-62	Ground	S	59.7	30	29.7	35	-5.3	24.7	6/12/6	44.7	Yes
Plot 63	Ground	E	60.8	30	30.8	35	-4.2	25.8	6/12/6	45.8	Yes
Plot 63	Ground	N	60.6	30	30.6	35	-4.4	25.6	6/12/6	45.6	Yes
Plot 63	Ground	W	53.5	30	23.5	35	-11.5	18.5	6/12/6	38.5	Yes
Plot 63	Ground	S	52.3	30	22.3	35	-12.7	17.3	6/12/6	37.3	Yes
Plot 64-69	Ground	E	66.4	30	36.4	35	1.4	31.4	4/16/6.4	51.4	Yes
Plot 64-69	Ground	S	55	30	25	35	-10	20	6/12/6	40	Yes
Plot 64-69	Ground	W	54.7	30	24.7	35	-10.3	19.7	6/12/6	39.7	Yes
Plot 64-69	Ground	N	65.8	30	35.8	35	0.8	30.8	4/16/6.4	50.8	Yes
Plot 70-72	Ground	E	52.1	30	22.1	35	-12.9	17.1	6/12/6	37.1	Yes
Plot 70-72	Ground	S	55.8	30	25.8	35	-9.2	20.8	6/12/6	40.8	Yes
Plot 70-72	Ground	W	55.6	30	25.6	35	-9.4	20.6	6/12/6	40.6	Yes
Plot 70-72	Ground	N	56.3	30	26.3	35	-8.7	21.3	6/12/6	41.3	Yes
Plot 73-75	Ground	N	57.9	30	27.9	35	-7.1	22.9	6/12/6	42.9	Yes
Plot 73-75	Ground	W	51.8	30	21.8	35	-13.2	16.8	6/12/6	36.8	Yes
Plot 73-75	Ground	S	54.8	30	24.8	35	-10.2	19.8	6/12/6	39.8	Yes
Plot 73-75	Ground	E	54.9	30	24.9	35	-10.1	19.9	6/12/6	39.9	Yes
Plot 76	Ground	E	55.9	30	25.9	35	-9.1	20.9	6/12/6	40.9	Yes
Plot 76	Ground	N	59.5	30	29.5	35	-5.5	24.5	6/12/6	44.5	Yes
Plot 76	Ground	W	51.6	30	21.6	35	-13.4	16.6	6/12/6	36.6	Yes
Plot 76	Ground	S	55.3	30	25.3	35	-9.7	20.3	6/12/6	40.3	Yes
Plot 77	Ground	E	57.6	30	27.6	35	-7.4	22.6	6/12/6	42.6	Yes
Plot 77	Ground	S	55.8	30	25.8	35	-9.2	20.8	6/12/6	40.8	Yes
Plot 77	Ground	W	53.4	30	23.4	35	-11.6	18.4	6/12/6	38.4	Yes
Plot 77	Ground	N	60.2	30	30.2	35	-4.8	25.2	6/12/6	45.2	Yes
Plot 78-79	Ground	E	64.5	30	34.5	35	-0.5	29.5	6/12/6	49.5	Yes
Plot 78-79	Ground	N	64	30	34	35	-1	29	6/12/6	49	Yes
Plot 78-79	Ground	W	57.8	30	27.8	35	-7.2	22.8	6/12/6	42.8	Yes
Plot 78-79	Ground	S	53.5	30	23.5	35	-11.5	18.5	6/12/6	38.5	Yes
Plot 80	Ground	S	51.9	30	21.9	35	-13.1	16.9	6/12/6	36.9	Yes
Plot 80	Ground	E	60.7	30	30.7	35	-4.3	25.7	6/12/6	45.7	Yes
Plot 80	Ground	N	59.8	30	29.8	35	-5.2	24.8	6/12/6	44.8	Yes
Plot 80	Ground	W	58.9	30	28.9	35	-6.1	23.9	6/12/6	43.9	Yes
Plot 81	Ground	N	53.8	30	23.8	35	-11.2	18.8	6/12/6	38.8	Yes
Plot 81	Ground	W	55.5	30	25.5	35	-9.5	20.5	6/12/6	40.5	Yes
Plot 81	Ground	S	53.2	30	23.2	35	-11.8	18.2	6/12/6	38.2	Yes
Plot 81	Ground	E	61	30	31	35	-4	26	6/12/6	46	Yes
Plot 82	Ground	S	50.2	30	20.2	35	-14.8	15.2	6/12/6	35.2	Yes
Plot 82	Ground	W	54.4	30	24.4	35	-10.6	19.4	6/12/6	39.4	Yes
Plot 82	Ground	N	57.6	30	27.6	35	-7.4	22.6	6/12/6	42.6	Yes
Plot 82	Ground	E	60.2	30	30.2	35	-4.8	25.2	6/12/6	45.2	Yes
Plot 83	Ground	S	58	30	28	35	-7	23	6/12/6	43	Yes
Plot 83	Ground	W	51.6	30	21.6	35	-13.4	16.6	6/12/6	36.6	Yes

Plot	Floor	Façade Direction	Calculated $L_{Aeq,16hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 83	Ground	N	54.5	30	24.5	35	-10.5	19.5	6/12/6	39.5	**Yes**
Plot 83	Ground	E	54.1	30	24.1	35	-10.9	19.1	6/12/6	39.1	**Yes**
Plot 84	Ground	S	59.3	30	29.3	35	-5.7	24.3	6/12/6	44.3	**Yes**
Plot 84	Ground	W	53.6	30	23.6	35	-11.4	18.6	6/12/6	38.6	**Yes**
Plot 84	Ground	N	57	30	27	35	-8	22	6/12/6	42	**Yes**
Plot 84	Ground	E	52.4	30	22.4	35	-12.6	17.4	6/12/6	37.4	**Yes**

Appendix G - Night-time Façade Noise Levels

Plot	Floor	Façade Direction	Calculated $L_{Aeq,8hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 1	1st	E	43.7	30	13.7	30	-16.3	13.7	6/12/6	28.7	No
Plot 1	1st	N	46.2	30	16.2	30	-13.8	16.2	6/12/6	31.2	**Yes**
Plot 1	1st	W	46.5	30	16.5	30	-13.5	16.5	6/12/6	31.5	**Yes**
Plot 1	1st	S	44.1	30	14.1	30	-15.9	14.1	6/12/6	29.1	No
Plot 2	1st	N	46.9	30	16.9	30	-13.1	16.9	6/12/6	31.9	**Yes**
Plot 2	1st	E	48.1	30	18.1	30	-11.9	18.1	6/12/6	33.1	**Yes**
Plot 2	1st	S	44.8	30	14.8	30	-15.2	14.8	6/12/6	29.8	No
Plot 2	1st	W	45.2	30	15.2	30	-14.8	15.2	6/12/6	30.2	**Yes**
Plot 3	1st	N	44.7	30	14.7	30	-15.3	14.7	6/12/6	29.7	No
Plot 3	1st	E	50	30	20	30	-10	20	6/12/6	35	**Yes**
Plot 3	1st	S	47.8	30	17.8	30	-12.2	17.8	6/12/6	32.8	**Yes**
Plot 3	1st	W	45.1	30	15.1	30	-14.9	15.1	6/12/6	30.1	**Yes**
Plot 4	1st	E	45.5	30	15.5	30	-14.5	15.5	6/12/6	30.5	**Yes**
Plot 4	1st	S	54.4	30	24.4	30	-5.6	24.4	6/12/6	39.4	**Yes**
Plot 4	1st	W	49.4	30	19.4	30	-10.6	19.4	6/12/6	34.4	**Yes**
Plot 4	1st	N	45.6	30	15.6	30	-14.4	15.6	6/12/6	30.6	**Yes**
Plot 5	1st	W	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	**Yes**
Plot 5	1st	S	55.3	30	25.3	30	-4.7	25.3	6/12/6	40.3	**Yes**
Plot 5	1st	E	52.5	30	22.5	30	-7.5	22.5	6/12/6	37.5	**Yes**
Plot 5	1st	N	45.6	30	15.6	30	-14.4	15.6	6/12/6	30.6	**Yes**
Plot 6	1st	E	43.6	30	13.6	30	-16.4	13.6	6/12/6	28.6	No
Plot 6	1st	N	48.7	30	18.7	30	-11.3	18.7	6/12/6	33.7	**Yes**
Plot 6	1st	W	49.3	30	19.3	30	-10.7	19.3	6/12/6	34.3	**Yes**
Plot 6	1st	S	45.6	30	15.6	30	-14.4	15.6	6/12/6	30.6	**Yes**
Plot 6	1st	S	43.3	30	13.3	30	-16.7	13.3	6/12/6	28.3	No
Plot 7-12	1st	E	43	30	13	30	-17	13	6/12/6	28	No
Plot 7-12	1st	N	47.4	30	17.4	30	-12.6	17.4	6/12/6	32.4	**Yes**
Plot 7-12	1st	W	46.5	30	16.5	30	-13.5	16.5	6/12/6	31.5	**Yes**
Plot 7-12	1st	S	45	30	15	30	-15	15	6/12/6	30	No
Plot 13-14	1st	E	43.8	30	13.8	30	-16.2	13.8	6/12/6	28.8	No
Plot 13-14	1st	N	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	**Yes**
Plot 13-14	1st	W	44.7	30	14.7	30	-15.3	14.7	6/12/6	29.7	No
Plot 13-14	1st	S	44.9	30	14.9	30	-15.1	14.9	6/12/6	29.9	No
Plot 15	1st	N	50	30	20	30	-10	20	6/12/6	35	**Yes**
Plot 15	1st	E	44.6	30	14.6	30	-15.4	14.6	6/12/6	29.6	No
Plot 15	1st	S	46.9	30	16.9	30	-13.1	16.9	6/12/6	31.9	**Yes**
Plot 15	1st	W	51.4	30	21.4	30	-8.6	21.4	6/12/6	36.4	**Yes**
Plot 16	1st	E	43.4	30	13.4	30	-16.6	13.4	6/12/6	28.4	No
Plot 16	1st	S	45.7	30	15.7	30	-14.3	15.7	6/12/6	30.7	**Yes**
Plot 16	1st	W	47.6	30	17.6	30	-12.4	17.6	6/12/6	32.6	**Yes**
Plot 16	1st	N	46.6	30	16.6	30	-13.4	16.6	6/12/6	31.6	**Yes**
Plot 17-22	1st	W	44.4	30	14.4	30	-15.6	14.4	6/12/6	29.4	No
Plot 17-22	1st	S	45.7	30	15.7	30	-14.3	15.7	6/12/6	30.7	**Yes**
Plot 17-22	1st	E	43.5	30	13.5	30	-16.5	13.5	6/12/6	28.5	No
Plot 17-22	1st	N	46.6	30	16.6	30	-13.4	16.6	6/12/6	31.6	**Yes**
Plot 23	1st	N	45.8	30	15.8	30	-14.2	15.8	6/12/6	30.8	**Yes**
Plot 23	1st	W	44.7	30	14.7	30	-15.3	14.7	6/12/6	29.7	No
Plot 23	1st	S	46.5	30	16.5	30	-13.5	16.5	6/12/6	31.5	**Yes**
Plot 23	1st	E	47.5	30	17.5	30	-12.5	17.5	6/12/6	32.5	**Yes**
Plot 24	1st	W	46.9	30	16.9	30	-13.1	16.9	6/12/6	31.9	**Yes**
Plot 24	1st	S	48.9	30	18.9	30	-11.1	18.9	6/12/6	33.9	**Yes**
Plot 24	1st	E	47.2	30	17.2	30	-12.8	17.2	6/12/6	32.2	**Yes**
Plot 24	1st	N	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	**Yes**

Plot	Floor	Façade Direction	Calculated $L_{Aeq,8hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 25	1st	N	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	**Yes**
Plot 25	1st	W	46.9	30	16.9	30	-13.1	16.9	6/12/6	31.9	**Yes**
Plot 25	1st	S	49.1	30	19.1	30	-10.9	19.1	6/12/6	34.1	**Yes**
Plot 25	1st	E	48.2	30	18.2	30	-11.8	18.2	6/12/6	33.2	**Yes**
Plot 26	1st	E	52.3	30	22.3	30	-7.7	22.3	6/12/6	37.3	**Yes**
Plot 26	1st	S	58.8	30	28.8	30	-1.2	28.8	6/12/6	43.8	**Yes**
Plot 26	1st	W	54.4	30	24.4	30	-5.6	24.4	6/12/6	39.4	**Yes**
Plot 26	1st	N	45.5	30	15.5	30	-14.5	15.5	6/12/6	30.5	**Yes**
Plot 27	1st	E	54.8	30	24.8	30	-5.2	24.8	6/12/6	39.8	**Yes**
Plot 27	1st	S	59.1	30	29.1	30	-0.9	29.1	6/12/6	44.1	**Yes**
Plot 27	1st	W	52.8	30	22.8	30	-7.2	22.8	6/12/6	37.8	**Yes**
Plot 27	1st	N	45.4	30	15.4	30	-14.6	15.4	6/12/6	30.4	**Yes**
Plot 28	1st	S	45.3	30	15.3	30	-14.7	15.3	6/12/6	30.3	**Yes**
Plot 28	1st	W	44	30	14	30	-16	14	6/12/6	29	No
Plot 28	1st	N	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	**Yes**
Plot 28	1st	E	44.7	30	14.7	30	-15.3	14.7	6/12/6	29.7	No
Plot 29	1st	N	46.6	30	16.6	30	-13.4	16.6	6/12/6	31.6	**Yes**
Plot 29	1st	W	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	**Yes**
Plot 29	1st	S	46.7	30	16.7	30	-13.3	16.7	6/12/6	31.7	**Yes**
Plot 29	1st	S	45.6	30	15.6	30	-14.4	15.6	6/12/6	30.6	**Yes**
Plot 29	1st	E	44.1	30	14.1	30	-15.9	14.1	6/12/6	29.1	No
Plot 30	1st	N	47.6	30	17.6	30	-12.4	17.6	6/12/6	32.6	**Yes**
Plot 30	1st	W	48.5	30	18.5	30	-11.5	18.5	6/12/6	33.5	**Yes**
Plot 30	1st	S	46.7	30	16.7	30	-13.3	16.7	6/12/6	31.7	**Yes**
Plot 30	1st	E	44.8	30	14.8	30	-15.2	14.8	6/12/6	29.8	No
Plot 31	1st	N	51.8	30	21.8	30	-8.2	21.8	6/12/6	36.8	**Yes**
Plot 31	1st	W	53.6	30	23.6	30	-6.4	23.6	6/12/6	38.6	**Yes**
Plot 31	1st	S	48.8	30	18.8	30	-11.2	18.8	6/12/6	33.8	**Yes**
Plot 31	1st	E	45.7	30	15.7	30	-14.3	15.7	6/12/6	30.7	**Yes**
Plot 32	1st	N	53	30	23	30	-7	23	6/12/6	38	**Yes**
Plot 32	1st	W	55.4	30	25.4	30	-4.6	25.4	6/12/6	40.4	**Yes**
Plot 32	1st	S	50.4	30	20.4	30	-9.6	20.4	6/12/6	35.4	**Yes**
Plot 32	1st	E	46.3	30	16.3	30	-13.7	16.3	6/12/6	31.3	**Yes**
Plot 33	1st	E	50.8	30	20.8	30	-9.2	20.8	6/12/6	35.8	**Yes**
Plot 33	1st	N	56.5	30	26.5	30	-3.5	26.5	6/12/6	41.5	**Yes**
Plot 33	1st	W	54.6	30	24.6	30	-5.4	24.6	6/12/6	39.6	**Yes**
Plot 33	1st	S	46.2	30	16.2	30	-13.8	16.2	6/12/6	31.2	**Yes**
Plot 34	1st	W	53.5	30	23.5	30	-6.5	23.5	6/12/6	38.5	**Yes**
Plot 34	1st	N	57.7	30	27.7	30	-2.3	27.7	6/12/6	42.7	**Yes**
Plot 34	1st	E	51.5	30	21.5	30	-8.5	21.5	6/12/6	36.5	**Yes**
Plot 34	1st	S	46.3	30	16.3	30	-13.7	16.3	6/12/6	31.3	**Yes**
Plot 35	1st	W	50.4	30	20.4	30	-9.6	20.4	6/12/6	35.4	**Yes**
Plot 35	1st	N	55.9	30	25.9	30	-4.1	25.9	6/12/6	40.9	**Yes**
Plot 35	1st	E	50.4	30	20.4	30	-9.6	20.4	6/12/6	35.4	**Yes**
Plot 35	1st	S	46.3	30	16.3	30	-13.7	16.3	6/12/6	31.3	**Yes**
Plot 36	1st	E	50.9	30	20.9	30	-9.1	20.9	6/12/6	35.9	**Yes**
Plot 36	1st	N	57.7	30	27.7	30	-2.3	27.7	6/12/6	42.7	**Yes**
Plot 36	1st	W	51.5	30	21.5	30	-8.5	21.5	6/12/6	36.5	**Yes**
Plot 36	1st	S	46.6	30	16.6	30	-13.4	16.6	6/12/6	31.6	**Yes**
Plot 37	1st	W	50.9	30	20.9	30	-9.1	20.9	6/12/6	35.9	**Yes**
Plot 37	1st	N	57.7	30	27.7	30	-2.3	27.7	6/12/6	42.7	**Yes**
Plot 37	1st	E	51.1	30	21.1	30	-8.9	21.1	6/12/6	36.1	**Yes**
Plot 37	1st	S	46.5	30	16.5	30	-13.5	16.5	6/12/6	31.5	**Yes**

Plot	Floor	Façade Direction	Calculated $L_{Aeq,8hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 38	1st	N	57	30	27	30	-3	27	6/12/6	42	Yes
Plot 38	1st	W	50.9	30	20.9	30	-9.1	20.9	6/12/6	35.9	Yes
Plot 38	1st	S	46.3	30	16.3	30	-13.7	16.3	6/12/6	31.3	Yes
Plot 38	1st	E	49.1	30	19.1	30	-10.9	19.1	6/12/6	34.1	Yes
Plot 39	1st	N	57	30	27	30	-3	27	6/12/6	42	Yes
Plot 39	1st	W	48.9	30	18.9	30	-11.1	18.9	6/12/6	33.9	Yes
Plot 39	1st	S	46.2	30	16.2	30	-13.8	16.2	6/12/6	31.2	Yes
Plot 39	1st	E	49	30	19	30	-11	19	6/12/6	34	Yes
Plot 40-42	1st	N	57.3	30	27.3	30	-2.7	27.3	6/12/6	42.3	Yes
Plot 40-42	1st	W	49.3	30	19.3	30	-10.7	19.3	6/12/6	34.3	Yes
Plot 40-42	1st	S	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	Yes
Plot 40-42	1st	E	51.7	30	21.7	30	-8.3	21.7	6/12/6	36.7	Yes
Plot 43-45	1st	E	52.5	30	22.5	30	-7.5	22.5	6/12/6	37.5	Yes
Plot 43-45	1st	N	57.9	30	27.9	30	-2.1	27.9	6/12/6	42.9	Yes
Plot 43-45	1st	W	52.4	30	22.4	30	-7.6	22.4	6/12/6	37.4	Yes
Plot 43-45	1st	S	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	Yes
Plot 46	1st	W	54.6	30	24.6	30	-5.4	24.6	6/12/6	39.6	Yes
Plot 46	1st	N	60.8	30	30.8	30	0.8	30.8	6/12/6	45.8	Yes
Plot 46	1st	E	58.8	30	28.8	30	-1.2	28.8	6/12/6	43.8	Yes
Plot 46	1st	S	46.6	30	16.6	30	-13.4	16.6	6/12/6	31.6	Yes
Plot 47	1st	N	52.7	30	22.7	30	-7.3	22.7	6/12/6	37.7	Yes
Plot 47	1st	W	49.1	30	19.1	30	-10.9	19.1	6/12/6	34.1	Yes
Plot 47	1st	S	45.8	30	15.8	30	-14.2	15.8	6/12/6	30.8	Yes
Plot 47	1st	E	52.5	30	22.5	30	-7.5	22.5	6/12/6	37.5	Yes
Plot 48	1st	W	47.6	30	17.6	30	-12.4	17.6	6/12/6	32.6	Yes
Plot 48	1st	S	48.4	30	18.4	30	-11.6	18.4	6/12/6	33.4	Yes
Plot 48	1st	E	45.1	30	15.1	30	-14.9	15.1	6/12/6	30.1	Yes
Plot 48	1st	N	46.5	30	16.5	30	-13.5	16.5	6/12/6	31.5	Yes
Plot 49	1st	E	46	30	16	30	-14	16	6/12/6	31	Yes
Plot 49	1st	S	47.5	30	17.5	30	-12.5	17.5	6/12/6	32.5	Yes
Plot 49	1st	W	46.6	30	16.6	30	-13.4	16.6	6/12/6	31.6	Yes
Plot 49	1st	N	47.1	30	17.1	30	-12.9	17.1	6/12/6	32.1	Yes
Plot 50	1st	E	46.7	30	16.7	30	-13.3	16.7	6/12/6	31.7	Yes
Plot 50	1st	N	47.6	30	17.6	30	-12.4	17.6	6/12/6	32.6	Yes
Plot 50	1st	W	46.4	30	16.4	30	-13.6	16.4	6/12/6	31.4	Yes
Plot 50	1st	S	46.2	30	16.2	30	-13.8	16.2	6/12/6	31.2	Yes
Plot 51-52	1st	E	45.3	30	15.3	30	-14.7	15.3	6/12/6	30.3	Yes
Plot 51-52	1st	N	47.4	30	17.4	30	-12.6	17.4	6/12/6	32.4	Yes
Plot 51-52	1st	W	46.5	30	16.5	30	-13.5	16.5	6/12/6	31.5	Yes
Plot 51-52	1st	S	47.3	30	17.3	30	-12.7	17.3	6/12/6	32.3	Yes
Plot 53	1st	E	46.4	30	16.4	30	-13.6	16.4	6/12/6	31.4	Yes
Plot 53	1st	N	48	30	18	30	-12	18	6/12/6	33	Yes
Plot 53	1st	W	44.8	30	14.8	30	-15.2	14.8	6/12/6	29.8	No
Plot 53	1st	S	48.3	30	18.3	30	-11.7	18.3	6/12/6	33.3	Yes
Plot 54	1st	E	48	30	18	30	-12	18	6/12/6	33	Yes
Plot 54	1st	N	49.1	30	19.1	30	-10.9	19.1	6/12/6	34.1	Yes
Plot 54	1st	W	45.6	30	15.6	30	-14.4	15.6	6/12/6	30.6	Yes
Plot 54	1st	S	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	Yes
Plot 55	1st	E	51.9	30	21.9	30	-8.1	21.9	6/12/6	36.9	Yes
Plot 55	1st	N	46	30	16	30	-14	16	6/12/6	31	Yes
Plot 55	1st	W	54.7	30	24.7	30	-5.3	24.7	6/12/6	39.7	Yes
Plot 55	1st	S	57.9	30	27.9	30	-2.1	27.9	6/12/6	42.9	Yes
Plot 56	1st	N	46.1	30	16.1	30	-13.9	16.1	6/12/6	31.1	Yes

Plot	Floor	Façade Direction	Calculated $L_{Aeq,8hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 56	1st	W	51.6	30	21.6	30	-8.4	21.6	6/12/6	36.6	Yes
Plot 56	1st	S	57.5	30	27.5	30	-2.5	27.5	6/12/6	42.5	Yes
Plot 56	1st	E	51.9	30	21.9	30	-8.1	21.9	6/12/6	36.9	Yes
Plot 57-58	1st	E	51.7	30	21.7	30	-8.3	21.7	6/12/6	36.7	Yes
Plot 57-58	1st	N	46.3	30	16.3	30	-13.7	16.3	6/12/6	31.3	Yes
Plot 57-58	1st	W	53.2	30	23.2	30	-6.8	23.2	6/12/6	38.2	Yes
Plot 57-58	1st	S	56.8	30	26.8	30	-3.2	26.8	6/12/6	41.8	Yes
Plot 59-62	1st	E	46.6	30	16.6	30	-13.4	16.6	6/12/6	31.6	Yes
Plot 59-62	1st	N	46.9	30	16.9	30	-13.1	16.9	6/12/6	31.9	Yes
Plot 59-62	1st	W	51.6	30	21.6	30	-8.4	21.6	6/12/6	36.6	Yes
Plot 59-62	1st	S	53.7	30	23.7	30	-6.3	23.7	6/12/6	38.7	Yes
Plot 63	1st	E	54.7	30	24.7	30	-5.3	24.7	6/12/6	39.7	Yes
Plot 63	1st	N	54.2	30	24.2	30	-5.8	24.2	6/12/6	39.2	Yes
Plot 63	1st	W	47.2	30	17.2	30	-12.8	17.2	6/12/6	32.2	Yes
Plot 63	1st	S	46.6	30	16.6	30	-13.4	16.6	6/12/6	31.6	Yes
Plot 64-69	1st	E	61.3	30	31.3	30	1.3	31.3	6/12/6	46.3	Yes
Plot 64-69	1st	S	51	30	21	30	-9	21	6/12/6	36	Yes
Plot 64-69	1st	W	48.5	30	18.5	30	-11.5	18.5	6/12/6	33.5	Yes
Plot 64-69	1st	N	61.3	30	31.3	30	1.3	31.3	6/12/6	46.3	Yes
Plot 70-72	1st	E	46.2	30	16.2	30	-13.8	16.2	6/12/6	31.2	Yes
Plot 70-72	1st	S	50	30	20	30	-10	20	6/12/6	35	Yes
Plot 70-72	1st	W	49.1	30	19.1	30	-10.9	19.1	6/12/6	34.1	Yes
Plot 70-72	1st	N	49.2	30	19.2	30	-10.8	19.2	6/12/6	34.2	Yes
Plot 73-75	1st	N	51.3	30	21.3	30	-8.7	21.3	6/12/6	36.3	Yes
Plot 73-75	1st	W	45.6	30	15.6	30	-14.4	15.6	6/12/6	30.6	Yes
Plot 73-75	1st	S	49	30	19	30	-11	19	6/12/6	34	Yes
Plot 73-75	1st	E	49.2	30	19.2	30	-10.8	19.2	6/12/6	34.2	Yes
Plot 76	1st	E	50.2	30	20.2	30	-9.8	20.2	6/12/6	35.2	Yes
Plot 76	1st	N	53.5	30	23.5	30	-6.5	23.5	6/12/6	38.5	Yes
Plot 76	1st	W	45.6	30	15.6	30	-14.4	15.6	6/12/6	30.6	Yes
Plot 76	1st	S	50.2	30	20.2	30	-9.8	20.2	6/12/6	35.2	Yes
Plot 77	1st	E	52.2	30	22.2	30	-7.8	22.2	6/12/6	37.2	Yes
Plot 77	1st	S	51.3	30	21.3	30	-8.7	21.3	6/12/6	36.3	Yes
Plot 77	1st	W	47.5	30	17.5	30	-12.5	17.5	6/12/6	32.5	Yes
Plot 77	1st	N	55	30	25	30	-5	25	6/12/6	40	Yes
Plot 78-79	1st	E	60.2	30	30.2	30	0.2	30.2	6/12/6	45.2	Yes
Plot 78-79	1st	N	61.7	30	31.7	30	1.7	31.7	4/10/6.4A	46.7	Yes
Plot 78-79	1st	W	53.3	30	23.3	30	-6.7	23.3	6/12/6	38.3	Yes
Plot 78-79	1st	S	47.8	30	17.8	30	-12.2	17.8	6/12/6	32.8	Yes
Plot 80	1st	S	54.2	30	24.2	30	-5.8	24.2	6/12/6	39.2	Yes
Plot 80	1st	E	54.8	30	24.8	30	-5.2	24.8	6/12/6	39.8	Yes
Plot 80	1st	N	53.9	30	23.9	30	-6.1	23.9	6/12/6	38.9	Yes
Plot 80	1st	W	52.8	30	22.8	30	-7.2	22.8	6/12/6	37.8	Yes
Plot 81	1st	N	47.7	30	17.7	30	-12.3	17.7	6/12/6	32.7	Yes
Plot 81	1st	W	52.1	30	22.1	30	-7.9	22.1	6/12/6	37.1	Yes
Plot 81	1st	S	55.1	30	25.1	30	-4.9	25.1	6/12/6	40.1	Yes
Plot 81	1st	E	54.4	30	24.4	30	-5.6	24.4	6/12/6	39.4	Yes
Plot 82	1st	S	45.3	30	15.3	30	-14.7	15.3	6/12/6	30.3	Yes
Plot 82	1st	W	49.2	30	19.2	30	-10.8	19.2	6/12/6	34.2	Yes
Plot 82	1st	N	51.1	30	21.1	30	-8.9	21.1	6/12/6	36.1	Yes
Plot 82	1st	E	53.3	30	23.3	30	-6.7	23.3	6/12/6	38.3	Yes
Plot 83	1st	S	56	30	26	30	-4	26	6/12/6	41	Yes
Plot 83	1st	W	47.1	30	17.1	30	-12.9	17.1	6/12/6	32.1	Yes

Plot	Floor	Façade Direction	Calculated $L_{Aeq,8hr}$ at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insultation Performance for Glazing (Rw +Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?
Plot 83	1st	N	48.5	30	18.5	30	-11.5	18.5	6/12/6	33.5	**Yes**
Plot 83	1st	E	51.6	30	21.6	30	-8.4	21.6	6/12/6	36.6	**Yes**
Plot 84	1st	S	58.5	30	28.5	30	-1.5	28.5	6/12/6	43.5	**Yes**
Plot 84	1st	W	54.6	30	24.6	30	-5.4	24.6	6/12/6	39.6	**Yes**
Plot 84	1st	N	50.6	30	20.6	30	-9.4	20.6	6/12/6	35.6	**Yes**
Plot 84	1st	E	47.8	30	17.8	30	-12.2	17.8	6/12/6	32.8	**Yes**