



Persimmon Homes

**Discharge of Condition 36,
Lyminster Bypass, Noise Barrier
North Littlehampton**

**Noise Assessment
August 2017**

Executive Park, Avalon Way, Anstey, Leicester, LE7 7GR





Document Control

Project: Discharge of Condition 36, Lyminster Bypass, North Littlehampton
Client: Persimmon Homes
Job Number: A095004
File Origin: O:\Acoustics Air Quality and Noise\Active Projects\A095004

Document Checking:

Prepared by:	Nathan Allen <i>Environmental Consultant</i>	Initialled: NJA
--------------	---	-----------------

Checked by:	Graham Davis <i>Senior Environmental Consultant</i>	Initialled: GD
-------------	--	----------------

Verified by:	Nigel Mann <i>Director, Environmental Scientist</i>	Initialled: NM
--------------	--	----------------

Issue	Date	Status
1	15 th February 2016	First Issue
2	25 th August 2017	Second Issue – revised barrier plans
3		
4		



Contents Page

1.0	Introduction.....	1
2.0	Assessment Criteria	2
3.0	Assessment Methodology.....	3
4.0	Noise Survey.....	9
5.0	Assessment of Key Effects	13
6.0	Mitigation	15
7.0	Conclusions	18

Appendix Contents

Appendix A – Acoustic Terminology and Abbreviations

Appendix B – Sketches

Appendix C – Barrier Details



1.0 Introduction

1.1 Purpose of this Report

This report presents the findings of a noise assessment for the discharge of condition 36 of planning permission ref LU/47/11 which states:

"36 Prior to the commencement of construction of the Lyminster by-pass southern section, details of the acoustic barrier (as defined by Figure 10.10 of the submitted Environmental Statement dated February 2011) shall be submitted to, and approved in writing by, the Local Planning Authority. The approved scheme shall be implemented in accordance with approved details and thereafter permanently maintained."

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A and a set of location plans and noise contour plots relevant to the assessment are presented in Appendix B.



2.0 Assessment Criteria

2.1 Traffic Noise Assessment Criteria

To establish the effectiveness of the proposed barrier, this assessment compares the 'with development' scenario and the 'without development' scenario for a selection of residential receptors considered to be worst case in terms of their proximity to traffic changes. For the purposes of assessing the significance of any effects, the criteria in Table 2.1 has been used. The noise level criteria detailed below have been derived from standards and design guidance:

Table 3.2 of HD213/11 published in November 2011 (*Design Manual for Roads and Bridges*)

Table 2.1 Noise Level Criteria and Actions (Traffic Noise Assessment)

Effect Level	Assessment	Short Term Noise Level Criteria	Long Term Noise Level Criteria
Negligible	Change in Traffic Noise Levels	Change in Noise Levels $L_{A10\ 18hr}$ $\geq 0\text{ dB and } < 0.9\text{ dB}$	Change in Noise Levels $L_{A10\ 18hr}$ $\geq 0\text{ dB and } < 3\text{ dB}$
Slight Adverse	Change in Traffic Noise Levels	Change in Noise Levels $L_{A10\ 18hr}$ $\geq 1.0\text{ dB and } < 2.9\text{ dB}$	Change in Noise Levels $L_{A10\ 18hr}$ $\geq 3\text{ dB and } < 5\text{ dB}$
Moderate Adverse	Change in Traffic Noise Levels	Change in Noise Levels $L_{A10\ 18hr}$ $\geq 3.0\text{ dB and } < 4.9\text{ dB}$	Change in Noise Levels $L_{A10\ 18hr}$ $\geq 5\text{ dB and } < 10\text{ dB}$
Significant Adverse	Change in Traffic Noise Levels	Change in Noise Levels $L_{A10\ 18hr}$ $\geq 5\text{ dB}$	Change in Noise Levels $L_{A10\ 18hr}$ $\geq 10\text{ dB}$

2.2 Noise Insulation Regulations

The barrier ensures that the Noise Insulation Regulations will not be triggered. The 1975 Noise Insulation Regulations and subsequent amendment Regulations [noise insulation (amendment) regulations 1988] provide criteria for assessing the eligibility for noise mitigation or properties based on variations in traffic noise due to a new or improved road scheme. Noise level criteria are given within the Regulations which, if satisfied, indicate whether properties in the vicinity may be entitled to the installation of additional noise insulation or to a grant to cover the cost of the noise insulation.

The entitlement conditions of the Noise Insulation Regulations are triggered when:

- 'the $L_{A10\ (18\ hour)}$ predicted figure is greater by at least 1 dB than the prevailing noise level'
- 'the $L_{A10\ (18\ hour)}$ predicted figure is not less than the specified level ($L_{A10\ (18\ hour)} = 68\text{ dB}$)'
- 'the noise caused, or expected to be caused, by traffic using or expected to use the new highway makes an effective contribution to the $L_{A10\ (18\ hour)}$ predicted figure of at least 1 dB'



3.0 Assessment Methodology

3.1 Noise Modelling Methodology

Three dimensional noise modelling has been undertaken based on the monitoring data to predict L_{Aeq} and L_{Amax} noise levels at a large number of locations both horizontally and vertically. CADNA noise modelling software has been used. This model is based on the Department of Transport Calculation of Road Traffic Noise (CRTN) and ISO 9613 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically.



The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data, assumptions and model settings as given in the table below have been used.

Table 3.1 Modelling Parameters Sources and Assumptions

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels – around site	Ordnance Survey	Ordnance Survey
Ground levels – other areas	Site Observations and Ordnance Survey	OS 1:25,000 contours and OS 1:10,000 spot heights.
Traffic data, main surrounding roads	WYG	Traffic flows for local roads based on WYGE observations and experience.
Traffic data – local roads	WYG	Traffic flows for local roads based on WYGE observations and experience.
Building heights – around site	WYG Observations	8 m height for two storey residential properties, and 4 m for Bungalows
Barrier heights	WYG Observations	All existing barriers at 1.0 m with the exception of hedges and trees which are assumed to offer no noise protection.
Receptor positions	WYG	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties with ground floor or bungalow dormer windows. 7 m for dormer windows on two storey properties. 1.5 m height for model grid and monitoring locations for validation.
Reflections	WYG	First order reflections have been applied based on mirror image sources
Absorbent Ground	CADNA	Frequency dependant ground absorption has been applied based on values specified in VDI 2714/16 clause 6.3.
Façade Correction	CADNA	Façade corrections have been incorporated into the modelling
Gradient	CADNA	Gradient for each road has been calculated from the height information using the 'calc slope of roads' tool

It is acknowledged that a number of these assumptions will affect the overall noise levels presented in this report. However it should be noted that certain assumptions made, as identified above, are worst case.



3.2 Model Input Data

3.2.1 Road Traffic Data (Development Related Traffic Noise Assessment)

All roads expected to make a significant contribution have been included within this assessment. Traffic flows have been based on traffic data provided. Three scenarios have been considered to represent traffic levels in the year 2017 with and without development scenarios, 2032 with and without development scenarios and base 2013 scenarios.

Table 3.2 Traffic Data (2017)

Road	18hr AAWT Baseline 2013	18hr AAWT Without Development 2017	18hr AAWT With Development 2017
Lyminster Road	11153	11590	17888
Lyminster Road	11153	11590	2463
Lyminster Road	10966	11397	162
Lyminster Road	9831	10217	0
Lyminster Road	10911	11339	1334
Lyminster Road	12025	12497	4798
Wick Street	9905	10294	9001
Wick Street	6627	6888	5268
Wick Street	6284	6531	4076
Arundel Road	6732	6996	3849
Arundel Road	7603	7901	5621
Arundel Road	8372	8700	6967
Northern Bypass	N/A	N/A	17699
Southern Bypass	N/A	N/A	25071
Fitzalan Link	N/A	N/A	9132
Fitzalan Link	N/A	N/A	8163
Fitzalan Link	1543	1603	7653
Littlehampton Bypass	15376	15979	21542
Worthing Road	19793	20570	30006
Worthing Road	21559	22405	29832
Worthing Road	24913	25891	31756
Rustington Bypass	21672	22522	27480
Arundel Road	12183	12661	15810
Franciscan Way	14394	14959	16960
Franciscan Way	13778	14319	16558
East Street	10783	11206	15723
East Street	10509	10922	13644
Horsham Road	9575	9951	9199
Horsham Road	9119	9477	8640
Horsham Road	10241	10643	10187
Horsham Road	12635	13131	12470
Horsham Road	12597	13091	12641
Worthing Road	9040	9395	11776
Mill Lane	3055	3175	162
Mill Lane / Toddington Lane	1776	1846	1712
Toddington Lane	1776	1846	4117



Road	18hr AAWT Baseline 2013	18hr AAWT Without Development 2017	18hr AAWT With Development 2017
Hollist Chase	2949	3065	4284
Courtwick Lane	2462	2559	2782
Courtwick Road	4408	4581	5112
North Street	1132	1177	1855
Swanbourne Road	688	715	839
Wick Farm Road	349	363	442
Clun Road	929	966	1084
Clun Road	1820	1892	1884
Cornwall Rd & Blakehurst Way	1622	1685	2223
Madehurst Way & Highdown Drive	1141	1186	955
Highdown Drive	1823	1895	1784
North Ham Road	925	961	884
East Ham Road	844	877	1360
East Ham Road	526	547	976
East Street	7246	7530	9515
Fitzalan Road	4231	4397	7060
St Flora's Road	1828	1899	2890
Southfields Road	4661	4844	5929
Southfields Road	3259	3387	4806
Peregrine Road	3311	3441	3666
North Littlehampton Access (W)	N/A	N/A	1384
North Littlehampton Access (E)	N/A	N/A	7981
Development Link Road	N/A	N/A	5654

Table 3.3 Traffic Data (2032)

Road	18hr AAWT Without Development 2032	18hr AAWT With Development 2032
Lyminster Road	12613	21249
Lyminster Road	12613	2960
Lyminster Road	12402	199
Lyminster Road	11118	0
Lyminster Road	12340	1607
Lyminster Road	13600	6296
Wick Street	11202	9836
Wick Street	7495	6001
Wick Street	7107	4707
Arundel Road	7613	4218
Arundel Road	8598	7029
Arundel Road	9468	8692
Northern Bypass	N/A	21115
Southern Bypass	N/A	28862
Fitzalan Link	N/A	11410
Fitzalan Link	N/A	10199
Fitzalan Link	1745	9703
Littlehampton Bypass	17389	24742
Worthing Road	22385	34951
Worthing Road	24382	33911
Worthing Road	28176	36218
Rustington Bypass	24510	32837



Road	18hr AAWT Without Development 2032	18hr AAWT With Development 2032
Arundel Road	13778	18862
Franciscan Way	16278	21120
Franciscan Way	15582	20652
East Street	12195	19200
East Street	11885	16888
Horsham Road	10829	11298
Horsham Road	10313	10612
Horsham Road	11582	12381
Horsham Road	14290	15053
Horsham Road	14247	15411
Worthing Road	10223	14453
Mill Lane	3455	159
Mill Lane / Toddington Lane	2009	2058
Toddington Lane	2009	4962
Hollist Chase	3336	5205
Courtwick Lane	2784	3869
Courtwick Road	4985	5923
North Street	1281	2657
Swanbourne Road	778	1462
Wick Farm Road	395	755
Clun Road	1051	1869
Clun Road	2059	2621
Cornwall Rd & Blakehurst Way	1834	2754
Madehurst Way & Highdown Drive	1290	1191
Highdown Drive	2062	2640
North Ham Road	1046	925
East Ham Road	954	1893
East Ham Road	595	1480
East Street	8195	9892
Fitzalan Road	4785	9117
St Flora's Road	2067	3833
Southfields Road	5272	7351
Southfields Road	3686	6044
Peregrine Road	3744	4561
North Littlehampton Access (W)	N/A	1371
North Littlehampton Access (E)	N/A	7882
Development Link Road	N/A	6848

3.2.2 Sensitive Receptors

Noise levels have been assessed at the same properties as found within the Environmental Statement 2011 with respect to direct noise from the southern portion of the proposed Lyminster Bypass. The locations of the proposed receptors are shown of SK02 of Appendix B.



Table 3.4 Existing Residential Receptor Locations

Ref.	Description	Closest Source	Approximate Distance To Source (m)	Height (m)
TR1	10 Toddington Park	Proposed Bypass	20.0	4.0
TR2	11 Toddington Park	Proposed Bypass	21.0	4.0
TR3	12 Toddington Park	Proposed Bypass	22.0	4.0
TR4	13 Toddington Park	Proposed Bypass	23.0	4.0
TR5	14 Toddington Park	Proposed Bypass	18.0	4.0
TR6	14 Toddington Park	Proposed Bypass	18.0	4.0
TR7	22 Toddington Park	Proposed Bypass	19.0	4.0
TR8	22 Toddington Park	Proposed Bypass	21.0	4.0
TR9	23 Toddington Park	Proposed Bypass	15.0	4.0
TR10	23 Toddington Park	Proposed Bypass	14.0	4.0



4.0 Noise Survey

4.1 Noise Survey Methodology

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included:

B&K 2260	Environmental Noise Analyser (WYG1)	s/n	2361273
B&K 4231	Calibrator	s/n	2176211
Rion NL-52	Environmental Noise Analyser (WYG13)	s/n	620858
Rion NL-52	Environmental Noise Analyser (WYG14)	s/n	610212
Rion NL-52	Environmental Noise Analyser (WYG15)	s/n	1221575

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice and no drift was observed. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

A baseline monitoring survey was undertaken at nine locations (as specified in the following table and shown in SK01 of Appendix B) from Wednesday 8th October 2014 to Tuesday 14th October 2014. Attended short term measurements were undertaken at six locations during the day, evening and night-time periods with three additional locations being measured unattended over a 115 hour period. The raw data collected from the long term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 *The Description and Measurement of Environmental Noise: Guide to quantities and procedures*. Weather conditions during the survey period were observed as being dry with scattered showers. Anemometer readings confirmed that wind speeds were less than 5 ms⁻¹ at all times during the survey with a predominant westerly wind direction.

Table 4.1 Noise Monitoring Locations

Ref	Description	Grid Reference	
		X	Y
LT1	Junction of Lyminster Road and Mill Lane	502721.4	104064.0
LT2	Land behind Empress Close along the rail line	502967.4	103855.4
LT3	Land north of Sunflower Close, along the rail line	504450.3	103646.6
ST1	Junction of Lyminster Road and Mill Lane	502709.3	104046.0
ST2	On Fuller's Walk, next to play area	502935.2	104092.9
ST3	Along Toddington Lane behind garden centre	503043.6	103926.4



Ref	Description	Grid Reference	
		X	Y
ST4	At the junction of Empress Close and Hearnfield Road	502917.0	103871.9
ST5	At the junction of Worthing Road and Landsdowne Road	502975.7	103420.4
ST6	Along Norway Lane adjacent to the A259	503962.7	103483.7

4.2 Noise Survey Results

Existing ambient noise levels around the site are dominated by road traffic noise from the A259 (Worthing Road) and the West Coastway railway line.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period).

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re: 2×10^{-5} Pa).

Table 4.2 Results of Baseline Noise Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Day 07:00 - 23:00	44 hours	08/10/2014 - 13/10/2014 07:00 - 23:00	LT1	68.0	101.7	36.3	71.2	53.0
Night 23:00 - 07:00	24 hours	08/10/2014 - 13/10/2014 23:00 - 07:00		62.7	84.5	28.9	60.5	43.9
Weekend Day 07:00 - 23:00	32 hours	11/10/2014 - 12/10/2014 07:00 - 23:00		67.1	103.6	36.1	70.6	49.7
Weekend Night 23:00 - 07:00	16 hours	11/10/2014 - 12/10/2014 23:00 - 07:00		60.0	84.3	25.6	58.3	36.6
Day 07:00 - 23:00	44 hours	08/10/2014 - 13/10/2014 07:00 - 23:00	LT2	60.9	96.5	34.7	55.7	47.3
Night 23:00 - 07:00	24 hours	08/10/2014 - 13/10/2014 23:00 - 07:00		56.8	85.0	26.5	51.2	42.9
Weekend Day 07:00 - 23:00	32 hours	11/10/2014 - 12/10/2014 07:00 - 23:00		60.3	89.4	33.7	53.0	45.0
Weekend Night 23:00 - 07:00	16 hours	11/10/2014 - 12/10/2014 23:00 - 07:00		55.8	89.3	23.4	43.9	34.8
Day 07:00 - 23:00	44 hours	08/10/2014 - 13/10/2014 07:00 - 23:00	LT3	66.0	108.9	36.0	62.4	55.4
Night 23:00 - 07:00	24 hours	08/10/2014 - 13/10/2014 23:00 - 07:00		59.8	92.9	28.3	55.7	44.8



Period	Duration (T)	Monitoring Date and Times	Location	L _{max,T} (dB)	L _{max,T} (dB)	L _{min,T} (dB)	L _{10,T} (dB)	L _{90,T} (dB)
Weekend Day 07:00 - 23:00	32 hours	11/10/2014 - 12/10/2014 07:00 - 23:00		65.9	102.2	35.6	60.9	53.1
Weekend Night 23:00 - 07:00	16 hours	11/10/2014 - 12/10/2014 23:00 - 07:00		59.8	90.6	24.5	53.5	37.9
Day 07:00 - 19:00	15 Mins	14/10/2014 11:28	ST1	70.7	91.8	42.6	73.9	52.5
	15 Mins	14/10/2014 11:48	ST2	53.1	74.2	38.6	54.6	42.1
	15 Mins	14/10/2014 12:07	ST3	62.9	84.2	39.0	63.0	41.8
	15 Mins	14/10/2014 12:26	ST4	55.7	74.0	40.3	55.3	42.7
	15 Mins	14/10/2014 13:09	ST5	77.0	92.3	54.3	80.5	67.7
	15 Mins	14/10/2014 10:38	ST6	82.1	93.6	59.7	86.8	68.6
Evening 19:00 - 23:00	15 Mins	13/10/2014 21:05	ST1	70.0	85.7	35.4	74.2	42.2
	15 Mins	13/10/2014 21:26	ST2	45.4	62.7	36.8	46.6	40.7
	15 Mins	13/10/2014 21:48	ST3	63.2	83.5	37.1	57.5	39.6
	15 Mins	13/10/2014 22:09	ST4	52.4	75.6	37.7	47.4	40.6
	15 Mins	13/10/2014 20:44	ST5	74.4	89.5	43.7	78.8	53.1
	15 Mins	13/10/2014 20:21	ST6	77.5	94.2	46.4	80.8	55.7
Night 23:00 - 07:00	15 Mins	13/10/2014 23:52	ST1	64.2	81.0	35.5	67.9	41.6
	15 Mins	14/10/2014 00:12	ST2	38.9	50.2	32.1	41.3	34.8
	15 Mins	14/10/2014 00:31	ST3	39.0	53.7	31.7	41.4	35.1
	15 Mins	14/10/2014 00:50	ST4	45.4	67.0	34.7	43.7	36.9
	15 Mins	13/10/2014 23:30	ST5	71.1	90.5	35.9	74.0	41.5
	15 Mins	13/10/2014 23:05	ST6	77.4	96.3	41.7	80.2	46.6

All values are sound pressure levels in dB re: 2x 10⁻⁵ Pa

Table 4.3 Traffic Noise Monitoring Locations

Ref	Description	Grid Reference	
		X	Y
T1	At the end of Toddington Park	503126	103568
T2	Land behind Highdown Drive	503134	103064
T3	Land behind Highdown Drive, adjacent to the Littlehampton Academy	503129	102758
T4	Along Worthing Road, west of the junction with Highdown Drive	503089	103391

Table 4.4 Results of Baseline Traffic Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	L _{max,T} (dB)	L _{max,T} (dB)	L _{min,T} (dB)	L _{10,T} (dB)	L _{90,T} (dB)
Day 07:00 - 19:00	9 Hours	13/10/2014 - 13/10/2014 14:19 - 22:59	T1	52.4	80.7	41.5	52.7	50.3
	17 Hours	13/10/2014 - 14/10/2014 14:43 - 15:42	T2	48.9	83.0	39.7	48.2	46.8
	16 Hours	13/10/2014 - 14/10/2014 15:08 - 15:33	T3	51.3	94.4	35.5	47.7	44.2
	3 Hours	13/10/2014 - 15:32	T4	76.0	95.9	47.5	79.7	65.5



Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Night 23:00 - 07:00	3 Hours	13/10/2014 – 14/10/2014 23:00 – 01:48	T1	48.8	64.1	27.2	49.1	45.4
	8 Hours	13/10/2014 – 14/10/2014 23:00 – 07:00	T2	46.7	61.1	34.4	45.7	44.9
	8 Hours	13/10/2014 – 14/10/2014 23:00 – 07:00	T3	40.7	62.5	30.4	39.3	38.0



5.0 Assessment of Key Effects

5.1 Road Traffic Noise Assessment

The table below shows the results of the traffic noise assessment comparing the 'with' and 'without' development traffic noise levels for the year 2017 on the Southern Lyminster Bypass and the public highways around the site; it should be noted that the assessments below do not include the beneficial effects of the acoustic barrier, which is considered in section 6.0 below.

Table 5.1 Difference Between With and Without Development Scenarios (2017)

Location	Traffic Noise Without Development 2017 ($L_{A10,10hr}$ dB(A))	Traffic Noise With Development Only 2017 ($L_{A10,10hr}$ dB(A))	Difference between with and without development scenarios (dB(A))
TR1	63.0	68.3	5.3
TR2	59.1	66.9	7.8
TR3	58.5	66.8	8.3
TR4	58.0	66.4	8.4
TR5	56.6	68.0	11.4
TR6	49.9	67.6	17.7
TR7	55.2	67.7	12.5
TR8	43.7	64.9	21.2
TR9	54.4	68.6	14.2
TR10	44.3	68.9	24.6

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

Table 5.2 below shows the results of the traffic noise assessment comparing the 'without development' and 'with development' traffic noise levels for the year 2032 on the public highways around the site.

Table 5.2 Difference Between With and Without Development Scenarios (2032)

Location	Traffic Noise Without Development 2032 ($L_{A10,10hr}$ dB(A))	Traffic Noise With Development 2032 ($L_{A10,10hr}$ dB(A))	Difference between with and without development scenarios (dB(A))
TR1	63.6	68.7	5.1
TR2	59.6	67.4	7.8
TR3	59.0	67.3	8.3
TR4	58.5	66.9	8.4
TR5	57.0	68.6	11.6
TR6	50.3	68.2	17.9
TR7	55.6	68.2	12.6
TR8	44.1	65.5	21.4



Location	Traffic Noise Without Development 2032 ($L_{A10,18hr}$ dB(A))	Traffic Noise With Development 2032 ($L_{A10,18hr}$ dB(A))	Difference between with and without development scenarios (dB(A))
TR9	54.9	69.2	14.3
TR10	44.7	69.5	24.8

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

When the differences between the 2017 and 2032 'with' and 'without' development traffic noise contributions are compared with the short term noise change criteria given in Table 2.1 of this report, all of the representative receptors would be considered to be within and above the moderate to significant adverse effect criteria.

Table 5.3 Difference Between Baseline Traffic Flows (2013) and With Development Scenarios (2032)

Location	Traffic Noise Without Development 2013 ($L_{A10,18hr}$ dB(A))	Traffic Noise With Development 2032 ($L_{A10,18hr}$ dB(A))	Difference between with and without development scenarios (dB(A))
TR1	62.0	68.7	6.7
TR2	58.1	67.4	9.3
TR3	57.5	67.3	9.8
TR4	56.9	66.9	10.0
TR5	55.7	68.6	12.9
TR6	49.2	68.2	19.0
TR7	54.2	68.2	14.0
TR8	43.5	65.5	22.0
TR9	53.6	69.2	15.6
TR10	44.1	69.5	25.4

Table 5.3 shows that when the differences between the baseline 2013 flows and the 2032 'with' development scenario are compared with the long term noise change criteria given in Table 2.2 of this report, all of the representative receptors would be considered to have a moderate or significant adverse impact. Road traffic noise levels at six receptor locations, during the year 2032 would, in the absence of mitigation, be above 68 dB $L_{A10, 18 \text{ hour}}$ and therefore could be eligible for any additional noise insulation under the Noise Insulation Regulations 1975; mitigation measures are shown in section 6.0 below.



6.0 Mitigation (Noise Barrier)

The following assessments incorporate the beneficial effects of erecting a 3.0 metre high acoustic barrier to the east of the southern section of the proposed Lyminster Bypass. In accordance with condition 36 location and details of the barrier are found in SK02 of Appendix B, and Appendix C of this report. The table below shows the results of the traffic noise assessment comparing the 'with' and 'without' development traffic noise levels for the year 2017 and 2032 on the public highways around the site inclusive of the 3.0 metre high acoustic barrier.

Table 6.1 Difference Between With and Without Development Scenarios, Inclusive of 3.0m High Acoustic Barrier (2017, 2032)

Location	Traffic Noise Without Development 2017 (LA10,18hr dB(A))	Traffic Noise With Development 2017 (LA10,18hr dB(A))	Difference between with and without development scenarios (dB(A))	Traffic Noise Without Development 2032 (LA10,18hr dB(A))	Traffic Noise With Development 2032 (LA10,18hr dB(A))	Difference between with and without development scenarios (dB(A))
TR1	63.0	63.7	0.7	63.6	64.0	0.4
TR2	59.1	61.8	2.7	59.6	62.2	2.6
TR3	58.5	61.4	2.9	59.0	61.9	2.9
TR4	58.0	61.0	3.0	58.5	61.4	2.9
TR5	56.6	61.7	5.1	57.0	62.2	5.2
TR6	49.9	60.3	10.4	50.3	60.8	10.5
TR7	55.2	60.5	5.3	55.6	61.1	5.5
TR8	43.7	57.5	13.8	44.1	58.2	14.1
TR9	54.4	61.7	7.3	54.9	62.2	7.3
TR10	44.3	61.3	17.0	44.7	62.1	17.4

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

When the differences between the 2017 and 2032 'with' and 'without' development traffic noise contributions are compared with the short term noise change criteria given in Table 2.1 of this report, TR1 is within the negligible effect level, a slight adverse impact is expected at TR2-TR3, receptors TR4-TR5 is within the moderate adverse effect criteria. The remaining receptors are predicted to experience a change in noise level greater than 5 dB and therefore likely to experience a significant effect. The conclusions of the assessment are similar to those of the 2011 ES chapter.

Road traffic noise levels are not expected to exceed 68 dB LA10, 18hour at any receptor locations and therefore are not eligible for any additional noise insulation under the Noise Insulation Regulations 1975.



Table 6.2 Difference Between Baseline Traffic Flows (2013) and With Bypass Scenarios (2032)

Location	Traffic Noise Without Development 2013 (LA10,18hr dB(A))	Traffic Noise With Development 2032 (LA10,18hr dB(A))	Difference between with and without development scenarios (dB(A))
TR1	62.0	64.0	2.0
TR2	58.1	62.2	4.1
TR3	57.5	61.9	4.4
TR4	56.9	61.4	4.5
TR5	55.7	62.2	6.5
TR6	49.2	60.8	11.6
TR7	54.2	61.1	6.9
TR8	43.5	58.2	14.7
TR9	53.6	62.2	8.6
TR10	44.1	62.1	18.0

Table 6.2 above shows that when the differences between the baseline 2013 flows and the 2032 'with' development scenario are compared with the long term noise change criteria given in Table 2.1 of this report, all of the representative receptors would be considered to have a negligible to slight adverse impact.

None of the representative receptors are predicted to experience levels in excess of 68 dB LA10, 18hour and therefore are not eligible for any additional insulation as specified in the Noise Regulations 1975.

A comparison of noise levels with and without the proposed 3.0m high acoustic barrier is presented in Table 6.3 below. The results show that shows that the provision acoustic barrier adjacent to the carriageway is predicted to significantly reduce traffic noise levels by up to 7.4 dB; noise contour plots showing the predicted road traffic noise levels and the effects of the barrier are presented in SK03 – SK05 in Appendix B.

Table 6.3 Difference Between the With Development 2032 scenario with and without the 3.0m High Barrier

Location	Traffic Noise Without Barrier DS2032 (LA10,18hr dB(A))	Traffic Noise With Barrier DS2032 (LA10,18hr dB(A))	Difference between with and without barrier (dB(A))
TR1	68.7	64.0	-4.7
TR2	67.4	62.2	-5.2
TR3	67.3	61.9	-5.4
TR4	66.9	61.4	-5.5
TR5	68.6	62.2	-6.4
TR6	68.2	60.8	-7.4



Location	Traffic Noise Without Barrier DS2032 ($L_{A10,15hr}$ dB(A))	Traffic Noise With Barrier DS2032 ($L_{A10,15hr}$ dB(A))	Difference between with and without barrier (dB(A))
TR7	68.2	61.1	-7.1
TR8	65.5	58.2	-7.3
TR9	69.2	62.2	-7.0
TR10	69.5	62.1	-7.4



7.0 Conclusions

The assessment of the proposed 3.0m high acoustic barrier has shown that the overall increase in noise levels from the scheme could be reduced by up to 7.4 dB.

In accordance with Condition 36 of planning permission LU/47/11 details of the acoustic barrier have been provided within the SK02 and in Appendix C of this report.

The requirements of Condition 36 of planning permission ref LU/47/11 are met and can therefore be discharged.



Appendices



Appendix A – Acoustic Terminology and Abbreviations

Acoustic Terminology

- dB** Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.
- dB(A)** Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dBA value provides a good representation of how loud a sound is.
- L_{Aeq}** Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The L_{Aeq, 07:00 – 23:00} for example, describes the equivalent continuous noise level over the 12 hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower than the L_{Aeq, 07:00 – 23:00}.
- L_{Amin}** The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.
- L_{Amax}** The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
- L_n** Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the L_{A10, 1 hr} = x dB.
- The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.
- R_w** The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.



Abbreviations

CADNA – Computer Aided Noise Abatement

DMRB – Design Manual for Roads and Bridges

HGV – Heavy Goods Vehicle

PPG – Planning Practice Guidance

UDP – Unitary Development Plan

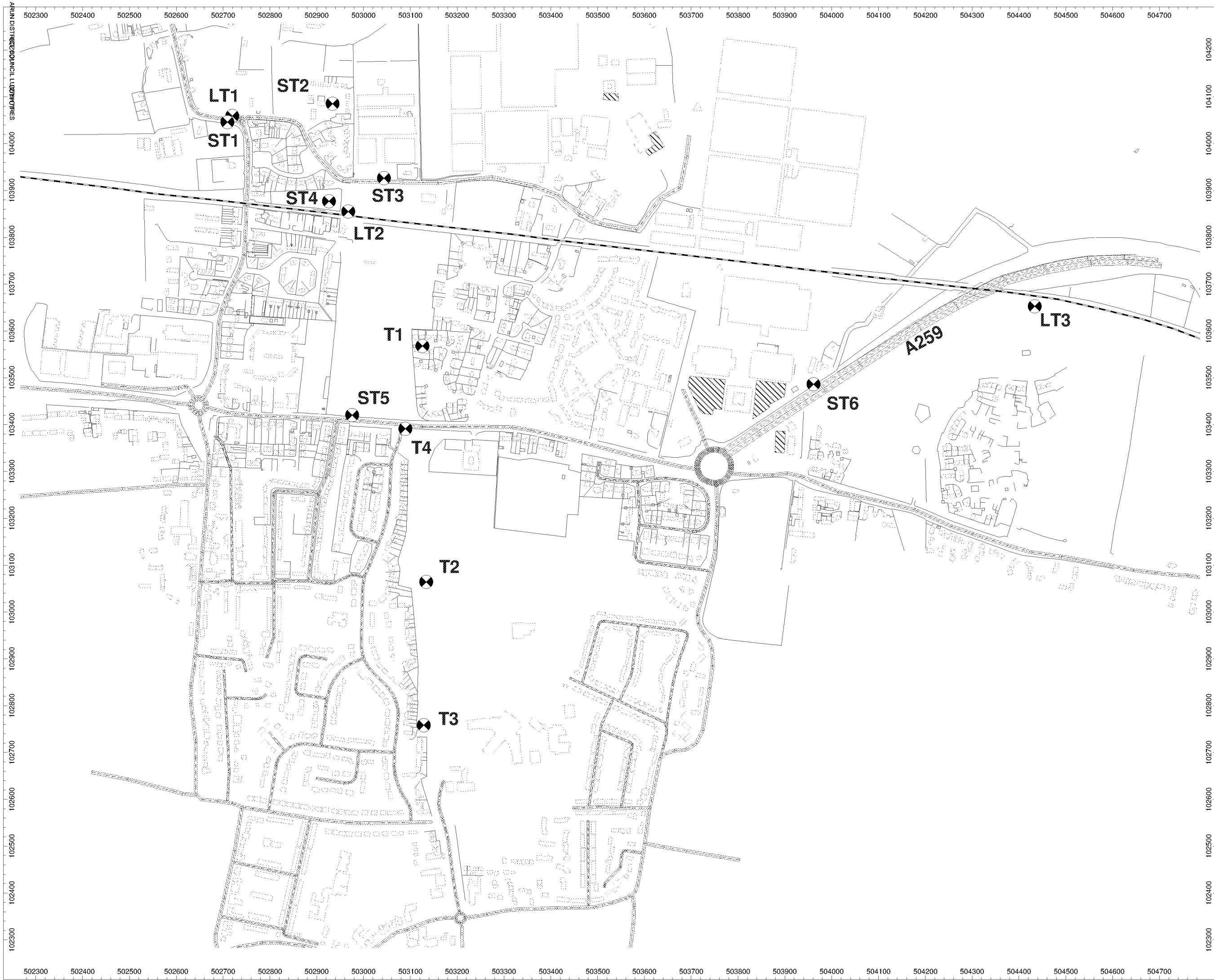
UKAS – United Kingdom Accreditation Service

WYGE – WYG Environment



Appendix B – Sketches

- SK01 Noise Monitoring Locations
- SK02 Receptor and Proposed Barrier Location
- SK03 DS2032 LA10, 18hour Noise Levels Without Barrier
- SK04 DS2032 LA10, 18hour Noise Levels With Proposed Barrier
- SK05 Difference between with and without Barrier Scenarios



Client:
Persimmon Homes

Project:
Lyminster Bypass,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
Noise Monitoring Locations

Drawing Number:
SK01

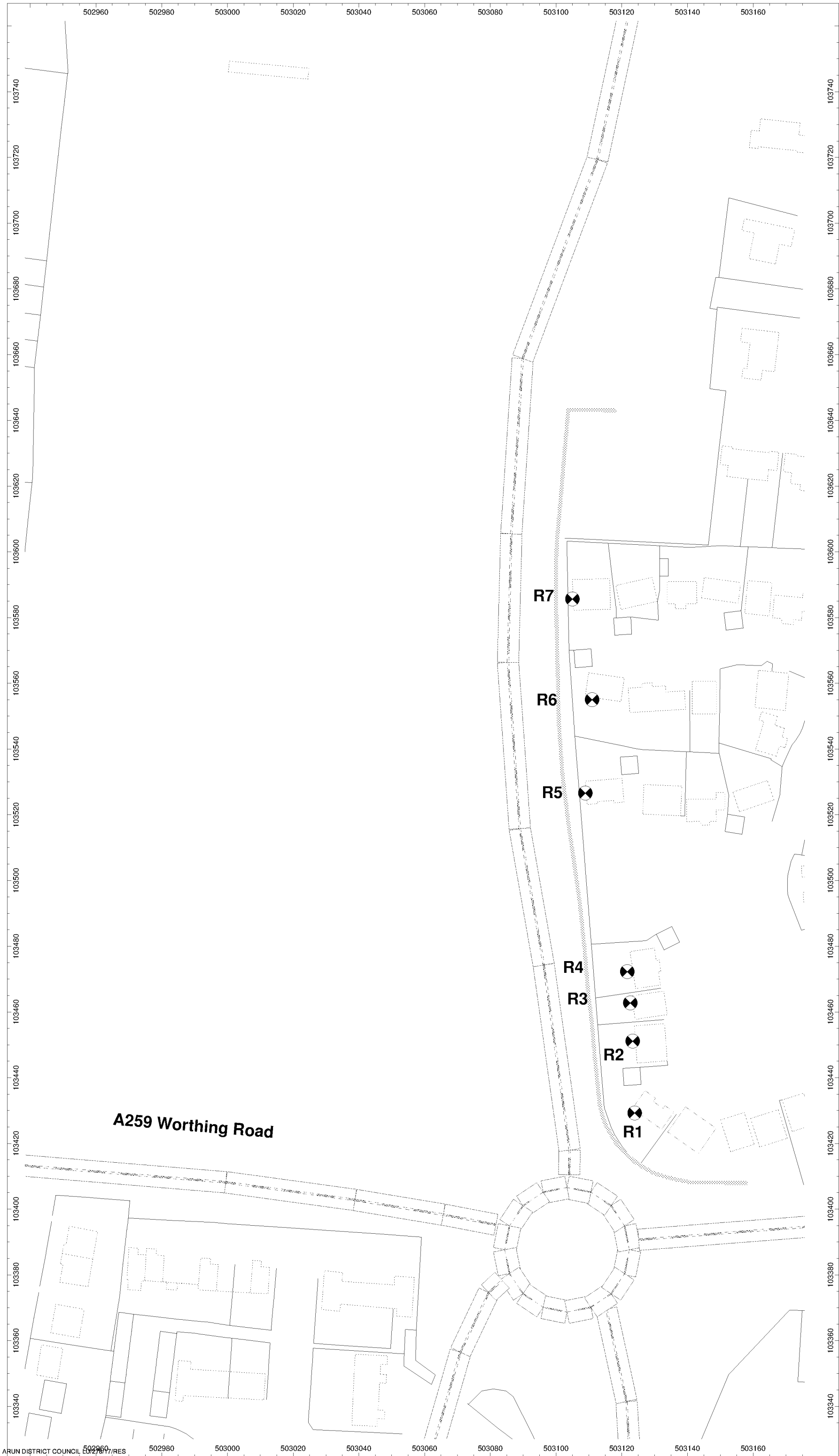
Scale : Not to scale

WYGE Leicester 09.02.16



Executive Park
Avon Way
Anlaby
Leicestershire
LE7 7GR
Tel 0116 234 8000

© WYGE Environment



Client:
Persimmon Homes

Project:
Lyminster Bypass,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
Receptor and Acoustic
Barrier Locations

Drawing Number:
SK02

Key:

Proposed 2.5m Barrier : 

A259 Worthing Road

R7

R6

R5

R4

R3

R2

R1

Scale : Not to scale

WYGE Leicester 24.08.17



Executive Park
Avalon Way
Anstey
Leicestershire
LE7 7GR
Tel 0116 234 8000

© WYG Environment



Client:
Persimmon Homes

Project:
Lyminster Bypass,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
DS 2032 LA10, 18Hour
Without Acoustic Barrier

Drawing Number:
SK03

Key:

[Lightest Shading]	0.0 - 50.0 dB
[Medium-Light Shading]	50.0 - 60.0 dB
[Medium-Dark Shading]	60.0 - 70.0 dB
[Darkest Shading]	>70.0 dB

Scale : Not to scale

Please note: Noise contour
plots are for illustrative
purposes only

WYGE Leicester 24.08.17



Executive Park
Avalon Way
Arisley
Leicestershire
LE7 7GR
Tel 0116 234 8000

© WYG Environment



Client:
Persimmon Homes

Project:
Lyminster Bypass,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
DS 2032 LA10, 18Hour
With Acoustic Barrier

Drawing Number:
SK04

Key:

	0.0 - 50.0 dB
	50.0 - 60.0 dB
	60.0 - 70.0 dB
	>70.0 dB

Scale : Not to scale

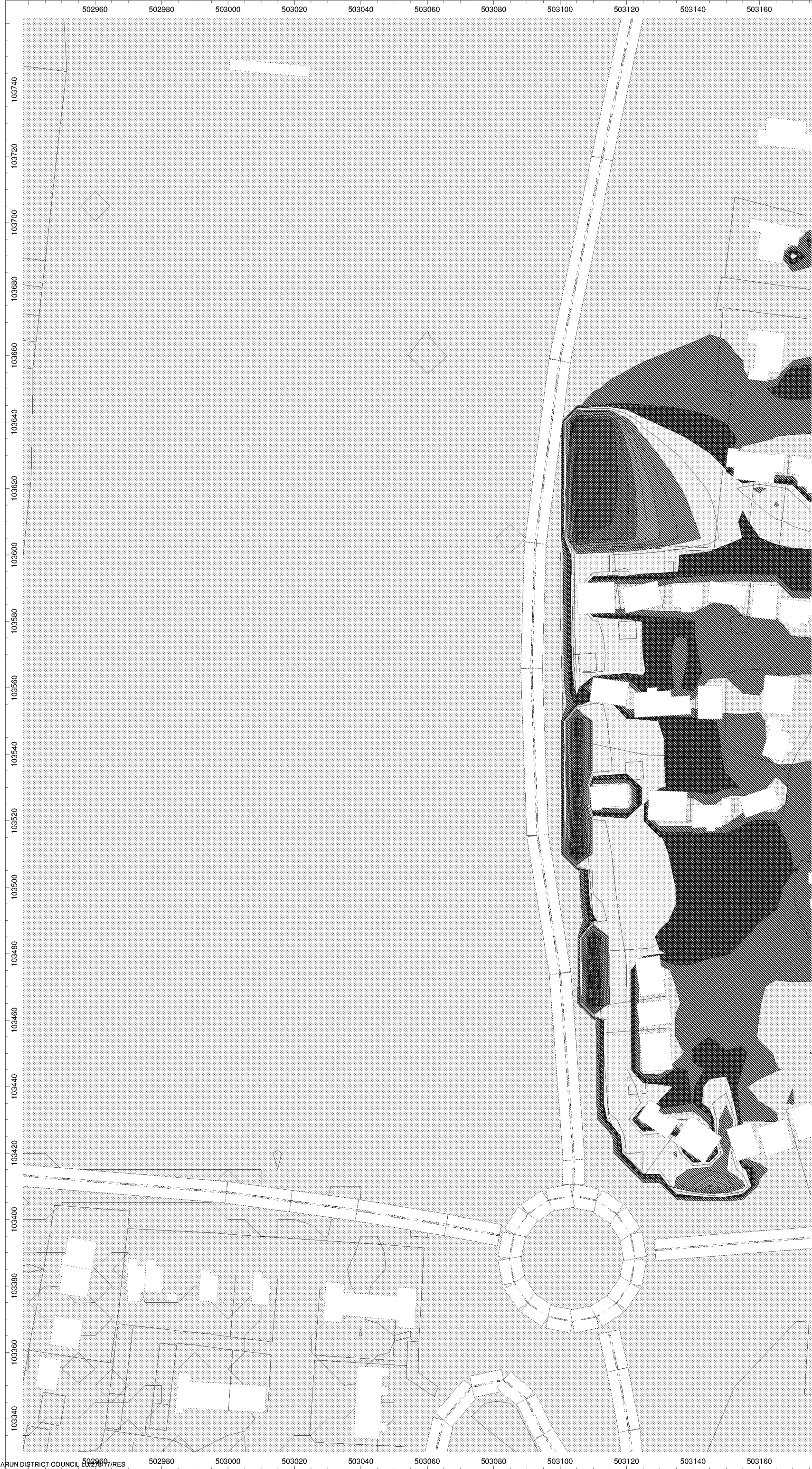
Please note: Noise contour
plots are for illustrative
purposes only

WYGE Leicester 24.08.17



Executive Park
Avalon Way
Arisley
Leicestershire
LE7 7GR
Tel 0116 234 8000

© WYG Environment



Client:
Persimmon Homes

Project:
Lyminster Bypass,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
Predicted Effects of
Proposed Barrier

Drawing Number:
SK05

Key:

- > -13.0 dB
- > -11.0 dB
- > -9.0 dB
- > -7.0 dB
- > -5.0 dB
- > -3.0 dB
- > -2.0 dB
- > -1.0 dB
- > -0.5 dB

Scale : Not to scale

Please note: Noise contour
plots are for illustrative
purposes only

WYGE Leicester 24.08.17

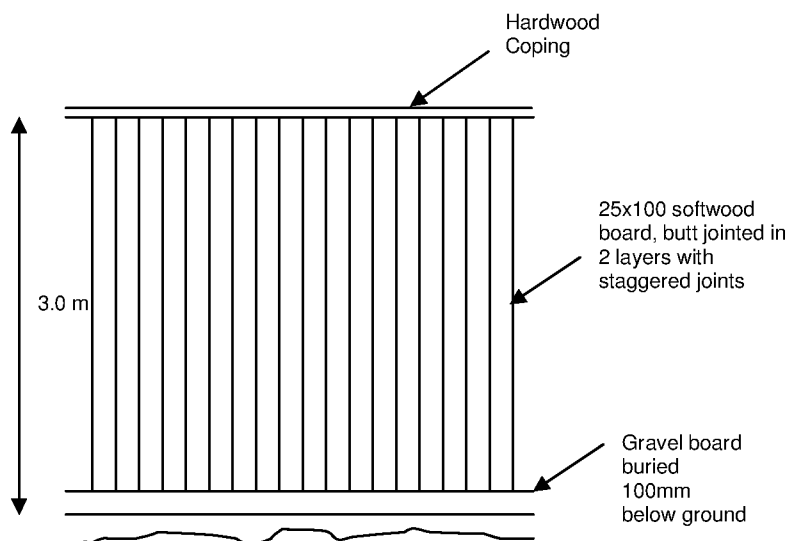
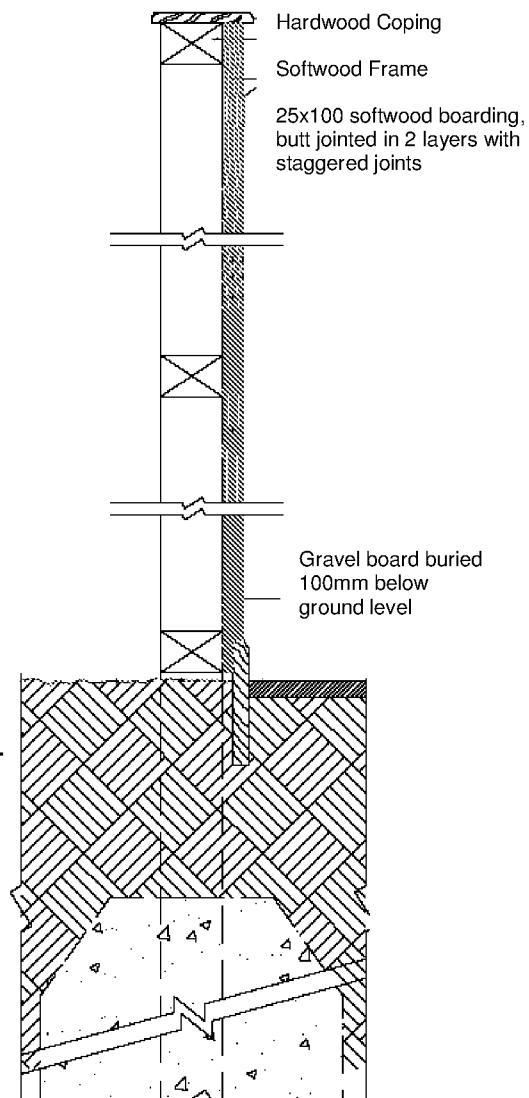


Executive Park
Avalon Way
Ainstay
Leicestershire
LE7 7GR
Tel 0115 234 8000

© WYG Environment



Appendix C – Barrier Details



Client: Persimmon Homes

Project: Lyminster Bypass,
North Littlehampton

Project Number: A095004

Drawing Title / Scenario:
Acoustic Fence Detail

Scale: Not to Scale

WYG Leicester

This map is based upon Ordnance Survey material reproduced by WYG on behalf of her Majesty's Stationary Office, © Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to civil proceedings.

License Number: AL 553611

