

Acoustic South East



Discharge of Condition 11 of DC/24/0982

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Date: 24/11/2025

Issue 1

Site: **Station Road, Cowfold**

Client: **Devine Homes Plc**

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Issue 1	24/11/2025	Original Issue
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1 Introduction and Executive Summary

Acoustic South East have been appointed to assist the client with a discharge of condition. Specifically, Horsham District Council have consented the erection of 35 residential units and conditions have been applied to the decision notice issued by Horsham District Council

In conclusion, mitigation measures were already provided (at the planning stage) to protect future occupants from adverse noise levels. The client has since obtained overheating assessments for each of the plots on the site which indicate that overheating is not likely to occur, even if windows are closed during the night time period, so long as the detailed mitigation measures are completed.

With this in mind, a decentralised mechanical extract ventilation (dMEV) system has been proposed, as detailed in Building Regulations Approved Document F (ADF) which requires that habitable rooms have trickle vents of no less than 4000mm² equivalent area per room. These trickle vents allow air into the property, whilst mechanical extracts remove air from the property.

Revised rigorous calculations have been completed to show that for certain plots enhanced measures are required. The rooms within the proposed dwellings have been sorted into zones with differing mitigation measures (depending on the overall external sound level). For the worst case areas upgraded glazing and acoustic trickle vents are required.

Condition 11 of DC/24/0982 may therefore be discharged by the local planning authority. It is noted that condition 26 will also be capable of being discharged with an evidence based desk based assessment in due course.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

Horsham District Council as the local planning authority have provided planning consent for Devine Homes Plc (The Client) to erect 35 residential plots. This is under DC/24/0982 and can be viewed online.

Acoustic South East provided a detailed acoustic report to support the planning process. The report reference was J3913 and dated 4/12/2024.

Condition 11 was placed onto the consent which requires as follows:

11. No development above ground floor slab level of any part of the development hereby permitted shall take place until a scheme of noise mitigation has been submitted to and approved in writing by the Local Planning Authority. The mitigation measures shall be in broad accordance with the recommendations in the Noise Impact Assessment Issue 2 (dated 04.12.24) and shall demonstrate that they are sufficient to prevent overheating. The development shall thereafter be carried out in accordance with the approved details

Horsham District Council therefore require a scheme of noise mitigation to be submitted. It is noted that the condition also specifically references that the scheme will demonstrate that it is sufficient to prevent overheating. Through discussions with the client, changes were indicated for the Plot 1 boundary treatment to protect the garden space. This is discussed below (section 4).

2.2 Acoustic South East Reporting

Acoustic South East also completed the planning application noise impact assessment. Details taken from the planning stage assessment can be seen below.

The site is bordered by Station Road to the North which is the dominant sound source of road traffic noise. Accordingly, the previously carried out reporting identified that the plots overlooking the road would require enhanced glazing and ventilation to protect future occupants.

The worst-case plot was that of Plot 31, which can be seen below for reference as this is closest to Station Road.



Figure 1. Location of Plot 31 on Approved Scheme

For the avoidance of doubt, Plot 31 can be seen as below in terms of the ground floor and first floor layouts. Please note that Plot 31 and 32 are semidetached, but as seen in Figure 3 below, it is bedroom 1 with two windows which overlooks Station Road as requiring the highest SRI of 32dB, driven by the L_{Amax} events from the roadside.



Figure 2. Plot 31/32 Semi Detached Layout (Ground and First)

It should be noted that residents are free to open windows at any time, however the process of opening windows will inevitably cause the internal sound pressure levels to rise as a result of road traffic noise. No windows have been recommended as being fixed shut.

The baseline sound survey data can be seen in the table below:

Day	Date	$L_{Aeq,16/8Hr}$		11th L_{Amax}		Sound Reduction			
		Day	Night	1 min	2min	Day 16Hr	Night 8Hr	$L_{Amax,1min}$	$L_{Amax,2min}$
Mon	07/04		64.4	81.2	81.2		34	36	36
Tue	08/04	69.1	63.7	81	81	34	34	36	36
Wed	09/04	70.3	64.3	81.4	81.4	35	34	36	36
Thu	10/04	69.2	66.6	82.2	82.2	34	37	37	37
Fri	11/04	70.1	65.6	81.6	81.6	35	36	37	37
Sat	12/04	69.2	65.2	80.9	80.6	34	35	36	36
AVERAGE:		70	65	81	81	35	35	36	36

Figure 3: Baseline Survey Data

The survey data shows that in order to achieve the (no more than 10 events over 45dB at night) L_{Amax} criteria the sound reduction needs to be 1dB higher than required to achieve the 8hr 30dBA criteria. This data was used to calibrate a model that predicts the sound level outside a particular building.

2.3 Client Proposals For Ventilation Strategy

Devine propose using a decentralised MEV (Mechanical Extract Ventilation) System, referred to hereafter as a dMEV system (It is understood this would be a “Continuous mechanical extract ventilation” system as described in ADF).

As detailed in ADF when utilising a continuous mechanical extract ventilation bedrooms must have a trickle vent of a minimim of 4000mm² equivalent area. Two sets of trickle vents (2500mm² equivalent area) have been used per room totalling 5000mm².

An example of dMEV is presented in Figure 4. For the plots most affected by road traffic noise the fan system needs to supply higher air flow rates to mitigate against overheating (see next section).



Figure 4. Example of dMEV from Titon Catalogue

2.4 Overheating Consultancy

The client commissioned Doherty Energy to carry out an overheating assessment for all plots on the site.

For the most affected plots the initial planning stage noise impact assessment stated that, in order to achieve the ADO noise criteria, windows would have to be closed at night time. Doherty Energy used this data in their overheating assessments. For the plots where windows were required to be closed at night additional fan cooling was required (100l/s per room). It is understood that this level of airflow would be possible with the correctly designed dMEV system.

The results of the TM59 assessment are extracted below, but also attached as Appendix A for transparency.

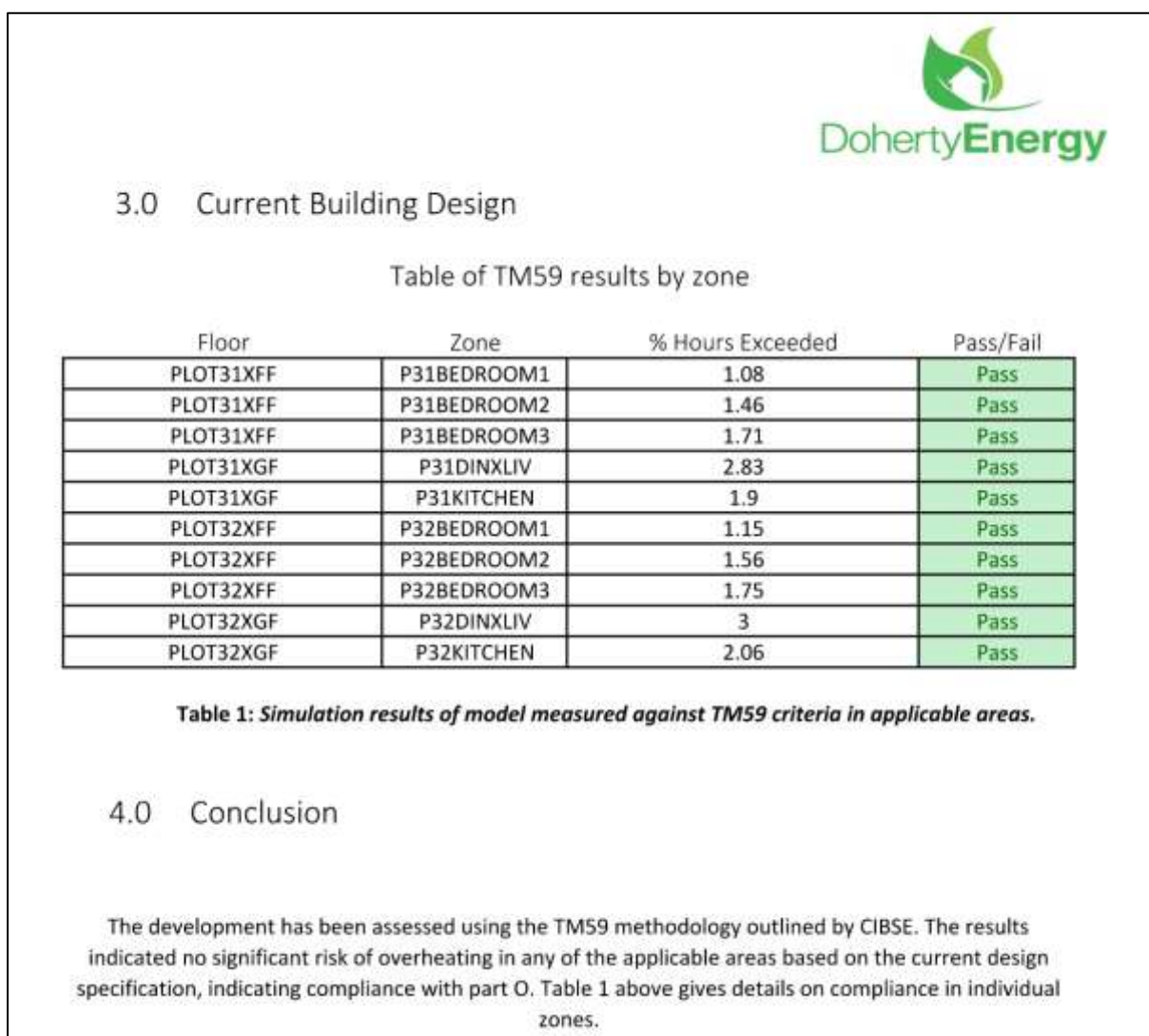


Figure 5. Doherty Energy TM59 Overheating Assessment - Plot 31

3 Mitigation Measures

3.1 Required Sound Reduction (Normal conditions)

Based on BS8233/WHO the maximum internal/external noise level for each area is as follows:

- Bedrooms $\leq 35/30$ dBA Day/Night (Inside)
- Bedrooms ≤ 10 events, per night, over L_{Amax} 45dB (Inside)
- Lounges/Kitchens ≤ 35 dBA Day (Inside)

In order for the BS8233 and WHO criteria to be achieved the building envelope will have to achieve the levels of sound insulation (SRI) as detailed in the appendix of the report.

For the bedrooms the sound reduction is based on achieving an average of no more than 10 events over 45dBA per night (ProPG criteria).

In achieving the L_{Amax} criteria the night time period sound level, in the bedroom, will be 29dBA (so the night period criteria are also achieved).

The highest required sound reduction related to the plots (26-35) facing the road (32dB SRI for bedrooms and 27dB for kitchens)

3.2 Revised Sound Reduction Calculations

Revised calculations have been completed which used glazing test results from Pilkington and Velfac. For trickle vents Titon examples were used and it should be noted that the revised calculations have been undertaken with 2 Titon SF2500mm² trickle vents so the total EA (5000mm²) achieves the ADF minimum (4000mm²). The calculation was also completed with a single trickle vent that achieves 5000mm² on its own.

The revised rigorous calculations (as shown in the appendix) use specific products. However the tables below detail the required performance of each element (so the developer can procure the correct glazing and ventilation products so the criteria can be achieved)

The bedroom assessment represents the worst case as it takes into account the L_{Amax} events which have the potential to negatively impact sleep.

The calculations have been completed in order to determine the required mitigation measures for each room:

Room	Strategy	Glazing R_{w+Ctr}	Vent $D_{n,e,w}$	SRI
Kitchen	Enhanced 1 (E1)	25	2x44dB (or 1x40dB)	31dB
Bedroom	Enhanced 1 (E1)	25	2x44dB (or 1x40dB)	30dB
Bedroom	Enhanced 2 (E2)	33	2x44dB (or 1x40dB)	32dB

Figure 6: SRI Strategy Calculation Summary

3.3 Mitigation Measure Zones

It is vitally important to highlight that not all windows on the development site require upgrading glazing and ventilation, only those properties with bedrooms in close proximity to the A272.

The table below indicates where enhanced glazing and/or acoustic vents are required. The full list can be seen in Appendix A.

The table also shows which plots will require the additional fan boost so that bedroom windows can be closed at night (without a risk of the plot overheating).

Location	Enhanced Glazing Vents		ADO Ventilation
	Bedroom	Lounge/Kitchen	
Front of Plots 26-35	E2	E1	Closed Window Night
Plot 1 Front	E2	E1	Closed Window Night
Plot 2 Front	E1	E1	Closed Window Night
Plot 1 REAR	E1		Closed Window Night
Plot 3 Front	E1		Closed Window Night
Plot 2 REAR	E1		Closed Window Night
Plot 25 REAR	E1		Closed Window Night
Plot 4 FRONT	E1		Closed Window Night
Plot 24 rear	E1		Closed Window Night
Plot 23 REAR			Closed Window Night

Figure 7: Mitigation Strategy Zones

4 Plot 1 Garden Fence Line/Barrier

The client proposed a mixture of a 3m brick build fence line and a 1.8m fence line to protect Plot 1 from road traffic noise. As stated within the original reporting, the minimum surface mass for the fence line/barrier must be no less than 12kg/m².

IMMI noise modelling software has been used to predict the outcome of the clients proposed garden boundary strategy. As can be seen in Figure 8 below, three receptor positions were placed into sections of Plot 1 garden space and these are presented in Figure 9 below. In summary, they are all below 55dB L_{Aeq, 16 hour} which achieves the requirements of BS8233:2014, and ProPG2017.

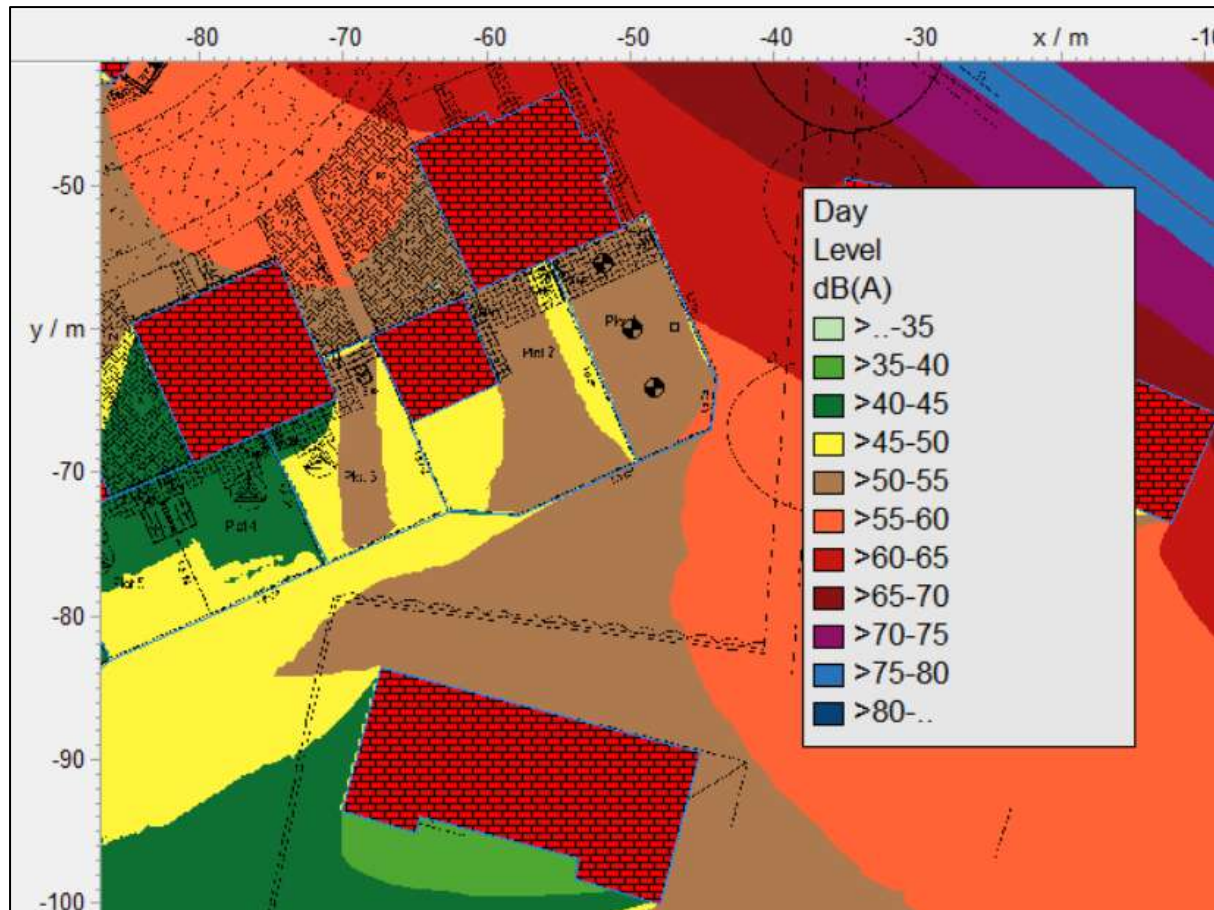


Figure 8. Plot 1 2D Noise Contour - Garden Area

Plot 1 Garden Location	Predicted Daytime SPL, $L_{Aeq,16 \text{ hour}}$
Plot 1-1	53.6
Plot 1-2	52.9
plot 1-3	53.4

Figure 9. Plot 1 Garden Area Reception Positions

5 Additional Planning Conditions

It is noted that condition 26 requires evidence be provided to the local planning authority. This will be a desk-based exercise providing evidence of exactly what has been installed and where.

6 Appendix A – Table of Requirements Per Plot

	Day	Night	Lounge	Bedroom	Lounge	Bedroom	ADO Bedroom
Plot 26-35 FF		60.5		31.5		Enhanced	Closed Window Night
Plot 1 Front FF		60.4		31.4		Enhanced	Closed Window Night
Plot 2 Front FF		58.4		29.4		Enhanced	Closed Window Night
Plot 1 REAR FF		54.1		25.1		Enhanced	Closed Window Night
Plot 3 Front FF		52.7		23.7		Enhanced	Closed Window Night
Plot 2 REAR FF		51.8		22.8		Enhanced	Closed Window Night
Plot 25 REAR FF		51.4		22.4		Enhanced	Closed Window Night
Plot 4 FRONT FF		51.3		22.3		Enhanced	Closed Window Night
Plot 24 FF rear		50.8		21.8		Enhanced	Closed Window Night
Plot 23 REAR FF		49.9		20.9		Basic	Closed Window Night
Plot 5 FRONT FF		49.3		20.3		Basic	Pass
Plot 6 FRONT FF		48.2		19.2		Basic	Pass
Plot 22 REAR FF		47.4		18.4		Basic	Pass
Plot 21 REAR FF		47.2		18.2		Basic	Pass
Plot 26 REAR FF		46.6		17.6		Basic	Pass
Plot 3 REAR FF		43.7		14.7		Basic	Pass
Plot 4 REAR FF		43.3		14.3		Basic	Pass
Plot 34 REAR FF		42.9		13.9		Basic	Pass
Plot 29 REAR FF		42.9		13.9		Basic	Pass
Plot 5 REAR FF		42.8		13.8		Basic	Pass
Plot 28 REAR FF		42.6		13.6		Basic	Pass
Plot 6 REAR FF		42.6		13.6		Basic	Pass
Plot 31 REAR FF		42.5		13.5		Basic	Pass
Plot 31-Rear Bed2		42.1		13.1		Basic	Pass
Plot 32 REAR FF		42.1		13.1		Basic	Pass
Plot 33 REAR FF		42.0		13.0		Basic	Pass
Plot 25 Front FF		40.4		11.4		Basic	Pass
Plot 24-FF Front		38.4		9.4		Basic	Pass
Plot 21 FRONT FF		37.5		8.5		Basic	Pass
Plot 23 FRONT - FF		36.6		7.6		Basic	Pass
Plot 22 FRONT FF		36.2		7.2		Basic	Pass
Plot 31 GF Kitchen	62.0		27.0		Enhanced		
Plot 1 Front GF	61.6		26.6		Enhanced		
Plot 2 Front GF	59.9		24.9		Enhanced		
Plot 3 Front GF	54.9		19.9		Basic		
Plot 4 FRONT GF	53.4		18.4		Basic		
Plot 25 REAR GF	52.1		17.1		Basic		
Plot 1 REAR GF	51.9		16.9		Basic		
Plot 5 FRONT GF	51.3		16.3		Basic		
Plot 2 REAR GF	50.9		15.9		Basic		
Plot 6 FRONT GF	50.3		15.3		Basic		
Plot 23 REAR GF	49.5		14.5		Basic		
Plot 26 REAR GF	47.0		12.0		Basic		
Plot 21 REAR GF	46.7		11.7		Basic		
Plot 22 REAR GF	45.7		10.7		Basic		
Plot 34 REAR GF	44.7		9.7		Basic		
Plot 31 REAR GF	44.7		9.7		Basic		
Plot 29 REAR GF	44.4		9.4		Basic		
Plot 32 REAR GF	44.1		9.1		Basic		
Plot 31-Rear GF Live	43.9		8.9		Basic		
Plot 28 REAR GF	43.8		8.8		Basic		
Plot 33 REAR GF	43.7		8.7		Basic		
Plot 10 GF Rear	42.4		7.4		Basic		
Plot 3 REAR GF	42.3		7.3		Basic		
Plot 4 REAR GF	41.9		6.9		Basic		
Plot 5 REAR GF	41.8		6.8		Basic		
Plot 6 REAR GF	41.3		6.3		Basic		
Plot 25 Front GF	40.1		5.1		Basic		
Plot 21 FRONT GF	38.6		3.6		Basic		
Plot 23 FRONT - GF	38.5		3.5		Basic		
Plot 22 FRONT GF	37.8		2.8		Basic		
Plot 10 GF Front	36.4		1.4		Basic		

Figure 10: Model Output and Required Sound Reduction

7 Appendix B –Rigorous Calculations

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A _o	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _f	Total Facade Area (m ²)	20.88	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.88	A	Equivalent Absorbtion Area of Rx Room
S _{ew}	External Wall Area (m ²)	18	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	14		
S	Total Area sound enters the room (m ²)	34.88		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	66	62	60	60	57	50
D _{n,e}	2x Titon SF2500	34	34	33.1	43.9	46.2	52.2
R _{wi}	4_12_4	24	20	25	35	38	35
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	43	43	43	43	43	43
A	Equivalent Absorbtion Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
Term From Equation Below	Octave Band Centre Frequency					
	125	250	500	1000	2000	4000
Leq,ff	66	62	60	60	57	50
A _o /S . 10 [^] (-D _{n,e} /10)	0.0001141	0.000114	0.00014	1.16795E-05	6.87739E-06	1.72752E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.0003287	0.000826	0.000261	2.61105E-05	1.30863E-05	2.61105E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.099E-05	6.5E-05	2.05E-05	3.25609E-06	5.16055E-07	1.63191E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	2.012E-05	2.01E-05	2.01E-05	2.01165E-05	2.01165E-05	2.01165E-05
10log10(S/A)+3	8.0118379	6.964484	6.384565	6.384564936	6.664852172	6.664852172
Leq,2	41.035771	39.07133	32.8406	24.24942271	19.74970356	13.48790278
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	24.935771	30.47133	29.6406	24.24942271	20.94970356	14.48790278

A-Weighted Level Outside	64.1
BS8233 Predicted Internal A-Weighted Level	34
Prediced Building Envelope SRI	29.7

Plot 31, Bed1

BS8233 Calculation can be seen below:	
$L_{eq,2} \approx L_{eq,ff} + 10 \log_{10} \left(\frac{A_o}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$	

Figure 11: Calculation – Bedroom E1 Strategy (SRI=30dB)

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A _o	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _f	Total Facade Area (m ²)	20.88	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.88	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	18	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	14		
S	Total Area sound enters the room (m ²)	34.88		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	66	62	60	60	57	50
D _{n,e}	2x Titon SF2500	34	34	33.1	43.9	46.2	52.2
R _{wi}	RW+Ctr=33 (velfac)	24.4	24.5	35.5	40.4	41.9	46.8
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	43	43	43	43	43	43
A	Equivalent Absorption Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
Term From Equation Below	Octave Band Centre Frequency					
	125	250	500	1000	2000	4000
Leq,ff	66	62	60	60	57	50
A _o /S . 10 [^] (-D _{n,e} /10)	0.0001141	0.000114	0.00014	1.16795E-05	6.87739E-06	1.72752E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.0002998	0.000293	2.33E-05	7.53036E-06	5.33109E-06	1.72511E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.099E-05	6.5E-05	2.05E-05	3.25609E-06	5.16055E-07	1.63191E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	2.012E-05	2.01E-05	2.01E-05	2.01165E-05	2.01165E-05	2.01165E-05
10log ₁₀ (S/A)+3	8.0118379	6.964484	6.384565	6.384564936	6.664852172	6.664852172
Leq,2	40.779081	35.88577	29.48832	22.67686552	18.82901498	10.41824674
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	24.679081	27.28577	26.28832	22.67686552	20.02901498	11.41824674

A-Weighted Level Outside	64.1
BS8233 Predicted Internal A-Weighted Level	32
Predicted Building Envelope SRI	32.2

Plot 31, Bed1

BS8233 Calculation can be seen below:	
$L_{eq,2} \approx L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$	

Figure 12: Calculation – Bedroom E2 Strategy (SRI=32dB)

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A _o	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _f	Total Facade Area (m ²)	20.88	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.88	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	18	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	14		
S	Total Area sound enters the room (m ²)	34.88		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	66	62	60	60	57	50
D _{n,e}	Titon SF2500 (4207)	37	37	36.1	46.9	49.2	55.2
R _{wi}	RW+Ctr=33 (velfac)	24.4	24.5	35.5	40.4	41.9	46.8
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	43	43	43	43	43	43
A	Equivalent Absorption Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
Term From Equation Below	Octave Band Centre Frequency					
	125	250	500	1000	2000	4000
Leq,ff	66	62	60	60	57	50
A _o /S . 10 [^] (-D _{n,e} /10)	5.72E-05	5.72E-05	7.04E-05	5.85361E-06	3.44686E-06	8.65812E-07
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.0002998	0.000293	2.33E-05	7.53036E-06	5.33109E-06	1.72511E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.099E-05	6.5E-05	2.05E-05	3.25609E-06	5.16055E-07	1.63191E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	2.012E-05	2.01E-05	2.01E-05	2.01165E-05	2.01165E-05	2.01165E-05
10log10(S/A)+3	8.0118379	6.964484	6.384565	6.384564936	6.664852172	6.664852172
Leq,2	40.22465	35.3519	27.66558	22.03790863	18.34987095	10.25762201
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	24.12465	26.7519	24.46558	22.03790863	19.54987095	11.25762201

A-Weighted Level Outside	64.1
BS8233 Predicted Internal A-Weighted Level	31
Predicted Building Envelope SRI	33.1

Plot 31, Bed1

BS8233 Calculation can be seen below:	
$L_{eq,2} \approx L_{eq,ff} + 10 \log_{10} \left(\frac{A_o}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$	

Figure 13: – Bedroom E2 Strategy (SRI=33dB) Single Vent Option

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A ₀	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _f	Total Facade Area (m ²)	17.8	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.04	A	Equivalent Absorbtion Area of Rx Room
S _{ew}	External Wall Area (m ²)	15.76	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.00001		
S	Total Area sound enters the room (m ²)	17.80001		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	64	60	58	58	55	48
D _{n,e}	2x Titon SF2500	34	34	33.1	43.9	46.2	52.2
R _{wi}	4 12 4	24	20	25	35	38	35
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	43	43	43	43	43	43
A	Equivalent Absorbtion Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
Term From Equation Below	Octave Band Centre Frequency					
	125	250	500	1000	2000	4000
Leq,ff	64	60	58	58	55	48
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.0002237	0.000224	0.000275	2.28865E-05	1.34766E-05	3.38516E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.0004563	0.001146	0.000362	3.62418E-05	1.81639E-05	3.62418E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	7.033E-05	0.000111	3.52E-05	5.58645E-06	8.85393E-07	2.79986E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	2.816E-11	2.82E-11	2.82E-11	2.81566E-11	2.81566E-11	2.81566E-11
10log10(S/A)+3	5.0902756	4.042922	3.463003	3.463002636	3.743289872	3.743289872
Leq,2	37.842291	35.74902	29.74201	19.57303957	13.86558804	7.753779784
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	21.742291	27.14902	26.54201	19.57303957	15.06558804	8.753779784

A-Weighted Level Outside	62.1
BS8233 Predicted Internal A-Weighted Level	31
Predicted Building Envelope SRI	31.2

Plot 31, Kitchen

BS8233 Calculation can be seen below:	
$L_{eq,2} \approx L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$	

Figure 14: Lounge/Kitchen E1 Strategy (SRI=31dB)

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A _o	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _f	Total Facade Area (m ²)	17.8	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.04	A	Equivalent Absorbtion Area of Rx Room
S _{ew}	External Wall Area (m ²)	15.76	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.00001		
S	Total Area sound enters the room (m ²)	17.80001		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	64	60	58	58	55	48
D _{n,e}	Titon SF2500 (4207)	37	37	36.1	46.9	49.2	55.2
R _{wi}	4 12 4	24	20	25	35	38	35
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	43	43	43	43	43	43
A	Equivalent Absorbtion Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
Term From Equation Below	Octave Band Centre Frequency					
	125	250	500	1000	2000	4000
Leq,ff	64	60	58	58	55	48
A _o /S . 10 [^] (-D _{n,e} /10)	0.0001121	0.000112	0.000138	1.14704E-05	6.75429E-06	1.6966E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.0004563	0.001146	0.000362	3.62418E-05	1.81639E-05	3.62418E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	7.033E-05	0.000111	3.52E-05	5.58645E-06	8.85393E-07	2.79986E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	2.816E-11	2.82E-11	2.82E-11	2.81566E-11	2.81566E-11	2.81566E-11
10log10(S/A)+3	5.0902756	4.042922	3.463003	3.463002636	3.743289872	3.743289872
Leq,2	37.143109	35.40894	28.75117	18.73017074	12.86010062	7.566018134
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	21.043109	26.80894	25.55117	18.73017074	14.06010062	8.566018134

A-Weighted Level Outside	62.1
BS8233 Predicted Internal A-Weighted Level	30
Prediced Building Envelope SRI	31.8

Plot 31, Kitchen

BS8233 Calculation can be seen below:	
$L_{eq,2} \approx L_{eq,ff} + 10 \log_{10} \left(\frac{A_o}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$	

Figure 15: Lounge/Kitchen E1 Strategy (SRI=32dB) Single Vent Option

8 Appendix B - Doherty Energy Overheating Assessment (Plot 31)