

moray offshore renewables ltd

Developing Wind Energy In The Outer Moray Firth

Environmental Statement

Modified Transmission Infrastructure for
Telford, Stevenson and MacColl Wind Farms

Technical Appendix 3.3 A

Noise Technical Report



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Moray Offshore Renewables Limited

4th Floor
 40 Princes Street
 Edinburgh
 EH2 2BY

Tel: +44 (0)131 556 7602

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1 Introduction

1.1 Purpose of this Report

This report presents the technical information and assessment with regard to the construction and operational phases for the installation of the modified Onshore Transmission Infrastructure (modified OnTI) to connect the three consented wind farms (Telford, Stevenson and MaColl offshore wind farms) to the pre-existing onshore National Electricity Transmission System (NETS).

The methodology used as part of the noise survey, which was undertaken within and around the OnTI boundary, is also provided within this report. Due to the extensive nature of the survey, the tabulated noise level data is presented within Chapter 3.3 of the Environmental Statement (ES). The indicative noise levels from the Proposed Development have been predicted at local representative receptors using CADNA (Computer Aided Noise Abatement) noise modelling software which incorporates ISO 9613 methodologies and calculations.

The assessment of construction noise has been presented within ES Chapter 3.3.

2 Assessment Criteria

2.1 Operational Noise

With respect to noise assessments in Scotland, the principal planning advice and guidance is contained within Planning Advice Note 1/2011: Planning and Noise and Technical Advice Note (TAN): Assessment of Noise. In addition, with regard to noise sources of an industrial nature, BS 4142 'Rating Industrial Noise Affecting Mixed Residential and Industrial Areas' (1997) is typically regarded as the most appropriate assessment method.

Noise from wind farm developments is considered within Sections 187 - 192 of Scottish Planning Policy (2010) which states that the criteria will vary depending on the scale of development and its relationship to the characteristics of the surrounding area. With regard to off-shore developments, plans should identify appropriate locations for facilities.

BS 4142 states that the standard is unsuitable when background noise levels and noise rating levels L_{Aeq} are very low. The documents clarifies that a background noise level of around 30 dB and a noise rating level of around 35 dBL_{Aeq} are very low; measured background noise levels at residential locations surrounding the proposed substation locations are considered to be very low (around or below 30 dB L_{A90}). Accordingly, rather than adopting the 5 stage approach outlined within the TAN, the assessment is based on achieving an external noise rating level of 35 $dBL_{Aeq,1hour}$ at the nearest sensitive receptors.

Due to the very low existing background noise levels, the noise criteria presented within BS 8233:2014 'Sound insulation and noise reduction for buildings – code of practice' and World Health Organisation (WHO) recommendations presented within their 'Guidelines for Community Noise' (1999) publication have been referred to. In addition to the guidance provided within BS 8233 and the WHO Guidelines, further consideration has been given to noise rating (NR) curves which are considered to be another way of demonstrating acceptable levels in noise sensitive premises whilst taking into account the anticipated tonal content of the noise generation.

For the purpose of this assessment the target noise criteria will be applied:

- Internal noise levels in bedrooms: 25 $dBL_{Aeq,5 mins}$ / NR 20
- Internal noise levels in living rooms: 30 $dBL_{Aeq,1 hour}$ / NR 25
- Noise levels in external amenity areas: 35 $dBL_{Aeq,1 hour}$ / NR 25

By achieving this noise level in external areas, an internal noise level criteria with windows open of 25 dB(A) in bedrooms and 30 dB(A) in living rooms will be achieved. This corresponds with the BS 8233:2014 'Sound insulation and noise reduction for buildings – code of practice' noise target criteria of 30 dB(A) in bedrooms (night-time) and 35 dB(A) in living rooms (daytime) whilst allowing for the anticipated low frequency content of the noise source.

At the current time of writing, due to the absence of specific noise data relating to the proposed substations and their components, it is not possible to undertake a detailed assessment in terms of achieving internal NR level criteria. The assessment undertaken, however demonstrates that, with the proposed mitigation measures (including the full enclosure of proposed substation buildings) internal noise levels of NR20 in bedrooms and NR25 in living rooms can be achieved.

2.2 Construction Noise Assessment Criteria

Noise from potential construction activity has been assessed in accordance with BS 5228-1: 2009 'Code of Practice for Noise and vibration control on construction and open sites' which provides guidance on the prediction, measurement and assessment of noise generated from construction sites as follows.

2.2.1 *Significance based upon fixed noise limits*

In order to determine whether construction noise levels are significant or not, reference has been made to the method provided in Annex E.2 of BS 5228-1:2009. On demolition/construction sites, noise limits for works are generally set with reference to the need to avoid speech interference in buildings adjacent to the site. Annex E.2 gives advice on maximum levels of demolition/construction site noise during daytime hours (taken to be 0700 to 1900 hours). The advice is that the noise levels outside the nearest window of the occupied room closest to the site boundary should not exceed:

- 75 dBA in urban areas near main roads or in heavy industrial areas;
- 70 dBA in rural, suburban and urban areas away from main roads and industrial noise.

For the purposes of this assessment it is considered that the existing noise sensitive properties adjacent to the site should be assessed against the 75 dB(A) criteria which is the upper limits level as measured outside of living rooms and offices below which conversation would not be difficult.

2.2.2 *Significance based upon noise change – ABC Method*

Reference has also been made to the ABC method in Annex E.3.2 of BS 5228. This method is adopted to identify whether the level of construction noise impacting neighbouring residents is significant. Primarily, the ABC Method requires the ambient noise level for the appropriate period (night, evening/weekends or day) to be determined and rounded to the nearest 5dB. This is then compared with the total noise level, including construction noise. If the total noise level exceeds the appropriate category value, then a significant effect is deemed to occur.

Table 2.1 ABC Method of Significance Effect at Dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value in decibels (dB)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night –time (23.00-07.00)	45	50	55
Evening and weekends	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00-13.00)	65	70	75

Note 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the category appropriate to the ambient noise level.

Note 2: If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.

Note 3: Applied to residential receptors only.

- A) Category A: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are less than these values.
 B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
 C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than A values.
 D) 19.00-2300 weekdays, 13.00-2300 Saturdays and 07.00-2300 Sundays

3 Assessment Methodology

3.1 Noise Modelling Methodology

Three dimensional noise modelling has been undertaken based on the monitoring data to predict L_{Aeq} and source noise levels. CADNA noise modelling software has been used. This model is based on the 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 3.1.

Table 3.1 Modelling Parameters Sources and Assumptions

Parameter	Source	Details
Horizontal distances – around site	OS	10,000 Raster maps
Ground levels	OS	OS panorama contours
Building heights	N/A	None included within model
Barrier heights	N/A	None included within model
Receptor positions	WYG	4m height
Absorbent Ground	Cadna	G=0 Hard ground
Proposed Plans	MORL	Transmission Infrastructure Application Boundary Design parameters Envelope

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 (Substation)

In the absence of specific data relating to the proposed substation equipment, the following noise sources have been assigned as point sources to provide an estimate of noise generation from the principal components of the substations. The data has been sourced from publicly available data (Rampion Offshore Wind farm, ES Section 27 – Noise, December 2012).

Table 3.2 Plant assigned within noise model

Equipment	Number	Sound power level dB(A)
Super Grid Transformer	4	90
Auxiliary Transformer	4	90
Reactor	12	78
STATCOM unit	4	84
Harmonic Filter Compound	4	91
Cooling Unit	12	75

Whilst there are no buildings or barriers included within the noise model, to present a reasonable worst case approximation, the point sources have been assigned heights of 6 m. The frequency spectrum for each source has been set to allow for a high low frequency content of the source.

3.3 Model Input data (Construction Noise Sources)

The assessment has been undertaken based on the use of assumed construction plant and considering the range of typical activities likely to be employed during the construction phase of the modified OnTI. The following scenarios have been assessed with regard to works occurring at landfall and over the cable route:

- Site preparation: top soil removal
- Site construction of access roads and site compound
- Trench excavation (open trench or cable plough)
- Laying the cable and jointing
- Backfilling the trench
- Re-instatement
- Cable pulling

Indicatively, works at the modified offshore export cable landfall point are expected to be undertaken over a 3 month period with specific activities lasting typically up to 1 month. In terms of the modified export cable route, it is expected that a distance of 1.5 km will be progressed per week. The longest period of works will comprise the civil engineering works which are expected to be undertaken over a 24 month period.

With respect to HGV movements, it is anticipated that these will only occur during daytime periods. The following HGV traffic flows have been used within the construction assessment

Table 3.3 HGV Traffic Flows Daytime

Link	Number of HGVs	Number of HGVs per hour
A98 west of Boyndie	50	4
B9121	27	2
A98 west of B9038	77	6
A97 south of B9121	28	2
A947 Keilhill	92	8
C92S east of Foulzie	0	0
C7S west of Gorrachie	30	3
B9105 south of Fintry	68	6
A947 north of Turrif	34	3
A947 south of B992	8	1
A98 east of B9027	54	5
B9170 west of Cuminestown	26	2
C29S south of Cuminestown	13	1
C121B west of C295	42	4
B9170 west of New Deer	7	1
A948 west of B9028	7	1
A981 west of B9028	0	0

Information regarding noise emissions from equipment used during the construction phase has been obtained from Annex C of BS 5228-1:2009 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This annex presents a range of current sound level data on typical site equipment and common site activities.

This data is obtained by field measurements for items of plant in actual use on construction and open sites in the UK. Levels quoted in the database are based on an average (logarithmic) of measured sound levels, and where appropriate have been derived from more than one model of similarly sized plant. The results are presented as un-weighted octave band activity L_{eq} levels, and overall A-weighted activity L_{eq} levels in dB. All sound pressure levels are standardized to 10 metres from the plant. Point sources have been defined at locations along the length of the proposed cable route adjacent to the sensitive receptor locations identified within Table 3.4 below; worst case assumptions regarding the on-time of plant (100%) have been made.

Table 3.4 Plant assigned within noise model

Equipment	Sound Pressure Level dB(A) 10m Distance
Tracked excavator	76
Wheeled loader	68
Dumper	81
Vibratory Roller	73
Wheeled Backhoe	68

3.4 Sensitive Receptor Locations

Table 3.5 summarises existing receptor locations that have been selected to represent the closest receptors with respect to direct noise from the site. The locations of the receptors are shown in Figure 3.3-3 within Volume 3 of the ES.

Table 3.5 Sensitive Receptor Locations (Operational Substation Noise)

Ref	Description	Distance from Nearest Assessed Proposed Plant Locations (m)
SR1	Upper Mains of Asleid	70
SR2	Asleid Cottages	210
SR3	Burnside	175
SR4	Silverlea	525
SR5	Rowan Brae	465
SR6	Smiddlybank Farm	670
SR7	Mains of Asleid	275
SR8	North Mains of Asleid	610
SR9	East Swanford	290
SR10	Swanford	845
SR11	Abbotshaugh	715
SR12	Burnside	850
SR13	The Neuk	755


Table 3.6 summarises existing receptor locations that have been selected to represent the closest receptors with respect to construction noise along the proposed cable route; receptors within 100m of the red line boundary of the scheme have been selected. The locations of the receptors are shown in Figure 3.3-2 within Volume 3 of the ES.

Table 3.6 Sensitive Receptor Locations (Construction Noise Assessment)

Ref	Description	Representative Monitoring Location
R1	Upper Mains of Asleid	LT28
R2	Asleid Cottages	LT28
R3	Burnside	LT30
R4	East Swanford	LT30
R5	Mains of Asleid	LT28
R6	The Neuk	LT3
R7	Cragganmore	LT3
R8	Rosebank Cottage	LT31
R9	Burnside	LT31
R10	Marymill House	LT31
R11	Upper Burnside	LT31
R12	Broomfield Cottage	LT31
R13	Little Swanford	LT31
R14	Bridge Valley	LT8
R15	Swanford	LT8
R16	Micali	LT8
R17	Bogside	LT2
R18	Meadowside	LT2
R19	Rushead	LT2
R20	Mill of Muirtack	LT2
R21	Mossie of Teucher	LT2
R22	Middletack	LT2
R23	Latchfold Croft	LT2
R24	Upper Greenfield	LT9
R25	Berryhill	LT9
R26	Boghead	LT9
R27	Hillview	LT9
R28	Roadside Croft	LT9
R29	Roadside of Teuchar	LT9
R30	Castlehill	LT9
R31	South Teuchar	LT9
R32	An Tellach	LT10
R33	Waterside	LT10
R34	Torbeck	LT11
R35	Mill of Pot	LT11
R36	Mill House	LT11
R37	The Willows	LT11
R38	Honeyneuk	LT11
R39	Beechside House	LT11
R40	Everton House	LT12
R41	Cairnhill	LT12
R42	Newton of Cairnhill	LT12

Ref	Description	Representative Monitoring Location
R43	North Everton	LT12
R44	Rowanhill	LT12
R45	Hill of Cotburn	LT13
R46	Upper Cotburn	LT13
R47	Fintry	LT14
R48	Fintry Cottage	LT14
R49	Findale Cottages	LT14
R50	House East of Fintry School	LT14
R51	Fintry School	LT14
R52	Slackdale	LT14
R53	The Bungalow	LT14
R54	Mill of Fintry	LT14
R55	Yonderton	LT14
R56	Gairnieston	LT14
R57	Backhill of Yonderton	LT35
R58	Cowsmill	LT15
R59	Mill of Balmaud	LT15
R60	Mill of Balmaud Cottages	LT15
R61	Property North of Mill of Balmaud Cottages	LT15
R62	Gowanlea	LT15
R63	Gorrachie Smithy	LT15
R64	Milltack	LT15
R65	Gorrachie Bridge	LT16
R66	Muirton	LT16
R67	Hazeldene	LT16
R68	Over Foulzie	LT22
R69	Marnoch	LT22
R70	Foulzie	LT22
R71	Foulzie Cottages	LT22
R72	Blairboyne	LT22
R73	Foulzie Villa	LT22
R74	Keilhill Cottage	LT22
R75	Keilhill Croft	LT22
R76	Keilhill Smithy	LT22
R77	Laurel Grove	LT22
R78	Minerva	LT22
R79	Eden Villa	LT22
R80	Burnside of Montbletton	LT22
R81	Wester Kielhill	LT22
R82	Denburn	LT22
R83	Bridge of Denmill	LT22
R84	Col-Mor	LT22
R85	Denmill Lodge	LT22
R86	Blanch-haven	LT22
R87	Den Cottage	LT22
R88	Den Croft	LT22
R89	Alvah View	LT22
R90	Funkieston House	LT23

Ref	Description	Representative Monitoring Location
R91	Ar Cala	LT23
R92	Wancot House	LT23
R93	Lower Wanford	LT23
R94	The Stables	LT23
R95	The Old Mill, Inverichnie	LT23
R96	Inverichnie House	LT23
R97	North Sandlaw Farm	LT41
R98	South Sandlaw House	LT41
R99	2 North Sandlaw Cottages	LT41
R100	1 Deveronview Cottages	LT41
R101	2 Deveron View Cottages	LT41
R102	3 Deveron View Cottages	LT41
R103	Berryton	LT41
R104	Tipperty	LT39
R105	Tobartaigh	LT39
R106	3 Tipperty Cottages	LT39
R107	Easter Culbeuchly	LT18
R108	Ashbrook	LT18
R109	Paddocklaw	LT18
R110	Easter Culbeuchly Cottage	LT18
R111	Paddocklaw Cottage	LT18
R112	Mid Culbeuchly Cottage	LT18
R113	Fiskaidly	LT18
R114	Hillhead Cottage	LT20
R115	Roadside Cottage	LT38
R116	The Maltings	LT19
R117	Old Manse	LT19
R118	Winterbourne	LT19
R119	Kirk Hill Farm House	LT19
R120	Kirkton Cottage	LT19
R121	Old Manse Cottages	LT19
R122	Links Cottage	LT19
R123	Burnside	LT19
R124	6 Links View	LT19
R125	5 Links View	LT19
R126	4 Links View	LT19
R127	3 Links View	LT19
R128	2 Links View	LT19
R129	1 Links View	LT19
R130	9 Links View	LT19
R131	Brandon View	LT19
R132	Jandar	LT19
R133	3 Distillery House	LT19
R134	4 Distillery Houses	LT19
R135	5 Distillery Houses	LT19
R136	6 Distillery Houses	LT19
R137	11 Distillery Cottages	LT19



Ref	Description	Representative Monitoring Location
R138	10 Distillery Cottages	LT19
R139	Inverboyndie Cottage	LT19
R140	Swordanes House Hotel	LT19
R141	Caravan Site	LT19

4 Noise Survey

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced within and around the boundary of the modified OnTI area. Equipment used during the survey included:

Type	Description	Serial Number
B&K 2260	Environmental Noise Analyser	2361273
B&K 4231	Calibrator	2176211
Rion NL-52	Environmental Noise Analyser	620858
Rion NL-52	Environmental Noise Analyser	1221576
Rion NL-52	Environmental Noise Analyser	510143
Rion NL-52	Environmental Noise Analyser	410085
Rion NL-52	Environmental Noise Analyser	610178
Rion NL-52	Environmental Noise Analyser	1121405
Rion NL-52	Environmental Noise Analyser	620865

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with BS 7445-1 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 from Saturday 17th May 2014 to Thursday 27th May 2014. Attended short term measurements were undertaken at 11 locations during the daytime period with 41 additional locations being measured unattended over periods which ranged from approximately 24 hours to week-long periods. In addition, data was also collected over full weekend periods at a number of locations including around the substation sites. The raw data collected from the long term monitoring is available upon request.

The noise monitoring locations are tabulated in Appendix 1 with plans showing the monitoring locations presented in Figure 3.3-2a – 3.3-2i of Volume 3 of the ES. The long term measurement locations were positioned primarily in or adjacent to the garden areas of the properties identified in Appendix 1. Where this was not possible or alternative suitable locations were available, the monitoring locations were positioned in areas representative of nearby dwellings.

Measurements were taken in accordance with BS 7445-1:2003 The Description and Measurement of Environmental Noise: Guide to quantities and procedures. Weather conditions during the attended survey periods were observed as being dry with wind speeds less than 5 ms⁻¹. A range of weather conditions occurred over the entire survey period with the conditions summarised in Table 4.1 below. Details relating to the conditions have been sourced from www.wunderground.com.

Table 4.1 Weather conditions during noise survey

Date	Mean Temperature (°C)	General Conditions	Wind Speed
Saturday 17 th May	11	Scattered showers, mostly cloudy	Predominantly South Frequently >5 m/s in evening when measurements began peaking at 8.2 m/s
Sunday 18 th May	15	Clear/partly cloudy	Predominantly South Frequently >5 m/s until mid afternoon peaking at 8.7 m/s
Monday 19 th May	12	Light Rain in early hours then mostly cloudy/haze/overcast throughout the day	Wind Direction predominantly E/SE infrequently above 5 m/s peaking at 5.1 m/s
Tuesday 20 th May	10	Overcast/Mostly Cloudy/ Fog	Wind Direction predominantly E/SE infrequently above 5 m/s peaking at 5.1 m/s. Direction moves NE/NNE in the late evening.
Wednesday 21 st May	14	Partly to mostly cloudy with rain. Total precipitation 4.0 mm	Wind Direction varies throughout the day. Infrequently above 5 m/s peaking at 5.1 m/s. Direction moves NE/NNE in the late evening.
Thursday 22 nd May	8	Total precipitation 9.0 mm rain on and off throughout the day	Wind Direction predominantly N/NNW. Frequently above 5 m/s peaking at 9.8 m/s.
Friday 23 rd May	9	No precipitation. Mostly cloudy throughout the day.	Wind Direction predominantly N/NNW. Frequently above 5 m/s peaking at 7.7 m/s.
Saturday 24 th May	10	No precipitation. Mostly cloudy throughout the day.	Wind Direction moves from NNW/N throughout the day to NE. Wind speed does not exceed 5 m/s over the course of the day.
Sunday 25 th May	10	Total precipitation 1 mm. Mostly cloudy with rain, drizzle and fog.	Wind direction varies from North to East throughout the day. Wind speed does not exceed 5 m/s over the course of the day.
Monday 26 th May	12	Some precipitation. Otherwise overcast and misty	Wind Direction moves from E throughout the day to SSE. Wind Direction varies throughout the day. Infrequently above 5 m/s peaking at 6.2 m/s.
Tuesday 27 th May	12	No precipitation. Partly to mostly cloudy throughout the day.	Wind direction varies throughout the day, moving from ESE to ENE. Wind speed does not exceed 5 m/s over the course of the day.
Wednesday 28 th May	11	No precipitation. Varies from clear to mostly cloudy.	Wind direction predominantly E to NE. Infrequently above 5 m/s peaking at 6.2 m/s
Thursday 29 th May	10	No precipitation. Varies from clear to mostly cloudy throughout the day.	Wind speed infrequently exceeds 5 m/s at a maximum of 5.1 m/s. Direction varies greatly throughout the day.

Based on observations made during the survey, whilst the study area covers a large distance, the principal sources of noise that were present throughout the study area comprised road traffic noise along main roads with less frequent traffic on local roads and agricultural activities within fields. Closer to the coast, noise from the sea was audible. Birdsong was also present during the night-time period as well as, when wind was present, from vegetation rustling.

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). Due to the extensive survey, the monitoring locations and results have been tabulated and are presented in Appendix 1.

5 Assessment of Key Effects

5.1 Substation – Operational Noise Assessment

Noise levels based on the source data presented in Section 3.2 have been predicted at the sensitive receptor locations identified in Table 3.5. Five scenarios have been considered based on the equipment being located within the different locations within the indicative substation areas. The predicted noise rating levels are presented in Table 5.1 and the difference between the predicted noise level and noise criteria of 35 dB_{L_{Aeq}} is presented in Table 5.2.

Table 5.1 Predicted Noise Rating Levels from Substation plant

Ref	Location	Scenario (Location within Substation Area) / Predicted Noise Rating Level (dB L _{Aeq})				
		NW corner	NE corner	Central	SW corner	SE Corner
SR1	Upper Mains of Asleid	33.2	43.4	45.1	39.1	58.3
SR2	Asleid Cottages	31.6	40.6	42.8	38.8	49.8
SR3	Burnside	43.2	35.3	45.2	49.2	41.7
SR4	Silverlea	29.4	39.6	39.4	30.3	36.1
SR5	Rowan Brae	37.3	36.5	39.5	39.8	39.4
SR6	Smiddybank Farm	36.3	37.0	38.7	33.9	30.8
SR7	Mains of Asleid	33.9	45.0	42.5	31.8	37.9
SR8	North Mains of Asleid	30.0	40.8	38.4	28.4	33.0
SR9	East Swanford	46.9	37.0	40.9	31.3	30.6
SR10	Swanford	33.9	36.2	35.6	29.0	26.0
SR11	Abbotshaugh	30.7	36.2	37.0	26.9	28.7
SR12	Burnside	38.6	37.5	35.9	26.4	26.4
SR13	The Neuk	32.6	39.6	36.9	27.0	28.0

Table 5.2 Difference between Noise Rating Level and Noise Criteria

Ref	Location	Scenario / Difference between Noise Rating Level and noise criteria dB(A)				
		NW corner	NE corner	Central	SW corner	SE Corner
SR1	Upper Mains of Asleid	-1.8	8.4	10.1	4.1	23.3
SR2	Asleid Cottages	-3.4	5.6	7.8	3.8	14.8
SR3	Burnside	8.2	0.3	10.2	14.2	6.7
SR4	Silverlea	-5.6	4.6	4.4	-4.7	1.1
SR5	Rowan Brae	2.3	1.5	4.5	4.8	4.4
SR6	Smiddybank Farm	1.3	2.0	3.7	-1.1	-4.2
SR7	Mains of Asleid	-1.1	10.0	7.5	-3.2	2.9
SR8	North Mains of Asleid	-5.0	5.8	3.4	-6.6	-2.0
SR9	East Swanford	11.9	2.0	5.9	-3.7	-4.4
SR10	Swanford	-1.1	1.2	0.6	-6.0	-9.0
SR11	Abbotshaugh	-4.3	1.2	2.0	-8.1	-6.3
SR12	Burnside	3.6	2.5	0.9	-8.6	-8.6
SR13	The Neuk	-2.4	4.6	1.9	-8.0	-7.0
Maximum difference for each scenario		11.9	10.0	10.2	14.2	23.3

On the basis that noise rating levels are predicted to be above 35 dB(A) and thus the adopted criteria, regardless of the location of the substations, there will be the need to consider controlling noise emissions in some form during the detailed design. The assessment presented above does not take into account the screening effects of buildings or enclosures, however, the proposal benefits from substations located within fully enclosed buildings. Accordingly a combination of the following mitigation measures is proposed for the finalised substation layouts.

The proposed design benefits from Gas Insulated Switchgear and as such plant will be housed within buildings fitted with silencers / attenuators where required to minimise airborne sound transmission from within the buildings to the external environment. The following typical sound reduction indices are given for the potential building constructions; the proposed substation buildings are considered likely to achieve composite sound reduction indices of between 25 – 30 dB.

Table 5.3 Sound Reduction Indices (dB)

Building Element	Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Wall/Roof Cladding	10	14	16	18	22	26	28	28
Glazing	10	13	17	21	24	28	32	36
Doors	13	17	21	26	29	31	34	34
Acoustic Louvres	7	8	12	24	31	33	29	30
Acoustic Barrier		18	24	30	35	42		

The buildings and enclosures will be designed to meet the relevant BS8233:2014 target external and internal noise levels at all nearby sensitive receptor locations.

5.2 Construction Phase – Noise Assessment

Noise levels from potential construction activity associated with the redevelopment of the site have been assessed in accordance with BS 5228-1: 2009 criteria which indicate if a significant effect is likely to occur at noise sensitive properties.

Point sources representing all likely items of plant have been represented in the model. Worst case assumptions regarding the ‘on-time’ of individual plant items have also been made and represented in the calculations. In order to ensure that the assessment is worst case, it is assumed that all proposed construction activity is occurring simultaneously.

5.2.1 Significance based on fixed limits

The table below shows predicted levels of construction noise at existing noise sensitive properties for comparison with the recommended noise limit criteria.

Table 5.4 Construction Noise Assessment Results (Fixed Limits Method)

Ref	Description	Construction Noise Level (dB(A))	Criteria (dB(A))	Within Recommended Fixed Noise Limit?
R1	Upper Mains of Asleid	54.4	70.0	Yes
R2	Asleid Cottages	54.6	70.0	Yes
R3	Burnside	56.6	70.0	Yes
R4	East Swanford	57.7	70.0	Yes
R5	Mains of Asleid	45.4	70.0	Yes
R6	The Neuk	55.9	70.0	Yes
R7	Cragganmore	54.7	70.0	Yes
R8	Rosebank Cottage	55.2	70.0	Yes
R9	Burnside	59.4	70.0	Yes
R10	Marymill House	58.6	70.0	Yes
R11	Upper Burnside	59.6	70.0	Yes
R12	Broomfield Cottage	52.6	70.0	Yes
R13	Little Swanford	61.2	70.0	Yes
R14	Bridge Valley	63.2	70.0	Yes
R15	Swanford	52.9	70.0	Yes
R16	Micali	57.2	70.0	Yes
R17	Bogside	57.2	70.0	Yes
R18	Meadowside	49.7	70.0	Yes
R19	Rushead	55.6	70.0	Yes
R20	Mill of Muirtack	56.7	70.0	Yes
R21	Mosside of Teucher	50.7	70.0	Yes
R22	Middletack	59.8	70.0	Yes
R23	Latchfold Croft	47.4	70.0	Yes
R24	Upper Greenfield	49.6	70.0	Yes
R25	Berryhill	55.6	70.0	Yes
R26	Boghead	52.9	70.0	Yes
R27	Hillview	55.2	70.0	Yes
R28	Roadside Croft	52.4	70.0	Yes
R29	Roadside of Teuchar	59.7	70.0	Yes
R30	Castlehill	47.1	70.0	Yes
R31	South Teuchar	51.4	70.0	Yes
R32	An Tellach	47.8	70.0	Yes
R33	Waterside	59.8	70.0	Yes
R34	Torbeck	54.1	70.0	Yes
R35	Mill of Pot	56.5	70.0	Yes
R36	Mill House	57.4	70.0	Yes
R37	The Willows	59.3	70.0	Yes
R38	Honeyneuk	57.1	70.0	Yes
R39	Beechside House	48.8	70.0	Yes
R40	Everton House	53.8	70.0	Yes
R41	Cairnhill	50.7	70.0	Yes
R42	Newton of Cairnhill	53.8	70.0	Yes
R43	North Everton	48.1	70.0	Yes

Ref	Description	Construction Noise Level (dB(A))	Criteria (dB(A))	Within Recommended Fixed Noise Limit?
R44	Rowanhill	57.6	70.0	Yes
R45	Hill of Cotburn	45.7	70.0	Yes
R46	Upper Cotburn	53.6	70.0	Yes
R47	Fintry	48.4	70.0	Yes
R48	Fintry Cottage	51.8	70.0	Yes
R49	Findale Cottages	51.2	70.0	Yes
R50	House East of Fintry School	51.6	70.0	Yes
R51	Fintry School	57.4	70.0	Yes
R52	Slackdale	55.0	70.0	Yes
R53	The Bungalow	51.6	70.0	Yes
R54	Mill of Fintry	55.0	70.0	Yes
R55	Yonderton	54.2	70.0	Yes
R56	Gairnieston	54.2	70.0	Yes
R57	Backhill of Yonderton	56.8	70.0	Yes
R58	Cowsmill	55.9	70.0	Yes
R59	Mill of Balmaud	59.4	70.0	Yes
R60	Mill of Balmaud Cottages	49.1	70.0	Yes
R61	Property North of Mill of Balmaud Cottages	60.4	70.0	Yes
R62	Gowanlea	61.1	70.0	Yes
R63	Gorrachie Smithy	57.3	70.0	Yes
R64	Milltack	52.3	70.0	Yes
R65	Gorrachie Bridge	58.5	70.0	Yes
R66	Muirton	59.6	70.0	Yes
R67	Hazeldene	64.3	70.0	Yes
R68	Over Foulzie	46.0	70.0	Yes
R69	Marnoch	52.9	70.0	Yes
R70	Foulzie	50.9	70.0	Yes
R71	Foulzie Cottages	54.8	70.0	Yes
R72	Blairboyne	53.7	70.0	Yes
R73	Foulzie Villa	53.2	70.0	Yes
R74	Keilhill Cottage	53.9	70.0	Yes
R75	Keilhill Croft	56.1	70.0	Yes
R76	Keilhill Smithy	55.8	70.0	Yes
R77	Laurel Grove	54.9	70.0	Yes
R78	Minerva	53.9	70.0	Yes
R79	Eden Villa	53.2	70.0	Yes
R80	Burnside of Montbletton	53.4	70.0	Yes
R81	Wester Kielhill	59.8	70.0	Yes
R82	Denburn	63.8	70.0	Yes
R83	Bridge of Denmill	62.4	70.0	Yes
R84	Col-Mor	60.5	70.0	Yes
R85	Denmill Lodge	57.8	70.0	Yes
R86	Blanch-haven	58.3	70.0	Yes
R87	Den Cottage	54.7	70.0	Yes
R88	Den Croft	53.9	70.0	Yes

Ref	Description	Construction Noise Level (dB(A))	Criteria (dB(A))	Within Recommended Fixed Noise Limit?
R89	Alvah View	57.8	70.0	Yes
R90	Funkioston House	59.1	70.0	Yes
R91	Ar Cala	48.7	70.0	Yes
R92	Wancot House	48.2	70.0	Yes
R93	Lower Wanford	41.7	70.0	Yes
R94	The Stables	60.3	70.0	Yes
R95	The Old Mill, Inverichnie	60.2	70.0	Yes
R96	Inverichnie House	57.2	70.0	Yes
R97	North Sandlaw Farm	55.7	70.0	Yes
R98	South Sandlaw House	51.4	70.0	Yes
R99	2 North Sandlaw Cottages	51.8	70.0	Yes
R100	1 Deveronview Cottages	50.8	70.0	Yes
R101	2 Deveron View Cottages	50.5	70.0	Yes
R102	3 Deveron View Cottages	49.6	70.0	Yes
R103	Berryton	46.0	70.0	Yes
R104	Tipperty	51.5	70.0	Yes
R105	Tobartaigh	57.9	70.0	Yes
R106	3 Tipperty Cottages	54.2	70.0	Yes
R107	Easter Culbeuchly	56.3	70.0	Yes
R108	Ashbrook	54.6	70.0	Yes
R109	Paddocklaw	52.5	70.0	Yes
R110	Easter Culbeuchly Cottage	53.9	70.0	Yes
R111	Paddocklaw Cottage	48.9	70.0	Yes
R112	Mid Culbeuchly Cottage	53.6	70.0	Yes
R113	Fiskaidly	51.9	70.0	Yes
R114	Hillhead Cottage	61.4	70.0	Yes
R115	Roadside Cottage	56.1	70.0	Yes
R116	The Maltings	58.7	70.0	Yes
R117	Old Manse	50.1	70.0	Yes
R118	Winterbourne	58.7	70.0	Yes
R119	Kirk Hill Farm House	57.2	70.0	Yes
R120	Kirkton Cottage	54.2	70.0	Yes
R121	Old Manse Cottages	54.4	70.0	Yes
R122	Links Cottage	50.5	70.0	Yes
R123	Burnside	48.3	70.0	Yes
R124	6 Links View	50.2	70.0	Yes
R125	5 Links View	50.1	70.0	Yes
R126	4 Links View	50.1	70.0	Yes
R127	3 Links View	49.7	70.0	Yes
R128	2 Links View	49.5	70.0	Yes
R129	1 Links View	50.7	70.0	Yes
R130	9 Links View	49.1	70.0	Yes
R131	Brandon View	49.1	70.0	Yes
R132	Jandar	49.3	70.0	Yes
R133	3 Distillery House	49.3	70.0	Yes

Ref	Description	Construction Noise Level (dB(A))	Criteria (dB(A))	Within Recommended Fixed Noise Limit?
R134	4 Distillery Houses	49.3	70.0	Yes
R135	5 Distillery Houses	49.4	70.0	Yes
R136	6 Distillery Houses	49.5	70.0	Yes
R137	11 Distillery Cottages	46.6	70.0	Yes
R138	10 Distillery Cottages	46.3	70.0	Yes
R139	Inverboyndie Cottage	49.4	70.0	Yes
R140	Swordanes House Hotel	48.8	70.0	Yes
R141	Caravan Site	52.4	70.0	Yes

The results indicate that the noise levels at the façades of the existing noise sensitive properties would be within the recommended criteria. Noise levels within the fixed limit criteria are likely to result in internal conditions where conversation would not be difficult.

5.2.2 Significance based on noise change – ABC Method

The table below presents the findings of a daytime construction noise assessment at noise sensitive properties surrounding the site. Daytime is regarded as Weekdays 07:00 – 19:00 and Saturdays 07:00 - 13:00.

Table 5.5 Construction Noise Assessment Results (ABC Method) – Daytime

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L_{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R1	51.4	50.0	54.4	55.7	A	65	No
R2	51.4	50.0	54.6	55.9	A	65	No
R3	52.1	50.0	56.6	57.5	A	65	No
R4	52.1	50.0	58.0	58.6	A	65	No
R5	51.4	50.0	45.4	51.3	A	65	No
R6	56.7	55.0	55.0	58.0	A	65	No
R7	56.7	55.0	54.0	57.5	A	65	No
R8	53.5	55.0	55.1	58.1	A	65	No
R9	53.5	55.0	59.6	60.9	A	65	No
R10	53.5	55.0	58.6	60.2	A	65	No
R11	53.5	55.0	59.7	61.0	A	65	No
R12	53.5	55.0	52.6	57.0	A	65	No
R13	53.5	55.0	61.2	62.1	A	65	No
R14	52.7	55.0	63.3	63.9	A	65	No
R15	52.7	55.0	53.0	57.1	A	65	No
R16	52.7	55.0	57.3	59.3	A	65	No
R17	48.8	50.0	57.2	58.0	A	65	No
R18	48.8	50.0	49.7	52.9	A	65	No
R19	48.8	50.0	55.6	56.7	A	65	No
R20	48.8	50.0	56.7	57.5	A	65	No
R21	48.8	50.0	50.7	53.4	A	65	No
R22	48.8	50.0	59.8	60.2	A	65	No

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L _{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R23	48.8	50.0	47.4	51.9	A	65	No
R24	43.8	45.0	49.6	50.9	A	65	No
R25	43.8	45.0	55.6	56.0	A	65	No
R26	43.8	45.0	52.9	53.6	A	65	No
R27	43.8	45.0	55.2	55.6	A	65	No
R28	43.8	45.0	52.4	53.1	A	65	No
R29	43.8	45.0	59.7	59.8	A	65	No
R30	43.8	45.0	47.1	49.2	A	65	No
R31	43.8	45.0	51.4	52.3	A	65	No
R32	42.7	45.0	47.8	49.6	A	65	No
R33	42.7	45.0	59.8	59.9	A	65	No
R34	61.3	60.0	54.1	61.0	A	65	No
R35	61.3	60.0	56.5	61.6	A	65	No
R36	61.3	60.0	57.4	61.9	A	65	No
R37	61.3	60.0	59.3	62.7	A	65	No
R38	61.3	60.0	57.1	61.8	A	65	No
R39	61.3	60.0	48.9	60.3	A	65	No
R40	45.1	45.0	53.8	54.3	A	65	No
R41	45.1	45.0	50.7	51.7	A	65	No
R42	45.1	45.0	53.8	54.3	A	65	No
R43	45.1	45.0	48.1	49.8	A	65	No
R44	45.1	45.0	57.6	57.8	A	65	No
R45	54.2	55.0	45.9	55.5	A	65	No
R46	54.2	55.0	53.7	57.4	A	65	No
R47	45.8	45.0	50.9	51.9	A	65	No
R48	45.8	45.0	57.3	57.5	A	65	No
R49	45.8	45.0	52.4	53.1	A	65	No
R50	45.8	45.0	52.0	52.8	A	65	No
R51	45.8	45.0	57.5	57.7	A	65	No
R52	45.8	45.0	55.1	55.5	A	65	No
R53	45.8	45.0	51.8	52.6	A	65	No
R54	45.8	45.0	55.1	55.5	A	65	No
R55	45.8	45.0	54.3	54.8	A	65	No
R56	45.8	45.0	54.3	54.8	A	65	No
R57	52.3	50.0	56.8	57.6	A	65	No
R58	49.5	50.0	55.9	56.9	A	65	No
R59	49.5	50.0	59.4	59.9	A	65	No
R60	49.5	50.0	49.1	52.6	A	65	No
R61	49.5	50.0	60.4	60.8	A	65	No
R62	49.5	50.0	61.1	61.4	A	65	No
R63	49.5	50.0	57.3	58.0	A	65	No
R64	49.5	50.0	52.3	54.3	A	65	No
R65	51.3	50.0	58.5	59.1	A	65	No
R66	51.3	50.0	59.6	60.1	A	65	No
R67	51.3	50.0	64.3	64.5	A	65	No

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L_{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R68	50.1	50.0	46.3	51.5	A	65	No
R69	50.1	50.0	53.1	54.8	A	65	No
R70	50.1	50.0	51.7	53.9	A	65	No
R71	50.1	50.0	57.0	57.8	A	65	No
R72	50.1	50.0	58.4	59.0	A	65	No
R73	50.1	50.0	58.9	59.4	A	65	No
R74	50.1	50.0	58.6	59.2	A	65	No
R75	50.1	50.0	59.5	60.0	A	65	No
R76	50.1	50.0	57.4	58.1	A	65	No
R77	50.1	50.0	56.2	57.1	A	65	No
R78	50.1	50.0	55.0	56.2	A	65	No
R79	50.1	50.0	54.2	55.6	A	65	No
R80	50.1	50.0	54.3	55.7	A	65	No
R81	50.1	50.0	59.9	60.3	A	65	No
R82	50.1	50.0	63.8	64.0	A	65	No
R83	50.1	50.0	62.4	62.6	A	65	No
R84	50.1	50.0	60.5	60.9	A	65	No
R85	50.1	50.0	57.9	58.6	A	65	No
R86	50.1	50.0	58.3	58.9	A	65	No
R87	50.1	50.0	54.7	56.0	A	65	No
R88	50.1	50.0	54.0	55.5	A	65	No
R89	50.1	50.0	57.8	58.5	A	65	No
R90	52.9	55.0	59.2	60.6	A	65	No
R91	52.9	55.0	48.9	56.0	A	65	No
R92	52.9	55.0	48.4	55.9	A	65	No
R93	52.9	55.0	41.9	55.2	A	65	No
R94	52.9	55.0	60.3	61.4	A	65	No
R95	52.9	55.0	60.2	61.3	A	65	No
R96	52.9	55.0	57.2	59.2	A	65	No
R97	49.5	50.0	55.7	56.7	A	65	No
R98	49.5	50.0	51.4	53.8	A	65	No
R99	49.5	50.0	51.8	54.0	A	65	No
R100	49.5	50.0	50.8	53.4	A	65	No
R101	49.5	50.0	50.5	53.3	A	65	No
R102	49.5	50.0	49.7	52.9	A	65	No
R103	49.5	50.0	46.1	51.5	A	65	No
R104	52.5	55.0	52.1	56.8	A	65	No
R105	52.5	55.0	58.8	60.3	A	65	No
R106	52.5	55.0	56.2	58.7	A	65	No
R107	51.2	50.0	56.7	57.5	A	65	No
R108	51.2	50.0	55.7	56.7	A	65	No
R109	51.2	50.0	52.6	54.5	A	65	No
R110	51.2	50.0	54.0	55.5	A	65	No
R111	51.2	50.0	49.1	52.6	A	65	No
R112	51.2	50.0	55.9	56.9	A	65	No

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L_{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R113	51.2	50.0	52.0	54.1	A	65	No
R114	52.4	50.0	61.4	61.7	A	65	No
R115	58.8	60.0	58.8	62.5	A	65	No
R116	54.2	55.0	58.8	60.3	A	65	No
R117	54.2	55.0	50.5	56.3	A	65	No
R118	54.2	55.0	58.8	60.3	A	65	No
R119	54.2	55.0	57.3	59.3	A	65	No
R120	54.2	55.0	54.3	57.7	A	65	No
R121	54.2	55.0	54.5	57.8	A	65	No
R122	54.2	55.0	50.9	56.4	A	65	No
R123	54.2	55.0	48.8	55.9	A	65	No
R124	54.2	55.0	50.6	56.3	A	65	No
R125	54.2	55.0	50.5	56.3	A	65	No
R126	54.2	55.0	50.5	56.3	A	65	No
R127	54.2	55.0	50.2	56.2	A	65	No
R128	54.2	55.0	50.0	56.2	A	65	No
R129	54.2	55.0	51.2	56.5	A	65	No
R130	54.2	55.0	49.7	56.1	A	65	No
R131	54.2	55.0	49.6	56.1	A	65	No
R132	54.2	55.0	49.8	56.1	A	65	No
R133	54.2	55.0	49.8	56.1	A	65	No
R134	54.2	55.0	49.8	56.1	A	65	No
R135	54.2	55.0	49.9	56.2	A	65	No
R136	54.2	55.0	49.9	56.2	A	65	No
R137	54.2	55.0	47.4	55.7	A	65	No
R138	54.2	55.0	47.0	55.6	A	65	No
R139	54.2	55.0	50.1	56.2	A	65	No
R140	54.2	55.0	49.7	56.1	A	65	No
R141	54.2	55.0	52.7	57.0	A	65	No

In accordance with ABC method of assessment outlined in BS 5228-1:2009, a significant effect isn't deemed to occur if the total noise level exceeds the threshold level for the category appropriate to the ambient noise level. It can be seen from the results tabulated above that all nearby noise sensitive premises included in this assessment are currently exposed to ambient noise levels which comply with Category A.

When the category threshold values are compared to the Total Noise level experienced at the noise sensitive properties during the demolition/construction phase of the development it is shown that the Total Noise levels are below the relevant threshold value and the impact is not considered to be significant during the daytime hours on Weekdays 07:00 – 19:00 and Saturdays 07:00 – 13:00.

Evenings and Weekends

Evenings & Weekends

The table below presents the findings of an evening and weekend construction noise assessment at noise sensitive properties surrounding the site. Evenings and weekends are regarded as 19:00 – 23:00 and 13.00 – 2300 Saturdays and 07.00 – 2300 Sundays.

Table 5.6 Construction Noise Assessment Results (ABC Method) – Evenings & Weekends

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L_{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R1	48.4	50.0	54.4	55.7	A	55	Yes
R2	48.4	50.0	54.6	55.9	A	55	Yes
R3	43.6	45.0	56.6	56.9	A	55	Yes
R4	43.6	45.0	57.7	57.9	A	55	Yes
R5	48.4	50.0	45.4	51.3	A	55	No
R6	53.3	55.0	55.9	58.5	A	55	Yes
R7	53.3	55.0	54.7	57.9	A	55	Yes
R8	50.5	50.0	55.2	56.3	A	55	Yes
R9	50.5	50.0	59.4	59.9	A	55	Yes
R10	50.5	50.0	58.6	59.2	A	55	Yes
R11	50.5	50.0	59.6	60.1	A	55	Yes
R12	50.5	50.0	52.6	54.5	A	55	No
R13	50.5	50.0	61.2	61.5	A	55	Yes
R14	50.0	50.0	63.2	63.4	A	55	Yes
R15	50.0	50.0	52.9	54.7	A	55	No
R16	50.0	50.0	57.2	58.0	A	55	Yes
R17	48.8	50.0	57.2	58.0	A	55	Yes
R18	48.8	50.0	49.7	52.9	A	55	No
R19	48.8	50.0	55.6	56.7	A	55	Yes
R20	48.8	50.0	56.7	57.5	A	55	Yes
R21	48.8	50.0	50.7	53.4	A	55	No
R22	48.8	50.0	59.8	60.2	A	55	Yes
R23	48.8	50.0	47.4	51.9	A	55	No
R24	36.8	35.0	49.6	49.7	A	55	No
R25	36.8	35.0	55.6	55.6	A	55	Yes
R26	36.8	35.0	52.9	53.0	A	55	No
R27	36.8	35.0	55.2	55.2	A	55	Yes
R28	36.8	35.0	52.4	52.5	A	55	No
R29	36.8	35.0	59.7	59.7	A	55	Yes
R30	36.8	35.0	47.1	47.4	A	55	No
R31	36.8	35.0	51.4	51.5	A	55	No
R32	50.2	50.0	47.8	52.0	A	55	No
R33	50.2	50.0	59.8	60.2	A	55	Yes
R34	57.3	55.0	54.1	57.6	B	60	No
R35	57.3	55.0	56.5	58.8	B	60	No
R36	57.3	55.0	57.4	59.4	B	60	No
R37	57.3	55.0	59.3	60.7	B	60	Yes
R38	57.3	55.0	57.1	59.2	B	60	No
R39	57.3	55.0	48.8	55.9	B	60	No

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L _{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R40	43.7	45.0	53.8	54.3	A	55	No
R41	43.7	45.0	50.7	51.7	A	55	No
R42	43.7	45.0	53.8	54.3	A	55	No
R43	43.7	45.0	48.1	49.8	A	55	No
R44	43.7	45.0	57.6	57.8	A	55	Yes
R45	53.6	55.0	45.7	55.5	B	60	No
R46	53.6	55.0	53.6	57.4	B	60	No
R47	43.0	45.0	48.4	50.0	A	55	No
R48	43.0	45.0	51.8	52.6	A	55	No
R49	43.0	45.0	51.2	52.1	A	55	No
R50	43.0	45.0	51.6	52.5	A	55	No
R51	43.0	45.0	57.4	57.6	A	55	Yes
R52	43.0	45.0	55.0	55.4	A	55	Yes
R53	43.0	45.0	51.6	52.5	A	55	No
R54	43.0	45.0	55.0	55.4	A	55	Yes
R55	43.0	45.0	54.2	54.7	A	55	No
R56	43.0	45.0	54.2	54.7	A	55	No
R57	48.7	50.0	56.8	57.6	A	55	Yes
R58	45.2	45.0	55.9	56.2	A	55	Yes
R59	45.2	45.0	59.4	59.6	A	55	Yes
R60	45.2	45.0	49.1	50.5	A	55	No
R61	45.2	45.0	60.4	60.5	A	55	Yes
R62	45.2	45.0	61.1	61.2	A	55	Yes
R63	45.2	45.0	57.3	57.5	A	55	Yes
R64	45.2	45.0	52.3	53.0	A	55	No
R65	51.0	50.0	58.5	59.1	A	55	Yes
R66	51.0	50.0	59.6	60.1	A	55	Yes
R67	51.0	50.0	64.3	64.5	A	55	Yes
R68	45.7	45.0	46.0	48.5	A	55	No
R69	45.7	45.0	52.9	53.6	A	55	No
R70	45.7	45.0	50.9	51.9	A	55	No
R71	45.7	45.0	54.8	55.2	A	55	Yes
R72	45.7	45.0	53.7	54.2	A	55	No
R73	45.7	45.0	53.2	53.8	A	55	No
R74	45.7	45.0	53.9	54.4	A	55	No
R75	45.7	45.0	56.1	56.4	A	55	Yes
R76	45.7	45.0	55.8	56.1	A	55	Yes
R77	45.7	45.0	54.9	55.3	A	55	Yes
R78	45.7	45.0	53.9	54.4	A	55	No
R79	45.7	45.0	53.2	53.8	A	55	No
R80	45.7	45.0	53.4	54.0	A	55	No
R81	45.7	45.0	59.8	59.9	A	55	Yes
R82	45.7	45.0	63.8	63.9	A	55	Yes
R83	45.7	45.0	62.4	62.5	A	55	Yes

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L _{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R84	45.7	45.0	60.5	60.6	A	55	Yes
R85	45.7	45.0	57.8	58.0	A	55	Yes
R86	45.7	45.0	58.3	58.5	A	55	Yes
R87	45.7	45.0	54.7	55.1	A	55	Yes
R88	45.7	45.0	53.9	54.4	A	55	No
R89	45.7	45.0	57.8	58.0	A	55	Yes
R90	44.6	45.0	59.1	59.3	A	55	Yes
R91	44.6	45.0	48.7	50.2	A	55	No
R92	44.6	45.0	48.2	49.9	A	55	No
R93	44.6	45.0	41.7	46.7	A	55	No
R94	44.6	45.0	60.3	60.4	A	55	Yes
R95	44.6	45.0	60.2	60.3	A	55	Yes
R96	44.6	45.0	57.2	57.5	A	55	Yes
R97	44.3	45.0	55.7	56.1	A	55	Yes
R98	44.3	45.0	51.4	52.3	A	55	No
R99	44.3	45.0	51.8	52.6	A	55	No
R100	44.3	45.0	50.8	51.8	A	55	No
R101	44.3	45.0	50.5	51.6	A	55	No
R102	44.3	45.0	49.6	50.9	A	55	No
R103	44.3	45.0	46.0	48.5	A	55	No
R104	47.2	45.0	51.5	52.4	A	55	No
R105	47.2	45.0	57.9	58.1	A	55	Yes
R106	47.2	45.0	54.2	54.7	A	55	No
R107	37.5	40.0	56.3	56.4	A	55	Yes
R108	37.5	40.0	54.6	54.7	A	55	No
R109	37.5	40.0	52.5	52.7	A	55	No
R110	37.5	40.0	53.9	54.1	A	55	No
R111	37.5	40.0	48.9	49.4	A	55	No
R112	37.5	40.0	53.6	53.8	A	55	No
R113	37.5	40.0	51.9	52.2	A	55	No
R114	41.6	40.0	61.4	61.4	A	55	Yes
R115	57.9	60.0	56.1	61.5	C	65	No
R116	52.3	50.0	58.7	59.2	A	55	Yes
R117	52.3	50.0	50.1	53.1	A	55	No
R118	52.3	50.0	58.7	59.2	A	55	Yes
R119	52.3	50.0	57.2	58.0	A	55	Yes
R120	52.3	50.0	54.2	55.6	A	55	Yes
R121	52.3	50.0	54.4	55.7	A	55	Yes
R122	52.3	50.0	50.5	53.3	A	55	No
R123	52.3	50.0	48.3	52.2	A	55	No
R124	52.3	50.0	50.2	53.1	A	55	No
R125	52.3	50.0	50.1	53.1	A	55	No
R126	52.3	50.0	50.1	53.1	A	55	No
R127	52.3	50.0	49.7	52.9	A	55	No

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L _{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R128	52.3	50.0	49.5	52.8	A	55	No
R129	52.3	50.0	50.7	53.4	A	55	No
R130	52.3	50.0	49.1	52.6	A	55	No
R131	52.3	50.0	49.1	52.6	A	55	No
R132	52.3	50.0	49.3	52.7	A	55	No
R133	52.3	50.0	49.3	52.7	A	55	No
R134	52.3	50.0	49.3	52.7	A	55	No
R135	52.3	50.0	49.4	52.7	A	55	No
R136	52.3	50.0	49.5	52.8	A	55	No
R137	52.3	50.0	46.6	51.6	A	55	No
R138	52.3	50.0	46.3	51.5	A	55	No
R139	52.3	50.0	49.4	52.7	A	55	No
R140	52.3	50.0	48.8	52.5	A	55	No
R141	52.3	50.0	52.4	54.4	A	55	No

In accordance with ABC method of assessment outlined in BS 5228-1:2009, it can be seen from the results tabulated above that nearby noise sensitive premises included in this assessment are currently exposed to ambient noise levels which comply with Categories A – C.

When the category threshold values are compared to the Total Noise level experienced at the noise sensitive properties during the demolition/construction phase of the development it is shown that the Total Noise levels are below the relevant threshold value and the impact is considered to be significant at the majority of dwellings during evenings and on 13.00-2300 Saturdays and 07.00-2300 Sundays.

Night-time

The table below presents the findings of a night-time construction noise assessment at noise sensitive properties surrounding the site. Night-time is regarded as 23:00 – 07:00.

Table 5.7 Construction Noise Assessment Results (ABC Method) – Night-time

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L _{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R1	51.3	50.0	54.4	55.7	C	55	Yes
R2	51.3	50.0	54.6	55.9	C	55	Yes
R3	42.7	45.0	56.6	56.9	B	50	Yes
R4	42.7	45.0	57.7	57.9	B	50	Yes
R5	51.3	50.0	45.4	51.3	C	55	No
R6	49.8	50.0	55.9	56.9	C	55	Yes
R7	49.8	50.0	54.7	56.0	C	55	Yes
R8	51.2	50.0	55.2	56.3	C	55	Yes
R9	51.2	50.0	59.4	59.9	C	55	Yes

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L _{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R10	51.2	50.0	58.6	59.2	C	55	Yes
R11	51.2	50.0	59.6	60.1	C	55	Yes
R12	51.2	50.0	52.6	54.5	C	55	No
R13	51.2	50.0	61.2	61.5	C	55	Yes
R14	47.6	50.0	63.2	63.4	C	55	Yes
R15	47.6	50.0	52.9	54.7	C	55	No
R16	47.6	50.0	57.2	58.0	C	55	Yes
R17	44.2	45.0	57.2	57.5	B	50	Yes
R18	44.2	45.0	49.7	51.0	B	50	Yes
R19	44.2	45.0	55.6	56.0	B	50	Yes
R20	44.2	45.0	56.7	57.0	B	50	Yes
R21	44.2	45.0	50.7	51.7	B	50	Yes
R22	44.2	45.0	59.8	59.9	B	50	Yes
R23	44.2	45.0	47.4	49.4	B	50	No
R24	43.0	45.0	49.6	50.9	B	50	Yes
R25	43.0	45.0	55.6	56.0	B	50	Yes
R26	43.0	45.0	52.9	53.6	B	50	Yes
R27	43.0	45.0	55.2	55.6	B	50	Yes
R28	43.0	45.0	52.4	53.1	B	50	Yes
R29	43.0	45.0	59.7	59.8	B	50	Yes
R30	43.0	45.0	47.1	49.2	B	50	No
R31	43.0	45.0	51.4	52.3	B	50	Yes
R32	49.8	50.0	47.8	52.0	C	55	No
R33	49.8	50.0	59.8	60.2	C	55	Yes
R34	50.7	50.0	54.1	55.5	C	55	Yes
R35	50.7	50.0	56.5	57.4	C	55	Yes
R36	50.7	50.0	57.4	58.1	C	55	Yes
R37	50.7	50.0	59.3	59.8	C	55	Yes
R38	50.7	50.0	57.1	57.9	C	55	Yes
R39	50.7	50.0	48.8	52.5	C	55	No
R40	37.7	40.0	53.8	54.0	A	45	Yes
R41	37.7	40.0	50.7	51.1	A	45	Yes
R42	37.7	40.0	53.8	54.0	A	45	Yes
R43	37.7	40.0	48.1	48.7	A	45	Yes
R44	37.7	40.0	57.6	57.7	A	45	Yes
R45	54.4	55.0	45.7	55.5	C	55	Yes
R46	54.4	55.0	53.6	57.4	C	55	Yes
R47	42.5	45.0	48.4	50.0	B	50	No
R48	42.5	45.0	51.8	52.6	B	50	Yes
R49	42.5	45.0	51.2	52.1	B	50	Yes
R50	42.5	45.0	51.6	52.5	B	50	Yes
R51	42.5	45.0	57.4	57.6	B	50	Yes
R52	42.5	45.0	55.0	55.4	B	50	Yes
R53	42.5	45.0	51.6	52.5	B	50	Yes
R54	42.5	45.0	55.0	55.4	B	50	Yes

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L _{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R55	42.5	45.0	54.2	54.7	B	50	Yes
R56	42.5	45.0	54.2	54.7	B	50	Yes
R57	43.0	45.0	56.8	57.1	B	50	Yes
R58	47.5	50.0	55.9	56.9	C	55	Yes
R59	47.5	50.0	59.4	59.9	C	55	Yes
R60	47.5	50.0	49.1	52.6	C	55	No
R61	47.5	50.0	60.4	60.8	C	55	Yes
R62	47.5	50.0	61.1	61.4	C	55	Yes
R63	47.5	50.0	57.3	58.0	C	55	Yes
R64	47.5	50.0	52.3	54.3	C	55	No
R65	49.9	50.0	58.5	59.1	C	55	Yes
R66	49.9	50.0	59.6	60.1	C	55	Yes
R67	49.9	50.0	64.3	64.5	C	55	Yes
R68	48.7	50.0	46.0	51.5	C	55	No
R69	48.7	50.0	52.9	54.7	C	55	No
R70	48.7	50.0	50.9	53.5	C	55	No
R71	48.7	50.0	54.8	56.0	C	55	Yes
R72	48.7	50.0	53.7	55.2	C	55	Yes
R73	48.7	50.0	53.2	54.9	C	55	No
R74	48.7	50.0	53.9	55.4	C	55	Yes
R75	48.7	50.0	56.1	57.1	C	55	Yes
R76	48.7	50.0	55.8	56.8	C	55	Yes
R77	48.7	50.0	54.9	56.1	C	55	Yes
R78	48.7	50.0	53.9	55.4	C	55	Yes
R79	48.7	50.0	53.2	54.9	C	55	No
R80	48.7	50.0	53.4	55.0	C	55	No
R81	48.7	50.0	59.8	60.2	C	55	Yes
R82	48.7	50.0	63.8	64.0	C	55	Yes
R83	48.7	50.0	62.4	62.6	C	55	Yes
R84	48.7	50.0	60.5	60.9	C	55	Yes
R85	48.7	50.0	57.8	58.5	C	55	Yes
R86	48.7	50.0	58.3	58.9	C	55	Yes
R87	48.7	50.0	54.7	56.0	C	55	Yes
R88	48.7	50.0	53.9	55.4	C	55	Yes
R89	48.7	50.0	57.8	58.5	C	55	Yes
R90	44.5	45.0	59.1	59.3	B	50	Yes
R91	44.5	45.0	48.7	50.2	B	50	Yes
R92	44.5	45.0	48.2	49.9	B	50	No
R93	44.5	45.0	41.7	46.7	B	50	No
R94	44.5	45.0	60.3	60.4	B	50	Yes
R95	44.5	45.0	60.2	60.3	B	50	Yes
R96	44.5	45.0	57.2	57.5	B	50	Yes
R97	46.0	45.0	55.7	56.1	B	50	Yes
R98	46.0	45.0	51.4	52.3	B	50	Yes

Nearest Sensitive Receptors	Measured Existing Ambient Noise Level (L _{Aeq})	Rounded to nearest 5 dB	Predicted Site Noise	Total Noise (Site noise + pre-construction ambient)	Category	Threshold	Significant Effect?
R99	46.0	45.0	51.8	52.6	B	50	Yes
R100	46.0	45.0	50.8	51.8	B	50	Yes
R101	46.0	45.0	50.5	51.6	B	50	Yes
R102	46.0	45.0	49.6	50.9	B	50	Yes
R103	46.0	45.0	46.0	48.5	B	50	No
R104	47.1	45.0	51.5	52.4	B	50	Yes
R105	47.1	45.0	57.9	58.1	B	50	Yes
R106	47.1	45.0	54.2	54.7	B	50	Yes
R107	38.6	40.0	56.3	56.4	A	45	Yes
R108	38.6	40.0	54.6	54.7	A	45	Yes
R109	38.6	40.0	52.5	52.7	A	45	Yes
R110	38.6	40.0	53.9	54.1	A	45	Yes
R111	38.6	40.0	48.9	49.4	A	45	Yes
R112	38.6	40.0	53.6	53.8	A	45	Yes
R113	38.6	40.0	51.9	52.2	A	45	Yes
R114	45.8	45.0	61.4	61.5	B	45	Yes
R115	56.5	55.0	56.1	58.6	C	55	Yes
R116	53.0	55.0	58.7	60.2	C	55	Yes
R117	53.0	55.0	50.1	56.2	C	55	Yes
R118	53.0	55.0	58.7	60.2	C	55	Yes
R119	53.0	55.0	57.2	59.2	C	55	Yes
R120	53.0	55.0	54.2	57.6	C	55	Yes
R121	53.0	55.0	54.4	57.7	C	55	Yes
R122	53.0	55.0	50.5	56.3	C	55	Yes
R123	53.0	55.0	48.3	55.8	C	55	Yes
R124	53.0	55.0	50.2	56.2	C	55	Yes
R125	53.0	55.0	50.1	56.2	C	55	Yes
R126	53.0	55.0	50.1	56.2	C	55	Yes
R127	53.0	55.0	49.7	56.1	C	55	Yes
R128	53.0	55.0	49.5	56.1	C	55	Yes
R129	53.0	55.0	50.7	56.4	C	55	Yes
R130	53.0	55.0	49.1	56.0	C	55	Yes
R131	53.0	55.0	49.1	56.0	C	55	Yes
R132	53.0	55.0	49.3	56.0	C	55	Yes
R133	53.0	55.0	49.3	56.0	C	55	Yes
R134	53.0	55.0	49.3	56.0	C	55	Yes
R135	53.0	55.0	49.4	56.1	C	55	Yes
R136	53.0	55.0	49.5	56.1	C	55	Yes
R137	53.0	55.0	46.6	55.6	C	55	Yes
R138	53.0	55.0	46.3	55.5	C	55	Yes
R139	53.0	55.0	49.4	56.1	C	55	Yes
R140	53.0	55.0	48.8	55.9	C	55	Yes
R141	53.0	55.0	52.4	56.9	C	55	Yes

In accordance with ABC method of assessment outlined in BS 5228-1:2009, it can be seen from the results tabulated above that nearby noise sensitive premises included in this assessment are currently exposed to ambient noise levels which comply with Categories A – C during the night-time.

When the category threshold values are compared to the Total Noise level experienced at the noise sensitive properties during the construction phase of the development it is shown that the Total Noise levels are below the relevant threshold value and the impact is considered to be significant at most sensitive receptor locations during night-time hours (23:00 – 07:00).

6 Conclusions

A baseline noise survey and assessment have been undertaken with regard to the construction and operational phases for the installation of the modified Onshore Transmission Infrastructure (modified OnTI) to connect the three consented wind farms (Telford, Stevenson and MaColl offshore wind farms) to the pre-existing onshore National Electricity Transmission System (NETS).

Operational Noise

Five scenarios based on the equipment being located within different locations within the indicative substation area have been assessed. The assessment concluded has identified that at the nearest potential location, the maximum reduction in noise levels required by the building/enclosures would need to be 23.3 dB. Typical building/enclosure constructions have been considered and show that a 25 – 30 dB reduction will be readily achievable. The buildings and enclosures will be designed to meet the relevant BS8233:2014 target external and internal noise levels at all nearby sensitive receptor locations.

Construction Noise

Noise levels from construction activity have been assessed in accordance with BS 5228-1:2009 criteria. The assessment concluded that noise levels from construction activity is predicted not to be significant during the daytime hours (weekdays 07:00 - 19:00 & Saturdays 07:00-13:00). It is considered that total noise levels are below the relevant threshold value for the majority of dwellings during the evening and night-time periods where there may be short term significant effects, however, all noise levels are predicted to below the fixed limits level of 70dB throughout the whole site.

Appendix 1 – Noise Survey Description and Results

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:

Type	Description	Serial Number
B&K 2260	Environmental Noise Analyser	2361273
B&K 4231	Calibrator	2176211
Rion NL-52	Environmental Noise Analyser	620858
Rion NL-52	Environmental Noise Analyser	1221576
Rion NL-52	Environmental Noise Analyser	510143
Rion NL-52	Environmental Noise Analyser	410085
Rion NL-52	Environmental Noise Analyser	610178
Rion NL-52	Environmental Noise Analyser	1121405
Rion NL-52	Environmental Noise Analyser	620865

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 52 locations (as specified in the following table and shown in SK01 of Appendix B) from Saturday 14th May 2014 to Thursday 27th July 2014. Attended short term measurements were undertaken at eleven locations during the day, evening, peak and night-time periods with forty one additional locations being measured unattended over a 90 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 A2.1 Noise Monitoring Locations

Ref	Description	Grid Reference	
		X	Y
LT1	Blackpool	381902.8	844192.7
LT2	Mill of Muirtack	381186.64	846409.6
LT3	Burnt out Pub, Maryhill	382955.2	845639.7
LT4	Silverlea	384055.5	844588.2
LT5	Smiddyhill	384582.6	844990.7
LT6	Upperton	384187.9	846045.6
LT7	North Milbrex	382161.7	843652.4
LT8	Rowansgarth	382176.2	845447.0
LT9	Hillview	380098.7	847889.0
LT10	Bridgend	379815.1	850108.0
LT11	1 Castle of Auchry Cottages	378959.0	850538.9

Ref	Description	Grid Reference	
		X	Y
LT12	Greystone Croft	376980.3	851161.9
LT13	Hill of Cotburn	376997.0	853253.1
LT14	Buona Vista	375502.3	854660.6
LT15	Mill of Balmaud	374257.8	856764.3
LT16	Blacktown	372467.7	858076.6
LT17	Parc ne Feidh	367773.4	862125.2
LT18	Paddocklaw	366166.7	861837.0
LT19	5 Links View (Oceanwaves)	366947.7	864503.2
LT20	South Colleonard	366584.6	862667.0
LT21	Rettie	363482.8	882953.9
LT22	Bridge of Denmill	370896.5	860442.7
LT23	Braeview	369639.7	861690.1
LT24	Woods Opposite Smiddyboyne Cottages*	360323.6	863723.3
LT25*	Kirk Wood*	358407.1	865035.9
LT26*	Property Opposite The Neuk (North)	355768.2	865530.8
LT27	The Neuk (South)	383126.7	845489.7
LT28	Woods opposite Upper Mains of Ashfield	383856.6	844484.5
LT29	9 The Bents	355464.8	865800.4
LT30	Woods to North of Upper Burnside*	382672.1	845602.7
LT31*	Burnside	382955.1	844205.4
LT32	Wellfield	367452.4	863873.6
LT33	Rowan Brae	383110.8	843681.5
LT34	The Park	375801.4	855995.7
LT35	13 Eden Court	364570.8	863721.7
LT36	Rowantree	361627.6	863061.4
LT37*	Woods West of Westside	357169.4	864752.5
LT38	Woodland South of Whitehills*	365526.1	864527.7
LT39*	Slacks Well Woods*	366328.7	859985.1
LT40*	Field North of Greenlaw Farm	367616.1	858495.3
LT41*	North Of Robs Knowe Wood	367833.8	860552.2
ST1	Outside Middletack Cottage, Cuminestown	381221.9	846817.0
ST2	Outside East Swanford, New Deer	383253.3	845100.0
ST3	Outside Burnside, New Deer	383075.2	843967.8
ST4	Outside Ladyswell, Fyvie	381530.2	844154.0
ST5	Outside Cairnbanno Lodge, New Deer, Turriff	384585.2	845281.0
ST6	At Caravan Site, Seaview Road, Sandend	355504.1	866141.9
ST7	Outside 20 Seaview Road, Sandend	355419.2	865985.0
ST8	Outside 12 Murray Place, Portsoy	358258.5	866132.8
ST9	Outside Cairnton, Boyndie	361283.1	863739.0
ST10	Outside 41 Tannery Street, Banff	367903.9	864034.9
ST11	Outside White Cottage Hill of Foulzie, Banff	372317.8	859579.8

Noise Survey Results

Existing ambient noise levels around the site are dominated by local roads in and around the site.

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 A2.2 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 – 19:00	82 hours	17/05/2014 - 24/05/2014 13:07 – 11:04	LT1	52.4	90.0	22.0	52.8	36.1
Evening 19:00 – 23:00	24 hours	17/05/2014 - 23/05/2014 19:00 - 23:00		49.4	82.5	14.3	46.0	30.0
Night 23:00 – 07:00	48 hours	17/05/2014 - 24/05/2014 23:00 - 07:00		51.5	89.7	13.9	40.8	27.8
Day 07:00 – 19:00	53 hours	17/05/2014 – 20/05/2014 16:55 - 10:05	LT2	48.8	85.4	21.8	47.5	35.6
Evening 19:00 – 23:00	12 hours	17/05/2014 – 19/05/2014 19:00 - 23:00		48.8	76.6	17.3	46.3	32.0
Night 23:00 – 07:00	24 hours	17/05/2014 – 20/05/2014 23:00 - 07:00		44.2	72.9	16.9	39.9	30.9
Day 07:00 – 19:00	13 hours	17/05/2014 – 18/05/2014 17:55 - :19:00	LT3	56.7	95.6	25.7	53.5	38.5
Evening 19:00 – 23:00	7 hours	17/05/2014 – 18/05/2014 19:00 - 21:45		53.3	84.8	21.4	50.7	38.2
Night 23:00 – 07:00	8 hours	17/05/2014 – 18/05/2014 23:00 - 07:00		49.8	84.1	21.5	45.5	37.5
Day 07:00 – 19:00	14 hours	19/05/2014 – 20/05/2014 11:32 – 12:57	LT4	52.7	104.3	24.9	46.0	35.6
Evening 19:00 – 23:00	4 hours	19/05/2014 – 19/05/2014 19:00 - 23:00		50.0	81.9	20.4	41.1	29.0
Night 23:00 – 07:00	8 hours	19/05/2014 – 20/05/2014 23:00 - 07:00		47.6	81.6	19.0	38.1	29.8
Day 07:00 – 19:00	35 hours	17/05/2014 - 20/05/2014 14:32 - 12:32	LT5	52.7	93.7	23.8	48.2	35.6
Evening 19:00 – 23:00	12 hours	17/05/2014 - 19/05/2014 19:00 - 23:00		48.2	87.1	19.8	43.5	31.8
Night 23:00 – 07:00	24 hours	17/05/2014 - 20/05/2014 23:00 - 07:00		45.8	84.2	19.0	40.1	33.7
Day 07:00 – 19:00	48 hours	20/05/2014 - 24/05/2014 12:09 - 12:09	LT6	50.6	92.4	24.6	51.1	35.7

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)
Evening 19:00 – 23:00	16 hours	20/05/2014 - 23/05/2014 19:00 - 23:00		47.7	88.4	16.1	44.9	31.4
Night 23:00 – 07:00	32 hours	20/05/2014 - 24/05/2014 23:00 - 07:00		44.6	75.5	15.5	40.9	30.1
Day 07:00 – 19:00	34 hours	17/05/2014 - 20/05/2014 12:47 - 10:17	LT7	49.5	81.7	23.9	46.9	36.5
Evening 19:00 – 23:00	12 hours	17/05/2014 - 19/05/2014 19:00 - 23:00		43.3	74.1	15.4	38.6	29.0
Night 23:00 – 07:00	24 hours	17/05/2014 - 20/05/2014 23:00 - 07:00		42.1	73.4	16.2	38.5	29.5
Day 07:00 – 19:00	14 hours	19/05/2014 - 20/05/2014 11:32 - 12:57	LT8	52.7	104.3	24.9	46.0	35.6
Evening 19:00 – 23:00	4 hours	19/05/2014 - 19/05/2014 19:00 - 23:00		50.0	81.9	20.4	41.1	29.0
Night 23:00 – 07:00	8 hours	19/05/2014 - 20/05/2014 23:00 - 07:00		47.6	81.6	19.0	38.1	29.8
Day 07:00 – 19:00	9 hours	20/05/2014 - 21/05/2014 13:14 - 10:15	LT9	43.8	80.4	23.2	43.4	31.9
Evening 19:00 – 23:00	4 hours	20/05/2014 - 21/05/2014 19:00 - 23:00		36.8	64.9	14.6	33.2	22.6
Night 23:00 – 07:00	8 hours	20/05/2014 - 21/05/2014 23:00 - 07:00		43.0	71.0	14.4	29.0	22.3
Day 07:00 – 19:00	7 hours	20/05/2014 - 21/05/2014 14:07 - 10:32	LT10	52.7	82.3	31.8	55.2	41.9
Evening 19:00 – 23:00	4 hours	20/05/2014 - 20/05/2014 23:00 - 07:00		50.2	74.1	16	50.4	32.9
Night 23:00 – 07:00	8 hours	20/05/2014 - 21/05/2014 23:00 - 07:00		49.8	74.5	15.5	38.4	27.9
Day 07:00 – 19:00	7 hours	20/05/2014 - 21/05/2014 14:42 - 10:57	LT11	61.3	98.8	26.2	62.8	38.5
Evening 19:00 – 23:00	4 hours	20/05/2014 - 21/05/2014 07:00 - 23:00		57.3	87.4	18.2	51.7	29.4
Night 23:00 – 07:00	8 hours	20/05/2014 - 21/05/2014 07:00 - 23:00		50.7	78.6	17.5	35.2	25.8
Day 07:00 – 19:00	3 hours	20/05/2014 - 21/05/2014 17:39 - 11:29	LT12	45.1	70.3	26.3	47.4	34.9
Evening 19:00 – 23:00	4 hours	20/05/2014 - 20/05/2014 07:00 - 23:00		43.7	71.2	16.7	45.0	30.4
Night 23:00 – 07:00	8 hours	20/05/2014 - 21/05/2014 23:00 - 07:00		37.7	68.1	16.3	33.8	24.3
Day 07:00 – 19:00	16 hours	20/05/2014 - 21/05/2014 15:40 – 19:00	LT13	54.2	88.5	27.2	57.2	42.7
Evening 19:00 – 23:00	4 hours	20/05/2014 - 20/05/2014 07:00 - 23:00		53.6	83.0	15.5	40.2	25.7
Night 23:00 – 07:00	8 hours	20/05/2014 - 21/05/2014 23:00 - 07:00		54.4	82.6	15.9	42.9	32.0

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 – 19:00	4 hours	20/05/2014 - 21/05/2014 17:10 - 11:30	LT14	45.8	75.4	23.7	47.2	35.1
Evening 19:00 – 23:00	4 hours	20/05/2014 - 20/05/2014 07:00 - 23:00		43.0	66.8	15.3	40.1	26.3
Night 23:00 – 07:00	8 hours	20/05/2014 - 21/05/2014 23:00 - 07:00		42.5	77.9	14.7	32.0	22.8
Day 07:00 – 19:00	12 hours	21/05/2014 - 22/05/2014 12:23 - 12:43	LT15	49.5	76.5	27.2	50.9	39.0
Evening 19:00 – 23:00	4 hours	21/05/2014 - 21/05/2014 07:00 - 23:00		45.2	76.5	21.0	42.0	28.5
Night 23:00 – 07:00	8 hours	21/05/2014 - 22/05/2014 23:00 - 07:00		47.5	80.5	20.8	40.2	28.3
Day 07:00 – 19:00	10 hours	22/05/2014 - 23/05/2014 17:58 - 16:18	LT16	51.3	78.1	30.3	53.6	39.8
Evening 19:00 – 23:00	4 hours	22/05/2014 - 22/05/2014 23:00 - 07:00		51.0	72.1	31.0	51.9	42.1
Night 23:00 – 07:00	8 hours	22/05/2014 - 23/05/2014 23:00 - 07:00		49.9	75.3	26.0	49.2	35.7
Day 07:00 – 19:00	11 hours	21/05/2014 – 22/05/2014 14:04 - 13:09	LT17	49.6	87.4	28.5	51.4	39.7
Evening 19:00 – 23:00	4 hours	21/05/2014 – 21/05/2014 23:00 - 07:00		47.3	72.1	20.7	47.3	31.7
Night 23:00 – 07:00	8 hours	21/05/2014 – 22/05/2014 23:00 - 07:00		47.8	75.0	19.8	38.5	29.9
Day 07:00 – 19:00	11 hours	21/05/2014 – 22/05/2014 14:04 - 13:09	LT18	51.2	87.4	29.8	48.5	39.0
Evening 19:00 – 23:00	4 hours	21/05/2014 – 21/05/2014 23:00 - 07:00		37.5	67.8	17.7	36.6	28.0
Night 23:00 – 07:00	8 hours	21/05/2014 – 22/05/2014 23:00 - 07:00		38.6	69.8	17.2	31.8	24.4
Day 07:00 – 19:00	62 hours	23/05/2014 - 29/05/2014 18:35 - 11:20	LT19	54.2	86.6	39.9	55.7	50.6
Evening 19:00 – 23:00	20 hours	23/05/2014 - 28/05/2014 23:00 - 07:00		52.3	86.2	41.8	55.4	50.8
Night 23:00 – 07:00	40 hours	23/05/2014 - 29/05/2014 23:00 - 07:00		53.0	80.9	38.0	54.2	50.1
Day 07:00 – 19:00	12 hours	21/05/2014 – 22/05/2014 15:05 - 15:20	LT20	52.4	83.1	29.9	52.9	45.1
Evening 19:00 – 23:00	4 hours	21/05/2014 – 21/05/2014 23:00 - 07:00		41.6	69.4	23.6	37.8	30.6
Night 23:00 – 07:00	8 hours	21/05/2014 – 22/05/2014 23:00 - 07:00		45.8	72.7	25.5	42.7	34.9
Day 07:00 – 19:00	12 hours	21/05/2014 – 22/05/2014 16:33 - 16:33	LT21	53.9	81.4	30.6	55.0	48.1

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)
Evening 19:00 – 23:00	4 hours	21/05/2014 – 21/05/2014 23:00 - 07:00		47.4	65.7	17.5	48.5	37.5
Night 23:00 – 07:00	8 hours	21/05/2014 – 22/05/2014 23:00 - 07:00		46.2	74.4	17.4	42.3	30.6
Day 07:00 – 19:00	12 hours	22/05/2014 – 23/05/2014 16:05 - 16:35	LT22	50.1	82.7	33.0	51.6	41.1
Evening 19:00 – 23:00	4 hours	22/05/2014 – 22/05/2014 23:00 - 07:00		45.7	78.9	34.3	46.3	40.5
Night 23:00 – 07:00	8 hours	22/05/2014 – 23/05/2014 23:00 - 07:00		48.7	73.8	32.6	46.0	38.5
Day 07:00 – 19:00	10 hours	22/05/2014 – 24/05/2014 16:09 - 14:34	LT23	52.9	87.9	23.2	44.5	32.9
Evening 19:00 – 23:00	4 hours	22/05/2014 – 23/05/2014 23:00 - 07:00		44.6	79.8	21.7	39.6	31.3
Night 23:00 – 07:00	8 hours	22/05/2014 – 24/05/2014 23:00 - 07:00		44.5	77.4	20.2	41.6	30.0
Day 07:00 – 19:00	10 hours	22/05/2014 – 23/05/2014 15:11 - 13:21	LT24	56.1	82.3	33.5	57.6	47.4
Evening 19:00 – 23:00	4 hours	22/05/2014 – 22/05/2014 23:00 - 07:00		54.6	73.2	35.1	56.0	48.1
Night 23:00 – 07:00	8 hours	22/05/2014 – 23/05/2014 23:00 - 07:00		51.8	75.3	32.2	52.7	42.4
Day 07:00 – 19:00	20 hours	22/05/2014 – 24/05/2014 18:58 - 14:23	LT25	46.9	75.4	22.8	46.0	37.7
Evening 19:00 – 23:00	8 hours	22/05/2014 – 22/05/2014 23:00 - 07:00		48.1	66.4	27.1	47.0	39.8
Night 23:00 – 07:00	16 hours	22/05/2014 – 23/05/2014 23:00 - 07:00		41.3	71.7	24.1	41.0	34.4
Day 07:00 – 19:00	10 hours	22/05/2014 – 23/05/2014 14:43 - 12:58	LT26	53.1	71.5	35.2	56.1	44.2
Evening 19:00 – 23:00	4 hours	22/05/2014 – 22/05/2014 23:00 - 07:00		50.8	68.8	39.6	52.8	45.0
Night 23:00 – 07:00	8 hours	22/05/2014 – 23/05/2014 23:00 - 07:00		47.3	76.9	37.9	47.9	42.6
Day 07:00 – 19:00	12 hours	23/05/2014 - 29/05/2014 14:04 - 15:09	LT27	62.5	113.5	20.3	49.2	35.8
Evening 19:00 – 23:00	4 hours	23/05/2014 - 28/05/2014 23:00 - 07:00		46.4	78.1	16.1	43.7	28.4
Night 23:00 – 07:00	8 hours	23/05/2014 - 29/05/2014 23:00 - 07:00		49.5	86.1	15.2	36.5	25.7
Day 07:00 – 19:00	70 hours	23/05/2014 – 29/05/2014 15:23 – 13:53	LT28	51.4	89.0	21.1	47.3	34.9
Evening 19:00 – 23:00	20 hours	23/05/2014 – 28/05/2014 23:00 - 07:00		48.4	83.2	16.5	41.3	28.3
Night 23:00 – 07:00	40 hours	23/05/2014 – 29/05/2014 23:00 - 07:00		51.3	84.5	15.8	36.4	26.8

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 – 19:00	50 hours	23/05/2014 - 28/05/2014 17:20 - 09:05	LT29	51.7	95.4	32.7	48.9	44.5
Evening 19:00 – 23:00	16 hours	23/05/2014 - 27/05/2014 23:00 - 07:00		49.8	85.7	33.4	49.4	46.0
Night 23:00 – 07:00	32 hours	23/05/2014 - 28/05/2014 23:00 - 07:00		47.5	76.2	29.3	46.8	43.1
Day 07:00 – 19:00	20 hours	27/05/2014 - 29/05/2014 17:40 - 13:15	LT30	52.1	97.4	23.0	45.5	32.2
Evening 19:00 – 23:00	8 hours	27/05/2014 - 29/05/2014 23:00 - 07:00		43.6	85.8	18.7	37.8	24.4
Night 23:00 – 07:00	16 hours	27/05/2014 - 29/05/2014 23:00 - 07:00		42.7	80.8	17.5	34.5	25.4
Day 07:00 – 19:00	22 hours	24/05/2014 - 26/05/2014 12:55 - 10:55	LT31	53.5	85.8	24.5	51.7	38.0
Evening 19:00 – 23:00	8 hours	24/05/2014 - 25/05/2014 23:00 - 07:00		50.5	79.8	15.3	47.6	31.6
Night 23:00 – 07:00	16 hours	24/05/2014 - 26/05/2014 23:00 - 07:00		51.2	85.3	14.2	40.7	30.0
Day 07:00 – 19:00	22 hours	24/05/2014 – 26/05/2014 14:59 - 12:44	LT32	54.5	92.5	25.0	45.8	34.2
Evening 19:00 – 23:00	8 hours	24/05/2014 – 25/05/2014 23:00 - 07:00		38.7	73.2	25.0	37.0	30.3
Night 23:00 – 07:00	16 hours	24/05/2014 – 26/05/2014 23:00 - 07:00		39.4	80.9	22.6	36.7	29.3
Day 07:00 – 19:00	18 hours	24/05/2014 – 26/05/2014 15:29 - 09:44	LT33	45.7	83.2	18.5	44.2	34.1
Evening 19:00 – 23:00	8 hours	24/05/2014 – 25/05/2014 23:00 - 07:00		41.9	78.6	16.1	35.8	26.1
Night 23:00 – 07:00	16 hours	24/05/2014 – 26/05/2014 23:00 - 07:00		44.0	80.5	15.0	35.3	26.4
Day 07:00 – 19:00	16 hours	26/05/2014 - 27/05/2014 12:02 - 16:07	LT34	59.1	91.7	23.8	57.8	38.5
Evening 19:00 – 23:00	5 hours	26/05/2014 - 26/05/2014 23:00 - 07:00		44.7	71.3	20.2	42.7	30.7
Night 23:00 – 07:00	7 hours	26/05/2014 - 27/05/2014 23:00 - 07:00		54.5	77.1	17.5	42.7	30.0
Day 07:00 – 19:00	19 hours	26/05/2014 - 28/05/2014 14:28 - 10:13	LT35	52.3	81.9	33.5	53.5	43.9
Evening 19:00 – 23:00	8 hours	26/05/2014 - 27/05/2014 23:00 - 07:00		48.7	80.6	31.0	48.3	38.3
Night 23:00 – 07:00	16 hours	26/05/2014 - 28/05/2014 23:00 - 07:00		43.0	71.9	29.2	42.3	34.3
Day 07:00 – 19:00	21 hours	26/05/2014 - 28/05/2014 13:11 - 08:46	LT36	57.0	90.0	29.7	50.2	39.1
Evening 19:00 – 23:00	8 hours	26/05/2014 - 27/05/2014 23:00 - 07:00		45.1	77.9	24.5	43.5	33.6

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	16 hours	26/05/2014 - 28/05/2014 23:00 - 07:00		47.6	87.6	20.6	42.1	31.4
Day 07:00 – 19:00	19 hours	26/05/2014 - 28/05/2014 13:46 - 09:21	LT37	54.2	90.1	28.1	53.4	40.0
Evening 19:00 – 23:00	8 hours	26/05/2014 - 27/05/2014 23:00 - 07:00		49.3	76.3	20.4	46.7	33.4
Night 23:00 – 07:00	16 hours	26/05/2014 - 28/05/2014 23:00 - 07:00		50.4	84.9	18.2	43.0	29.6
Day 07:00 – 19:00	13 hours	28/05/2014 – 29/05/2014 11:10 - 12:10	LT38	58.8	87.4	15.2	40.4	33.8
Evening 19:00 – 23:00	4 hours	28/05/2014 – 28/05/2014 23:00 - 07:00		57.9	84.9	15.2	37.7	31.8
Night 23:00 – 07:00	8 hours	28/05/2014 – 29/05/2014 23:00 - 07:00		56.5	86.6	15.3	38.6	32.5
Day 07:00 – 19:00	12 hours	28/05/2014 – 29/05/2014 10:56 - 10:36	LT39	52.5	96.0	23.4	53.0	34.8
Evening 19:00 – 23:00	4 hours	28/05/2014 – 28/05/2014 23:00 - 07:00		47.2	76.4	17.3	42.0	25.1
Night 23:00 – 07:00	8 hours	28/05/2014 – 29/05/2014 23:00 - 07:00		47.1	82.3	16.6	38.8	28.0
Day 07:00 – 19:00	11 hours	28/05/2014 – 29/05/2014 12:21 - 11:46	LT40	54.9	88.0	24.7	47.1	32.8
Evening 19:00 – 23:00	4 hours	28/05/2014 – 28/05/2014 23:00 - 07:00		50.9	84.5	22.5	43.3	29.8
Night 23:00 – 07:00	8 hours	28/05/2014 – 29/05/2014 23:00 - 07:00		47.5	82.6	22.5	36.6	28.6
Day 07:00 – 19:00	11 hours	28/05/2014 – 29/05/2014 12:42 - 11:57	LT41	49.5	78.1	30.6	50.0	41.8
Evening 19:00 – 23:00	4 hours	28/05/2014 – 28/05/2014 23:00 - 07:00		44.3	71.7	29.7	42.8	36.2
Night 23:00 – 07:00	8 hours	28/05/2014 – 29/05/2014 23:00 - 07:00		46.0	72.7	28.7	40.5	35.0
Day 07:00 - 19:00	60 Mins	19/05/2014 12:58	ST1	47.0	80.7	26.3	42.2	31.0
	60 Mins	19/05/2014 14:18	ST2	52.9	84.3	29.8	47.9	35.8
	60 Mins	19/05/2014 15:31	ST3	61.0	86.8	27.6	50.8	35.2
	60 Mins	19/05/2014 15:31	ST4	58.1	86.0	27.8	49.9	33.5
	15 Mins	24/05/2014 17:50	ST5	49.5	76.8	25.6	49.3	34.2
	15 Mins	27/05/2014 11:02	ST6	62.7	70.4	59.4	63.9	61.2
	15 Mins	27/05/2014 11:24	ST7	57.5	81.7	37.8	58.5	43.7
	15 Mins	27/05/2014 12:02	ST8	48.7	67.1	37.7	51.9	41.3
	15 Mins	27/05/2014 12:36	ST9	55.7	74.5	39.4	55.6	43.0
	15 Mins	27/05/2014 13:02	ST10	58.0	74.4	31.4	61.4	36.0
	15 Mins	27/05/2014 13:28	ST11	52.5	79.8	24.8	41.9	29.2

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