Human Health and Population

Chapter 10: Noise and Vibration

Contents

List of Tables

Glossary

Application Site	The area within the red line Planning Boundary comprising the Onshore Transmission Works (OnTW), as defined.
Consented Offshore Transmission Works (OfTW)	Offshore substation platforms and their foundations and substructures, interconnector cables and offshore export cables, as consented by the Scottish Ministers on 10 October 2014.
Consented Offshore Wind Farm	Wind turbine generators and their foundations and substructures, and inter-array cables, as consented by the Scottish Ministers on 10 October 2014.
Construction Compound	An indicative area within the Application Site used to accommodate the temporary work site including; construction parking, construction welfare facilities, construction meeting room, construction laydown and storage area, construction security facilities (fenced area/gate and security access) and construction security lighting.
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2×10^{-5} Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting ('A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
ICOL's Offshore Transmission Works (OfTW)	Offshore substation platforms (OSPs) and their foundations and substructures, interconnector cables and Offshore Export Cables. This refers to either the Consented OfTW or Revised OfTW, as defined.
ICOL's Offshore Wind Farm	This includes proposed wind turbine generators, foundations and substructures and inter-array cables. This refers to either the Consented Offshore Wind Farm or Revised Offshore Wind Farm, as defined.
Landfall	Point where up to two Offshore Export Cables from ICOL's Offshore Wind Farm will be brought ashore.
L_{Aeq}	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{A10} & L_{A90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n per cent of the time. Hence, L_{A10} is the level exceeded for 10 per cent of the time and as such can be regarded as the 'average maximum level'. It is common practice to use the L_{A10} index to describe traffic noise. Similarly, L_{A90} is the 'average minimum level' and is often used to describe the background noise.
L_{AFmax}	L_{AFmax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{AFmax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{Aeq} noise level, but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
Offshore Export Cable	The subsea, buried or protected electricity cables running from ICOL's Offshore Wind Farm offshore substation to the Landfall.
Onshore Export Cables	Electricity cables from the Onshore Substation to the grid connection point.
Onshore Export Cable Corridor	The area within the Application Site where the proposed Onshore Export Cables will be laid.

Onshore Substation	The electrical substation comprising of all the equipment and associate infrastructure required to enable connection to the electrical transmission grid.
Onshore Substation Site/Substation Site	The indicative area within the Application Site where the Onshore Substation and screening will be located.
Onshore Transmission Works (OnTW)	All proposed works within the Application Site, typically including the Onshore Substation, cables transition pits, cable jointing pits, underground electricity transmission cables connecting to the Onshore Substation and further underground cables required to facilitate connection to the national grid. This includes all permanent and temporary works required. See *Chapter 5: Description of Development* for full details.
Original Application Site	The red line planning boundary in which the Original OnTW was to be located in accordance with planning permission in principle with East Lothian Council (ELC) reference 14/00456/PPM.
Original Onshore Substation	The electrical substation comprising of all the equipment and associate infrastructure required to enable connection to the electrical transmission grid as was granted planning permission in principle in September 2014, under ELC reference 14/00456/PPM.
Original OnTW	The OnTW, as was granted planning permission in principle in September 2014, under ELC reference 14/00456/PPM.
Original OnTW EIA	The Environmental Impact Assessment (EIA) that was prepared to support the planning application for the Original OnTW and reported in the Original OnTW ES, as defined.
Original OnTW ES	The Environmental Statement (ES) that was submitted to support the application for the Original OnTW in 2014.
Planning Boundary	The red line application boundary containing the Onshore Transmission Works (OnTW), as defined.
Revised Offshore Transmission Works (OfTW)	Offshore substation platforms and their foundations and substructures, interconnector cables and Offshore Export Cables, as per the scoping report submitted to Marine Scotland Licensing Operations Team on behalf of the Scottish Ministers in April 2017.
Revised Offshore Wind Farm	Wind turbine generators and their foundations and substructures, and inter-array cables, as per the scoping report submitted to Marine Scotland Licensing Operations Team on behalf of the Scottish Ministers in April 2017.
Scoping Opinion	The Scoping Opinion adopted by ELC as to the scope and information to be provided in support of an application for the OnTW, as defined.
Scoping Report	Report prepared as the first stage of the EIA process in support of a request for a Scoping Opinion from ELC, under Regulation 17 of the EIA Regulations. The Report was submitted in July 2017.

Abbreviations and Acronyms

CadnaA	Computer Aided Noise Abatement
DMRB	Design Manual for Roads and Bridges
EC	European Commission
EIA	Environmental Impact Assessment
ELC	East Lothian Council
END	Environmental Noise Directive
Hz	Hertz
HGV	Heavy Goods Vehicle
ICOL	Inch Cape Offshore Limited
IEMA	Institute of Environmental Management and Assessment
kW	Kilowatt
MSR	Mechanically Switched Reactor
NSR	Noise Sensitive Receptor
NNG	Night Noise Guidelines
OS	Ordnance Survey
OnTW	Onshore Transmission Works
PAN	Planning Advice Note
PPV	Peak Particle Velocity
SPL	Sound Pressure Level
SVC	Static VAR Compensator
TAN	Technical Advice Note
UK	United Kingdom
VDV	Vibration Dose Value
WHO	World Health Organisation

10 Noise and Vibration

10.1 Introduction

1 This chapter sets out the results of a study of the noise and vibration effects associated with the Onshore Transmission Works (OnTW). The chapter considers the relevant advice regarding noise emissions and noise limits associated with industrial sites in Scotland; outlines the prevailing background sound levels at the closest receptors; predicts the noise levels likely to be generated by the construction and operation of the OnTW at the closest receptors; and establishes noise limit criteria which form the basis of the assessment.

2 Where it is determined that levels of noise and/or vibration would have an impact at the closest receptors, then mitigation measures have been recommended accordingly.

3 Technical terms and references are occasionally used in this chapter. To assist the reader, a glossary of terminology including a table of example noise levels that may be found in general life are included in *Appendix 10A,* Volume 2.

4 This chapter also shares direct linkages with the following chapter:

- Chapter 11: Traffic and Transport.

10.2 Consultation

5 Scoping responses received from East Lothian Council (ELC), which are relevant to noise and vibration, are summarised in Table 10.1 below, including Inch Cape Offshore Limited's (ICOL) response and where relevant information can be found within this Environmental Impact Assessment (EIA) Report.

Table 10.1 Scoping Opinion Responses and Actions

Consultee	Scoping / Consultation Response	ICOL Response
East Lothian Council Scoping Opinion	The Scoping Report identifies the relevant policy and guidance documents of which the Noise Impact Assessment should take cognisance. In addition to the receptors noted in the Scoping Report, sensitive receptors at Hawthorn Bank located on the B1348 (Edinburgh Road) should be considered for impacts.	Hawthorn Bank has been included within the assessment as a sensitive receptor, as indicated in Table 10.2 below and on Figure 10.1.

Consultee	Scoping / Consultation Response	ICOL Response
	Noise from demolition works currently being undertaken on the proposed site shall not be included in any assessment of the baseline noise climate.	Measurement of the baseline noise climate in 2017 was undertaken on a Sunday, and did not include noise from demolition works on the Application Site. The measured baseline noise levels are presented in Table 10.5 and Table 10.6 below for daytime and night-time respectively.
	Peak noise levels, L_{AFmax}, should also be considered in any assessment of noise associated with demolition and operational phases.	The maximum ambient noise levels (L_{Aeq}) associated with the construction and operation of the OnTW have been considered, as *per Section 10.7.1 and Section 10.7.2* respectively. With respect to construction noise, BS5228-1:2009+A1:2014 provides the majority of plant sound power level data as ambient noise levels, not the peak L_{AFmax} values. In addition, the standard refers to the L_{Aeq} parameter when recommending suitable limits for construction noise and within its methods of calculation. For the operational phase, the noise levels associated with the Onshore Substation have been provided by a representative manufacturer and these have been assumed to be the maximum (peak) noise levels expected. As per the guidance of BS4142:2014 for operational sound, the L_{Aeq} parameter to represent the specific sound level has been used.

Consultee	Scoping / Consultation Response	ICOL Response
	The assessment should predict internal daytime and night-time levels within residential properties of sensitive receptors associated with both construction and operational phases. Therefore, night-time surveys should be undertaken.	A night-time baseline survey was undertaken and the assessment has considered the predicted noise levels during both the daytime and night-time periods. As per the guidance of BS4142:2014, the assessment of internal sound levels is not required; however, consideration has been made to the guidance of BS8233:2014 and the World Health Organisation for suitable internal daytime and night-time noise limits, as detailed in *Section 10.7.2* below. A note relating to the Scoping Opinion was submitted to ELC on the 20 November 2017 which included the approach set out above (see *Appendix 3B*, Volume 2). ELC agreed with this approach in their response (see *Appendix 3C*, Volume 2) stating that they would accept the use of the guidance as ICOL have indicated.
	Section 10.4.2 of the Scoping Report 'Embedded Mitigation' states that the acoustic bund constructed to protect occupiers from the noise of Cockenzie Power Station will be taken into account. This bund was constructed specifically to avoid noise from Cockenzie Power Station, which use has now ceased. There would not now therefore appear to be an obligation on the part of its owner to retain it. The continued existence of the bund should not be relied upon, unless the bund is under control of the applicants and the application includes provision for it to remain in place.	ICOL responded to ELC on this in their note which can be found in *Appendix 3B*, Volume 2 stating that the bund located to the south of the Application Site, to the north of Atholl View, is well established and is likely to remain in place for the operational life of the Onshore Substation. This bund provides both an acoustic and visual screen between the Application Site and the closest receptors on Atholl View. There are no proposals to remove this bund and as such it represents the baseline. It has therefore been considered within the assessment of noise impact, along with the surrounding local

Consultee	Scoping / Consultation Response	ICOL Response
		topography and landscape mitigation plan ELC responded (*Appendix 3C*, Volume 2) by stating that they are aware of previous aspirations to remove the bund from residents (which may or may not be the case currently). Regardless of the owners aspirations for the bund, and how bedded in it looks, if it is not under the control of the applicants it cannot be relied on to stay in position. As such, Noise and visual assessment may include 'with' the bund if the applicant chooses, but it must also include 'without'. As such, a noise and visual assessment without the bund has been carried out, however as the assessment is not representative of the baseline, it is considered that the assessment should not sit within the impact assessment sections of *Chapter 8: Landscape and Visual* or *Chapter 10: Noise and Vibration* and instead has been included as an Appendix to *Chapter 3: Process and Methodology* (see *Appendix 3D*, Volume 2).
	The assessment of vibration as set out in the Scoping Report is satisfactory. There should be cross references to impacts of vibration on biodiversity and material assets.	The assessment of vibration impact has been considered with respect to the construction phase, as detailed in *Section 10.7.1* below.

Consultee	Scoping / Consultation Response	ICOL Response
	The revised site has the potential to have greater impacts on marine mammals than the previous location and this should be considered. These may be affected through underwater noise and disturbance associated with the construction of the proposal and possibly also its operation. Noise can also affect availability of prey species. The main activities likely to result in noise or disturbance are piling, blasting, dredging and vessel movements but all potentially noise activities should be assessed. There are also potential effects from sediment mobilisation affecting prey availability. Any blasting or piling works should be fully described and assessed.	Consideration of impacts on marine mammals has been undertaken. It is not considered that impacts from the OnTW would lead to significant environmental effects and therefore it is not assessed in the EIA. This is due to the fact that landfall works will have no greater impact than the installation of the Offshore Export Cable as described and assessed for the Consented Offshore Wind Farm, which has been assessed as not significant. In their recent Scoping Opinion for the Revised Offshore Wind Farm application, both SNH and Marine Scotland have noted that the impacts from the installation of the Offshore Export Cable does not need to be assessed, as it will not lead to significant effects. Therefore, not assessing marine mammals is also consistent with the advice of both Marine Scotland and SNH. Further to this is the fact that there is low marine mammal presence in the vicinity of the coast line at this location.

10.3 Policy and Legislation

10.3.1 European Directive 2002/49/EC

6 The overarching European legislation in relation to noise is Directive 2002/49/EC *(*the *Environmental Noise Directive* (END)). The END aims to limit people's exposure to environmental noise and requires each member state to provide data on noise exposure, to adopt action plans to prevent or reduce noise exposure and try to preserve environmental noise quality where it is currently good.

10.3.2 Environmental Noise (Scotland) Regulations 2006

7 The Environmental Noise (Scotland) Regulations 2006 transpose and implement the END into Scottish law, and apply to *"environmental noise to which humans are exposed…in built-up areas, in public parks or other quiet areas…near schools, hospitals and other noise-sensitive buildings and areas"*.

8 The Regulations apply to noise from roads, railways and airports, as well as industrial noise. In line with the END, the Regulations aim to ensure that new development does not give rise to adverse noise impacts, and this is managed by Scottish Ministers (and airport authorities) through a process of strategic noise mapping and noise action plans. From this, planning authorities then have a role in preventing and limiting the effects of environmental noise in areas identified through noise mapping.

10.3.3 PAN 1/2011

9 At a national level, Planning Advice Note (PAN) 1/2011 and its associated *Technical Advice Note* (TAN) are key guidance documents for planners in Scotland on noise issues. PAN 1/2011 sets out a series of noise issues which planning authorities must be aware of when making decisions on planning applications in order to preserve environmental quality.

10 PAN 1/2011 and its TAN are also of assistance to developers in the identification of noise issues relevant to proposed developments. In this regard, PAN 1/2011 states the following:

"The PAN promotes the principles of good acoustical design and a sensitive approach to the location of new development. It promotes the appropriate location of new potentially noisy development and a pragmatic approach to the location of new development within the vicinity of existing noise generating uses, to ensure that quality of life is not unreasonably affected and that new development continues to support sustainable economic growth."

11 With regards to noise from industrial sources, PAN 1/2011 states (at paragraph 31):

"Due to its variable character, industrial noise is generally difficult to assess. Since background noise levels vary throughout a 24 hour period, it will usually be necessary for Noise Impact Assessments to assess the acceptability of noise levels for separate periods (e.g. day, evening, night and weekend) chosen to suit the hours of operation of the proposed development. Noise that may result from traffic generated by new industrial developments is likely to be a relevant consideration."

12 With regards to noise from construction sites, PAN 1/2011 states (at paragraph 32):

"While planning conditions can be used to limit noise from temporary construction sites, it is most effectively controlled through the Control of Pollution Act 1974 and the Pollution and Prevention Control Act 1999 for relevant installations. Notice can be served in advance of works and site conditions set to control activities."

10.3.4 Technical Advice Note to PAN 1/2011

13 Appendix 1 of the *Technical Advice Note* (TAN) to PAN 1/2011 details a number of standards and guidelines which may be used in the assessment of noise. *Chapter 2* of the TAN states that *"the basic principle of any noise impact assessment is to assess the change in the acoustic environment that will be brought about by the proposed development".* This assessment of change can be both qualitative and quantitative.

14 With respect to noise and vibration from construction sites, the TAN refers to BS5228:1997 (*Noise and Vibration Control on Construction and Open Sites*). This standard was substantially revised in 2009 and again in 2014; however, the 1997 version is still the approved code of practice under *The Control of Noise (Codes of Practice for Construction and Open Sites) (Scotland) Order 2002*. For EIAs, the most recent version (2014) is applicable.

15 The TAN also refers to BS6472-1:2008 (*Guide to Evaluation of Human Exposure to Vibration in Buildings. Vibration Sources other than Blasting*) and BS7385-2:1993 (*Evaluation and Measurement for Vibration in Buildings. Guide to Damage Levels from Groundborne Vibration*) with respect to the measurement and assessment of vibration impacts.

16 With respect to noise from industrial sites, the TAN refers to BS4142:1997 (*'Method for rating industrial noise affecting mixed residential and industrial areas'*). This version was withdrawn and replaced in October 2014 with BS4142:2014; however, the following advice within the TAN can still be considered valid within the context of the revised guidance[1]:

"In deciding if a significant impact occurs in regard to the assessment of industrial noise, or noise of an industrial nature, using the methodology of BS4142 (where appropriate), the Scottish Government considers impacts are normally not significant (in a quantitative sense only) if the difference between the Rating and background noise levels is less than 5 dB, and that usually the threshold of minor significant impacts is when the difference between the Rating and background noise levels is at least 5 dB; and commonly do not become sufficiently significant to warrant mitigation until the difference between the Rating and background noise levels is more than 10 dB".

10.4 Embedded Mitigation

17 Embedded mitigation will be incorporated into the OnTW as noted below. A landscape mitigation plan is also proposed (shown on Figure 8.6 in *Appendix 8B*, Volume 2 and discussed within *Chapter 8: Landscape and Visual*) and this has been considered as embedded mitigation for the purposes of this assessment, along with the following:

- Earth mounding within the south-west and north-west boundaries of the Application Site, as per the landscape mitigation plan, *Figure 8.6a*;
- Some components of the Onshore Substation will be enclosed, namely the transformer tanks and shunt reactor tanks, providing 20 dB attenuation to the sound power levels of these sources; and
- With respect to mitigation during the construction phase, a temporary noise barrier has been assumed around the Application Site – which would be used to also visually screen ground-based activities from the closest receptors.

18 In addition, the existing acoustic bund (to the south-west of the Application Site) which was constructed to protect occupiers from noise associated with the former Cockenzie Power

[1] The TAN states that where a technical standard has been superseded by a more recent version or alternative, then that document should be used.

Station has been accounted for within the assessment, specifically for the prediction work within the noise modelling software CadnaA®. Another bund is located to the south of the Application Site, immediately north of Atholl View, and has been accounted for within the noise modelling software. This bund provides both an acoustic and visual screen between the Application Site and the closest receptors on Atholl View.

19 These bunds have been taken from Ordnance Survey (OS) *'Terrain 5'* data, which has also provided topographical data for the remainder of the Study Area, as defined below.

10.5 Embedded Mitigation

20 The baseline noise environment in the vicinity of the OnTW is influenced by a number of sources, but predominantly by road traffic noise on the B1348 (Edinburgh Road).

10.5.1 Study Area

21 Noise-Sensitive Receptors (NSRs) are properties which are potentially sensitive to noise and, as such, require protection from nearby noise sources. A number of NSRs have been identified in proximity to the OnTW. This area, which is within 600 m of the OnTW, is the defined Study Area and represents the area containing the closest residential properties. The closest residential properties are located on Edinburgh Road and Hawthorn Terrace, approximately 180 m from the Application Site boundary to the north-east.

22 The identified NSRs were agreed through the Scoping process with ELC, which are detailed in Table 10.2 and shown on Figure 10.1.

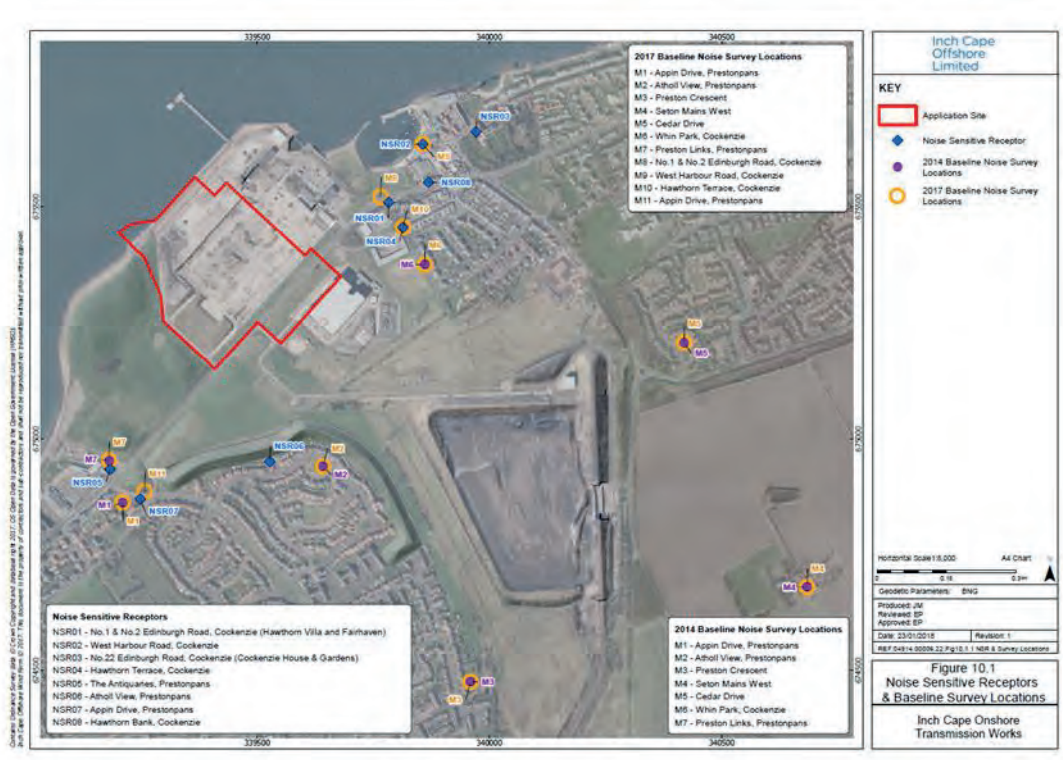

Figure 10.1: Noise Sensitive Receptors & Baseline Survey Locations

Table 10.2: Noise-Sensitive Receptors (NSRs)

NSR ID	NSR Name	Direction from Site	Approximate Distance from Application Site Boundary	OS Grid Coordinates (Easting, Northing)
NSR01	No.1 & No.2 Edinburgh Road, Cockenzie (Hawthorn Villa and Fairhaven)	North-east	190 m	339783, 675509
NSR02	West Harbour Road, Cockenzie	North-east	330 m	339856, 675634
NSR03	No.22 Edinburgh Road, Cockenzie (Cockenzie House & Gardens)	North-east	435 m	339971, 675661
NSR04	Hawthorn Terrace, Cockenzie	North-east	185 m	339820, 675460
NSR05	The Antiquaries, Prestonpans	South-west	310 m	339183, 674934
NSR06	Atholl View, Prestonpans	South	265 m	339527, 674950
NSR07	Appin Drive, Prestonpans	South-west	320 m	339248, 674870
NSR08	Hawthorn Bank, Cockenzie	North-east	285 m	339869, 675552

10.5.2 Data Sources

23 The noise assessment has been based on information from daytime and night-time baseline sound surveys, and on traffic data gathered (by the transport consultants) for the '*baseline*' and '*baseline + development*' scenarios, as presented in *Chapter 11: Traffic and Transport.*

10.5.3 Overview of Baseline

24 For the Original OnTW EIA, measurements of the baseline noise environment were undertaken in April and May 2014 at seven locations representative of the closest NSRs. The locations where baseline monitoring was undertaken in 2014 are detailed in Table 10.3 and are shown in Figure 10.1.

Table 10.3: 2014 Baseline Noise Survey Locations

Location ID	2014 Baseline Survey Locations	Receptors represented by 2014 survey locations
1	Appin Drive, Prestonpans	Appin Drive; Nethershot Road
2	Atholl View, Prestonpans	Atholl View; Clanranald Avenue; Struan Wynd; McLachlan Gardens
3	Preston Crescent	Preston Crescent; Preston Avenue; Preston Terrace; B1361; Meadowmill; Jacobite Way
4	Seton Mains West	Seton Mains West
5	Cedar Drive	Cedar Drive; Rowanhill; Seton Park; Alder Road; B6371
6	Whin Park, Cockenzie	Whin Park; Hawthorn Terrace; Lorimer Place
7	Preston Links, Prestonpans	The Antiquaries; Prestonpans High Street

25 Of those survey locations listed in Table 10.3, four are relevant to the OnTW, namely Locations 1, 2, 6 and 7. These are the closest locations to the OnTW and, as such, the 2014 baseline data measured at these locations has been used within this assessment.

26 The baseline noise environment within the vicinity of the OnTW has increased over time due to higher road traffic flows. This is detailed in *Chapter 11: Traffic and Transport* whereby an observed growth rate has been identified from traffic flow data recorded on the A198 over a five year period (2011 to 2016). The A198 leads into Cockenzie from the A1 and as such, it represents a good source of actual traffic growth within the Study Area. Therefore, the 2014 baseline noise levels are likely to represent a conservative approach for the OnTW, whereby lower road traffic flows in 2014 will have resulted in lower baseline noise levels.

27 However, due to the change in location of the Application Site an additional baseline survey has been undertaken (in 2017) at locations representative of the closest NSRs to the Application Site. This data has been included to supplement the 2014 baseline data, and specifically for the night-time period where there was no existing data.

28 The locations used for the 2017 baseline survey are detailed in Table 10.4 and are shown on Figure 10.1. Within the table, information is also provided in terms of which receptor locations are represented by the chosen survey location.

Table 10.4: 2017 Baseline Noise Survey Locations

Location ID	2017 Baseline Survey Locations	Receptor(s) represented by 2017 survey location
8	1 & 2 Edinburgh Road, Cockenzie *	1 & 2 Edinburgh Road (Hawthorn Villa & Fairhaven); Hawthorn Bank
9	West Harbour Road, Cockenzie *	West Harbour Road; Cockenzie House & Gardens
10	Hawthorn Terrace, Cockenzie **	Hawthorn Terrace
11	Atholl View, Prestonpans **	Atholl View; Appin Drive
* Daytime & night-time survey ** Night-time survey only		

29 The 2017 baseline survey, at the locations shown in Table 10.4, was undertaken to gather representative background (L_{A90}) and ambient (L_{Aeq}) sound information. The survey was undertaken during periods of the weekend considered to be the quietest, namely a Sunday evening and night-time period.

30 Weather conditions were noted to be conducive for the 2017 baseline survey, being dry and calm during both the daytime and night-time periods. There was 100 per cent cloud cover, with a daytime air temperature of 19 °C and a night-time air temperature of 14 °C.

31 Observations of the baseline noise environment were made during the daytime survey and it was noted that traffic[2] on the B1348 (Edinburgh Road) was the predominant source of noise at all locations, albeit at a lower level with increased distance from the road. During the daytime, other audible noise sources included aircraft and birds, with localised noise from the harbour and passing cars at West Harbour Road. Voices from the public (including runners and cyclists), car doors and the revving of car engines were also noted during the daytime survey.

32 At night-time, traffic on the B1348 was noted to be considerably lower, with a few passing cars and buses, and aircraft noise was audible until approximately midnight. Conditions were calm and still during the night-time survey (in 2017), with only very intermittent traffic contributing to the baseline noise environment.

33 Measurements were made at 1.5 m above the ground in free-field conditions, i.e. at least 3.5 m from the closest vertical reflecting surface, and were logged every five minutes. The following noise indices were recorded:

[2] to include cars, motorbikes, cyclists and buses

- **$L_{Aeq,T}$** – the A-weighted equivalent continuous noise level over the measurement period T;
- **L_{A90}** – the A-weighted noise level exceeded for 90 per cent of the measurement period. This parameter is often used to describe background sound;
- **L_{A10}** – the A-weighted noise level exceeded for 10 per cent of the measurement period. This parameter is often used to describe road traffic noise; and
- **L_{AFmax}** – the maximum A-weighted noise level during the measurement period.

34 The measured ambient noise levels (L_{Aeq}) and the representative background sound level (median L_{A90}) from the 2014 and 2017 baseline surveys are shown in Table 10.5 and Table 10.6 for the daytime and night-time period respectively, along with the corresponding L_{A10} and L_{AFmax} values.

Table 10.5: Baseline Survey Data – Daytime

NSR ID	NSR Name	Daytime Baseline Survey Data, dB				
		Date; Time Stamp	L_{Aeq}	L_{A90}	L_{A10}	L_{AFmax}
NSR01	No.1 & No.2 Edinburgh Road **	03/09/17; 18.40 – 19.40	68	52	71	89
NSR02	West Harbour Road **	03/09/17; 17.30 – 18.30	51	47	51	79
NSR03	Cockenzie House and Gardens **					
NSR04	Hawthorn Terrace *	24/04/14; 12.35 – 13.35 ***	46	41	-	74
		25/04/14; 08.35 – 09.35 ***	50	48	-	75
NSR05	The Antiquaries (Preston Links) *	27/05/14; 14.00 – 16.00	60	52	-	74
NSR06	Atholl View *	24/04/14; 13.45 – 14.45	46	34	-	66
		25/04/14; 09.55 – 10.55	45	39	-	62
NSR07	Appin Drive *	24/04/14; 12.40 – 13.40	64	42	-	96
		25/04/14; 11.10 – 12.10	46	42	-	76
NSR08	Hawthorn Bank **	03/09/17; 18.40 – 19.40	68	52	71	89

NSR ID	NSR Name	Daytime Baseline Survey Data, dB				
		Date; Time Stamp	L_{Aeq}	L_{A90}	L_{A10}	L_{AFmax}
* 2014 baseline data ** 2017 baseline data *** Measured at Whin Park in 2014 and considered representative of Hawthorn Terrace. Whin Park is adjacent to Hawthorn Terrace in Cockenzie and was used as a baseline survey location in 2014.						

Table 10.6: Baseline Survey Data – Night-time

NSR ID	NSR Name	Night-time Baseline Survey Data, dB				
		Date; Time Stamp	L_{Aeq}	L_{A90}	L_{A10}	L_{AFmax}
NSR01	1 & 2 Edinburgh Road **	04/09/17; 00.20 – 00.50	54	35	53	74
NSR02	West Harbour Road **	03/09/17; 23.00 – 23.30	42	36	42	63
NSR03	Cockenzie House and Gardens **					
NSR04	Hawthorn Terrace **	03/09/17 to 04/09/17; 23.40 – 00.10	34	29	37	55
NSR05	The Antiquaries (Preston Links) *	27/05/14 to 28/05/14; 23.05 – 01.05	51	30	-	70
NSR06	Atholl View **	04/09/17; 00.55 – 01.25	44	26	32	69
NSR07	Appin Drive **					
NSR08	Hawthorn Bank **	04/09/17; 00.20 – 00.50	54	35	53	74
* 2014 baseline data ** 2017 baseline data						

35 Based on the observations made during the baseline survey, it is considered that the background sound levels (L_{A90}) (measured in 2014 and 2017) are representative of the prevailing acoustic environment at the closest receptors.

10.5.4 Baseline without the OnTW

36 The Scottish Government (National Planning Framework 3, June 2014) identifies the site of the former Cockenzie Power Station as a national development site for thermal energy generation, carbon capture and storage (National Development 3). NPF3 also identifies Cockenzie as a key location with opportunities for renewable energy-related investment, reflected by National Development 4 'High Voltage Electricity Transmission Network' in NPF3. ELC recognises that the site presents a key opportunity in terms of economic development and energy related investment and is seeking views on the most appropriate land uses for the site through its Local Development Plan (LDP) consultation exercise, which is at draft stage only at present and a separate Masterplan which was published in November 2017.

37 Until the draft LDP has been formally adopted by ELC it is difficult to predict the baseline in the absence of the OnTW. However, given the status of the site in NPF3 it is expected that the demolished site of the former Cockenzie Power Station will be redeveloped, most probably for some energy/industrial related purpose.

38 The baseline noise environment, without the OnTW, would likely continue to increase over time due to an anticipated increase in road traffic flows on the local road network, as well as a result of committed and/or proposed developments. An observed growth rate has been identified during the five year period between 2011 and 2016 (as per *Chapter 11: Traffic and Transport*), and so future growth on the road network, beyond 2016, is also expected.

10.6 Assessment Methodology

39 With respect to construction noise and vibration, the assessment has been referenced to the guidance of BS5228:2009+A1:2014, *Code of practice for noise and vibration control on construction and open sites.*

40 An assessment of additional vehicles associated with the construction phase of the OnTW (i.e. off-site traffic) has been undertaken based on the results of a transport assessment and with reference to the *Design Manual for Roads and Bridges* (DMRB) (Scottish Government, 2011).

41 The assessment of operational sound has been undertaken in accordance with BS4142:2014, *Methods for rating industrial and commercial sound*, whereby the operational sound sources under investigation have been compared to the existing background sound levels. The assessment has been based on the results of daytime and night-time baseline sound surveys undertaken at locations representative of the closest noise sensitive receptors. Operational sound levels from the Application Site have been predicted at the closest noise sensitive receptors using the calculation methodologies described in ISO 9613-2:1996, *Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation*, using the proprietary sound modelling software CadnaA®.

42 It has been assumed that potential impacts associated with the decommissioning phase would be similar to, and no worse than, those presented for the construction phase.

43 The assessments have been completed in accordance with the guidance documents detailed in the following sections of this chapter.

10.6.1 Guidance and Methods

BS5228-1:2009+A1:2014

44 BS5228:2009+A1:2014 sets out a methodology for predicting noise levels arising from a wide variety of construction and related open site activities, and contains tables of sound power levels generated by a wide variety of mobile and fixed plant. Compliance with this standard is expected as a minimum standard when assessing the impact of construction noise upon the existing noise environment at the closest receptors.

45 There is currently no specific EIA assessment criteria for construction site noise; however, BS5228-1:2009+A1:2014 does provide advice on acceptable noise levels, the most simplistic being based upon the exceedance of fixed noise limits. In this respect, paragraph E.2 of BS5228-1:2009+A1:2014 states:

"*Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut.*"

46 The standard goes on to state:

"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed 70 decibels (dB(A)) in rural, suburban and urban areas away from main road traffic and industrial noise."

47 This limit of 70 dB (L_{Aeq}) is applicable to daytime working outside living rooms, i.e. 07.00 - 19.00 hours on weekdays and 07.00 – 13.00 hours on Saturdays. When working outside these hours, say between 19.00 and 22.00 hours, the allowable noise level from construction sites would be less and *"a reduction of 10 dB may often be appropriate"*.

48 Night-time working (23.00 – 07.00 hours) is not normally permitted; however, BS5228-1:2009+A1:2014 suggests that a lower cut-off value of 45 dB L_{Aeq} would be appropriate for construction activity during these hours.

49 If these adopted 'threshold values' are exceeded, then the effect of construction noise may be significant. BS5228-1:2009+A1:2014 states that the significance of the effect will depend upon *"other project-specific factors, such as the number of receptors affected and the duration and character of the impact"*.

BS4142:2014

50 BS4142:2014 is used to assess the potential adverse impact of sound, of an industrial nature, at nearby sensitive receptor locations within the context of the existing sound environment. As per Section 1 of the Standard, it is *"not intended to be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels"*.

51 The assessment of impacts contained in BS4142:2014 is undertaken by comparing the rating level, i.e. the specific sound level of the source plus any penalties, to the measured representative background sound level outside the receptor(s).

52 In accordance with BS4142:2014, the significance of an industrial sound source depends on both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. It is therefore essential to place the sound in context.

53 BS4142:2014 (Section 3) provides the following definitions:

- **Ambient Sound**: Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. NOTE: The ambient sound comprises the residual sound and the specific sound when present.
- **Ambient Sound Level, $L_a = L_{Aeq,T}$**: Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
- **Background Sound Level, $L_{A90,T}$**: A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90 per cent of a given interval, T, measured using time weighting F and quoted to the nearest whole number of decibels (dB).
- **Rating Level, $L_{Ar,Tr}$**: Specific sound level plus any adjustment for the characteristic features of the sound.
- **Specific Sound Level, $L_s = L_{Aeq,T}$**: Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.
- **Specific Sound Source:** Sound source being assessed.

54 BS4142:2014 defines the impact of the specific sound by subtracting the measured background sound level from the rating level. This assessment is detailed in Table 10.7 and is reproduced from Section 11 of BS4142:2014 where it states: *"Typically, the greater this difference, the greater the magnitude of impact".*

Table 10.7: BS4142:2014 Assessment of Impacts

Rating Level minus Background Sound Level	Assessment of Impacts
Around +10 dB or more	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
Around +5 dB	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

55 In addition, BS4142:2014 states:

"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

56 BS4142:2014 also notes that "adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact".

57 To account for the acoustic character of proposed sound sources, BS4142:2014 provides the following with respect to the application of penalties to account for "the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention".

- **Tonality** – "*For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible*;
- **Impulsivity –** *A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible*;
- **Intermittency** – *When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied*; and
- **Other Sound Characteristics** – *Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied*."

58 Finally, BS4142:2014 outlines guidance for the consideration of the context of the potential impact including consideration of the existing residual sound levels, location and/or absolute sound levels.

<u>World Health Organisation Guidelines</u>

59 The *Guidelines for Community Noise* (1999) and the *Night Noise Guidelines for Europe* (2009) published by the World Health Organisation (WHO) recommend guideline noise levels regardless of the current noise environment. The WHO suggests suitable noise levels for indoor living areas during the daytime and night-time periods, and these levels are set regardless of the noise type or noise source, i.e. '*benchmark*' levels. It advises on the minimum levels of noise before critical health effects, including annoyance, occur.

60 In this regard, the *Guidelines for Community Noise* state:

- "*In dwellings, the critical effects of noise are on sleep, annoyance and speech interference. To avoid sleep disturbance, indoor guideline values for bedrooms are 30 dB $L_{Aeq,8h}$ for continuous noise and 45 dB L_{AFmax} for single sound events*;
- *To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB $L_{Aeq,16h}$ for a steady, continuous noise*; and
- *To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB $L_{Aeq,16h}$.*"

61 The *Night Noise Guidelines for Europe* can be considered as an extension to, as well as an update of, the *Guidelines for Community Noise.* These guidelines consider the scientific evidence on the thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the END and state that:

"*For the primary prevention of subclinical adverse health effects related to night noise in the population, it is recommended that the population should not be exposed to night noise levels greater than 40 dB of $L_{night,outside}$ during the part of the night when most people are in bed*."

62 This recommended (external) night-time noise limit [3] (Night Noise Guideline (NNG)) is "*considered a health-based limit value…necessary to protect the public, including most of the vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise*".

63 A value of 55 dB $L_{night,outside}$ is recommended as an interim target for the countries where the NNG cannot be achieved in the short-term for various reasons, and where policy-makers choose to adopt a stepwise approach.

BS8233:2014

64 BS8233:2014 *"provides guidance on the control of noise in and around buildings"* and recommends appropriate limits for different situations. The Standard suggests suitable internal noise levels within residential buildings (as per Table 10.8 below) and states that *"in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values"*.

Table 10.8: Indoor Ambient Noise Levels for Dwellings

Activity	Location	07.00 – 23.00 hours	23.00 – 07.00 hours
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room	40 dB $L_{Aeq,16hr}$	-

[3] The night noise guidelines adopt a harmonized noise indicator as defined by the END (Directive 2009/49/EC) – L_{night} measured outside, averaged over a year.

Activity	Location	07.00 – 23.00 hours	23.00 – 07.00 hours
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

Design Manual for Roads and Bridges

65 Noise generated by construction traffic is assessed following the guidance within DMRB (Volume 11 (*Environmental Assessment*), Section 3 (*Environmental Assessment Techniques*), Part 7 (*HA 213/08 – Noise and Vibration*).

66 This guidance note states that *"a change in noise level of 1 dB is equivalent to a 25 per cent increase or 20 per cent decrease in traffic flows, assuming all other factors remain unchanged"*.

67 DMRB also provides advice on the magnitude of impacts associated with increases in traffic flows and associated noise levels. Paragraph 3.37 of DMRB states that *"a change in road traffic noise of 1 dB $L_{A10,18hr}$ in the short term (e.g. when a project is opened) is the smallest that is considered perceptible"*. In the long term (15 years after opening), a 3 dB $L_{A10,18hr}$ is considered perceptible.

BS5228-2:2009+A1:2014

68 BS5228-2:2009+A1:2014 gives recommendations for basic methods of vibration control relating to construction and open sites where work activities could generate significant vibration levels. The majority of people are known to be sensitive to vibration, the threshold of perception being typically in the Peak Particle Velocity (PPV) range of between 0.14 mms^{-1} and 0.30 mms^{-1}. Vibration levels above these values can cause disturbance. The standard provides guidance on the effects of vibration as shown in Table 10.9 (which is reproduced from Table B.1 of the standard).

Table 10.9: Guidance on the Effects of Vibration

Vibration Level, mms^{-1}	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30	Vibration might be just perceptible in residential environments.
1.00	It is likely that vibration at this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.

Vibration Level, mms^{-1}	Effect
10.00	Vibration at this level is likely to be intolerable for any more than a brief exposure.

BS6472-1:2008

69 BS6472-1:2008 gives guidance on human exposure to vibration in buildings and advises on the maximum satisfactory magnitudes of vibration for residential properties. The advice contained in BS6472-1:2008 suggests that, in homes, adverse comment about building vibrations is likely when the vibration levels to which the occupants are exposed are only slightly above thresholds of perception.

70 The effect of building vibration on occupants can be assessed by finding the appropriate vibration dose. Present knowledge suggests that this type of vibration is best evaluated with the Vibration Dose Value (VDV). When the appropriately-weighted vibration measurements have been used to derive the VDV, for either a 16-hour daytime or eight-hour night-time period, their significance in terms of human response for occupants in those locations can be derived from the guidance shown in Table 10.10 below.

Table 10.10: Vibration Dose Value (VDV) Ranges within Residential Buildings

	Low Probability of Adverse Comment ($ms^{-1.75}$)	Adverse Comment Possible ($ms^{-1.75}$)	Adverse Comment Probable ($ms^{-1.75}$)
Residential Buildings – 16-hour Daytime	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential Buildings – 8-hour Night-time	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

71 The above guidance relates to vibration measured at the point of entry into the human body, which is usually taken to mean the ground surface or at a point mid-span of an upper storey floor, rather than the point of entry into the building, for example a foundation element.

BS7385-2:1993

72 BS7385:1993 gives guidance on levels of vibration on building structures to ascertain whether damages would occur. Part 2 of the standard provides guidance on the assessment of the possibility of vibration-induced damage in buildings due to a variety of sources and sets guide values for building vibration based on the lowest levels above which damage has been credibly demonstrated.

73 The standard defines PPV as the *"maximum instantaneous velocity of a particle at a point during a given time interval"*, and this is defined in terms of three mutually perpendicular

components (usually vertical, transverse and longitudinal (or radial)). In accordance with the standard, PPV has been found *"to be the best single descriptor for correlating with case history data on the occurrence of vibration-induced damage"*.

74 The guide values from Table 1 of BS7385-2:1993 are reproduced as Table 10.11 below; they relate predominantly to transient vibration which does not give rise to resonant responses in structures and to low-rise buildings. These guide values are also referenced within BS5228-2:2009+A1:2014 (Table B.2) – specifically with respect to vibration-generating construction activities.

Table 10.11: Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity (in frequency range of predominant pulse)	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures; industrial and heavy commercial buildings	50 mms^{-1} at 4 Hz and above	50 mms^{-1} at 4 Hz and above
Unreinforced or light-framed structures; residential or light commercial type buildings	15 mms^{-1} at 4 Hz, increasing to 20 mms^{-1} at 15 Hz	20 mms^{-1} at 15 Hz, increasing to 50 mms^{-1} at 40 Hz and above

ISO 9613-2:1996

75 The levels of sound generated by the operation of the OnTW have been predicted in accordance with the prediction framework in ISO 9613-2:1996. This takes account the distance between the sound sources and the closest receptors, and the amount of attenuation due to atmospheric absorption. The methodology also assumes downwind propagation, i.e. a wind direction that assists the propagation of sound from the source to the receptor.

Guidelines for Environmental Noise Impact Assessment

76 The *Guidelines for Environmental Noise Impact Assessment*, produced by the Institute of Environmental Management and Assessment (IEMA), address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines state that *"noise measurement and quantification is concerned with the effect of noise which varies significantly with time"*. The guidelines go on to state:

77 *"Measuring in decibels means that a 3 dB change is a doubling of the sound energy and a 10 dB change is a tenfold increase. For sounds which are very similar in all but magnitude, a change or difference of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions and a 10 dB increase appears to be twice as loud."*

78 The guidelines provide specific support on how noise impact assessment fits within the EIA process. They cover:

- How to scope a noise assessment;
- Issues to be considered when defining the baseline noise environment;
- Prediction of changes in noise levels as a result of implementing development proposals; and
- Definition and evaluation of the significance of the effects of changes in noise levels.

79 The IEMA guidelines offer advice on how to establish the baseline noise level and suggest that "*it is good practice to measure over short time periods even though the required assessment indicator is to be averaged over a longer period*".

80 The guidelines also state that monitoring should be avoided when the wind speed exceeds five m/s, during unusual temperature conditions, or when there is significant precipitation – unless these are normal conditions for the area.

81 In terms of cumulative effects, these are defined within the IEMA guidelines as "*those that result from additive impacts caused by other past, present or reasonably foreseeable actions together with the plan, programme or project itself and synergistic effects (in combination) which arise from the reaction between impacts of a development plan, programme or project on different aspects of the environment*".

10.7 Noise Impact

10.7.1 Methodology

82 For both the construction and operational phases of the OnTW, a noise model has been constructed using the proprietary noise modelling software package CadnaA®, whereby noise levels generated by all anticipated noise sources have been predicted at the closest NSRs. For all phases, the noise model has taken into account the distance between the identified noise sources and the receptors, and the amount of attenuation due to atmospheric absorption. In all cases, the noise model assumes downwind propagation, i.e. a wind direction that assists the propagation of sound from the source to the receptor i.e. a worst case scenario.

83 The assessment of construction noise and vibration impact has been based on a generic outline construction methodology and programme, and has been determined using the methodology and guidance set out in BS5228:2009+A1:2014.

84 With respect to potential noise impact due to traffic movements associated with the OnTW, reference is made to Part 7 of DMRB. The assessment of noise impact from traffic is based on the increase between the '*baseline*' and predicted ('*baseline + development'*) total traffic flows as presented in *Chapter 11: Traffic and Transport*.

85 The levels of sound generated by the operation of the OnTW have been predicted in accordance with the prediction framework set out in ISO 9613-2:1996 and assessed in accordance with the guidance of BS4142:2014.

86 With respect to the assessment of operational sound affecting residential receptors, and in accordance with the requirements of BS4142:2014, the assessment has included a subjective assessment of the acoustic features of the OnTW, in terms of potential tonal, impulsive and/or intermittent characteristics. Section 9.2 of BS4142:2014 states that *"a rating penalty for sound based on a subjective assessment of its characteristics"* should be established where appropriate. For new sources, that cannot be measured at the time of an assessment, BS4142:2014 considers *"the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention"*.

87 Reference has also been made to the guidance of the WHO and BS8233:2014 with respect to appropriate external and internal noise limits for dwellings, including consideration of the impact of maximum noise levels (L_{AFmax}) during the night-time period.

88 Overall, the results of the modelling and prediction work have been assessed in accordance with the relevant criteria to identify the significance of construction and operational noise and vibration impacts. Where appropriate, specific mitigation measures have been detailed to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

10.7.2 Identification of Effects

89 The key terms within this assessment, which are relevant to the EIA process, are Sensitivity, Magnitude and Significance. In accordance with the IEMA guidelines, the noise impact, the noise effect and the significance of the effect must be determined.

Magnitude of Impact

90 In accordance with the IEMA guidelines, noise impact may be determined by comparing the predicted noise level with an absolute noise limit value and/or by calculating the change in the noise level.

91 The impact of construction noise has been determined with reference to the guidance within BS5228-1:2009+A1:2014, as shown in Table 10.12 below.

Table 10.12: Construction Noise – Impact Magnitude

Magnitude	Definition
Major	Threshold value exceeded by more than 10 dB; change in ambient noise level (L_{Aeq}) of 10 dB or more
Moderate	Threshold value exceeded by a value between 6.0 and 9.9 dB; change in ambient noise level (L_{Aeq}) between 6.0 and 9.9dB

Magnitude	Definition
Minor	Threshold value exceeded by a value between 3.0 and 5.9 dB; change in ambient noise level (L_{Aeq}) between 3.0 and 5.9dB
Negligible	Threshold value exceeded by a value between 0.1 and 2.9 dB; change in ambient noise level (L_{Aeq}) between 0.1 and 2.9 dB
None	Threshold value not exceeded; no change in ambient noise level (L_{Aeq})

92 The impact of noise associated with construction traffic has been determined with reference to the guidance of DMRB, as shown in Table 10.13 below.

Table 10.13: Construction Traffic Noise – Impact Magnitude

Magnitude	Definition
Major	Change in $L_{A10,18hr}$ noise level of 10 dB or more
Moderate	Change in $L_{A10,18hr}$ noise level between 3.0 and 9.9 dB
Minor	Change in $L_{A10,18hr}$ noise level between 1.0 and 2.9 dB
Negligible	Change in $L_{A10,18hr}$ noise level between 0.1 and 0.9 dB
None	No change in $L_{A10,18hr}$ noise level

93 The impact of operational sound upon residential receptors has been determined with reference to BS4142:2014 (and the guidance within the TAN), as shown in Table 10.14 below.

Table 10.14: Operational Sound – Impact Magnitude

Magnitude	Definition
Major	Rating level is 10 dB or more above the background sound level, L_{A90}; change in ambient noise level (L_{Aeq}) of 10 dB or more
Moderate	Rating level is between 5.5 and 9.9 dB above the background sound level, L_{A90}; change in ambient noise level (L_{Aeq}) between 3.0 and 9.9dB
Minor	Rating level is between 0.1 and 5.4 dB above the background sound level, L_{A90}; change in ambient noise level (L_{Aeq}) between 1.0 and 2.9dB
Negligible	Rating level is between 0 and 9.9 dB below the background sound level, L_{A90}; change in ambient noise level (L_{Aeq}) between 0.1 and 0.9dB

Magnitude	Definition
None	Rating level is 10 dB or more below the background sound level, L_{A90}; no change in ambient noise level (L_{Aeq})

Sensitivity

94 The significance of the effect will depend on the receptor type and its sensitivity to the impact. The sensitivity of the receptor is shown in Table 10.15 below.

Table 10.15: Sensitivity Criteria for Receptors

Sensitivity	Definition
Very High	Residential properties (night-time) Schools and healthcare buildings (daytime)
High	Residential properties (daytime) SAC, SPA, SSSI (or similar areas of special interest)
Medium	Offices and other non-noise producing employment areas
Low	Industrial areas

95 The sensitivity of the receptor, together with the magnitude of the impact, defines the significance of the effects as shown in Table 10.16 below.

96 All receptors within this assessment are residential properties. As such, their sensitivity to the impact is defined as Very High for night-time and High for daytime.

Noise Effect

97 Generic noise effects are detailed in Table 7-7 of the IEMA guidelines. Where an adverse impact is identified, the IEMA guidelines present the following generic relationship between noise impact and noise effect:

- **Major Impact Noise Effect** – "*Significant changes in behaviour and/or inability to mitigate the effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening, loss of appetite, significant medically definable harm, e.g. auditory and non-auditory*;
- **Moderate Impact Noise Effect** – *Causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in character of the area*;

- **Minor Impact Noise Effect –** *Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television, speaking more loudly, closing windows. Potential for non-awakening sleep disturbance. Affects the character of the area such that there is a perceived change in the quality of life*;
- **Negligible Impact Noise Effect –** *Noise can be heard, but do not cause any change in behaviour or attitude. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life*."

Significance of Effect

Table 10.16: Significance of Noise Effect

Magnitude	Sensitivity Very High	Sensitivity High	Sensitivity Medium	Sensitivity Low
Major	Major	Major	Major	Moderate
Moderate	Moderate	Moderate	Moderate	Minor
Minor	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	None
None	None	None	None	None

10.8 Impact Assessment

10.8.1 Effects of Construction

98 A development of this nature has the potential to generate noise during the construction phase, should appropriate mitigation not be employed. However, disruption due to construction noise is a localised phenomenon, and is both temporary and intermittent in nature. The techniques available to predict the likely noise effects from construction are necessarily based on quite detailed information on the type and number of plant being used, their location within the site and the length of time they are in operation.

99 Details of the proposed construction phase and programme are provided within *Chapter 5: Description of Development*.

100 In summary, and for the purposes of the assessment of noise impact, the construction phase has been assumed to comprise the following:

- Landfall and Onshore Export Cable – to include excavation using either an open trench or Horizontal Directional Drilling (HDD) methodology, and subsequent filling and compacting, of the cable runs from the Landfall to the Onshore Substation and cable runs from the Onshore Substation to the grid connection point. This would also include the 'pull-in' of each of the two export cables;

- Site Preparation – to include the establishment of foundations, internal access roads and drainage systems; and
- Construction of Onshore Substation – to include installation of substation components and electrical infrastructure, and further enabling works where required.

101 In addition, a construction compound would be located within the Application Site, providing welfare and security facilities, along with parking for construction vehicles. Mobile plant (such as dozers and dump trucks) would also operate within the Application Site throughout the construction phase.

102 The construction phase would also include a period of works at the B1348 (Edinburgh Road), whereby a connection will be required between the Onshore Substation and the nearby grid substation (i.e. the grid connection point). As per the works at the Landfall, this phase of the construction is anticipated to comprise either an open trench or HDD methodology.

103 There are four existing conduits underneath the B1348 and these were used to connect the former Cockenzie Power Station to the grid substation. It is anticipated that two of these existing conduits will be used for the Onshore Export Cables; therefore, no drilling or tunnelling is anticipated. However, if these conduits are found to be unsuitable for this purpose, then open trenching or HDD will be used for works at the B1348. For the purposes of the assessment however, it has been assumed that the HDD methodology would be used at the B1348, i.e. assuming a preference to drill underneath the existing road, rather than use open trenches.

104 Construction within the Application Site would be restricted between the daytime hours of 07.00 and 19.00 Monday to Friday, and between the hours of 08.00 to 13.00 on Saturdays (unless otherwise agreed with ELC). However, construction work associated with installation of the Offshore Export Cables at the Landfall would take place out with these hours, i.e. at night-time, between the hours of 23.00 and 07.00.

105 Night-time working has thus been considered within this section, which relates to the pull-in of each of the two export cables only. Each cable pull-in would occur separately, lasting for a maximum of two nights, with a period of two weeks between each. The main source of noise associated with the cable pull-in would be a diesel-powered winch unit, which would be located at a distance of 100 m from the shore.

106 All other construction work associated with the Landfall would be undertaken during daytime hours and is anticipated to be approximately two to three months in duration. This would include preparation of the onshore Landfall and then backfilling of the Landfall trench, as well as work to connect the export cables to the onshore cables. Work to connect the Onshore Substation to the grid connection point (i.e. under the B1348 (Edinburgh Road)) would also be undertaken during the stated daytime hours.

107 A list of the likely construction plant has been assumed for identified activities and work areas, and this is detailed in Table 10.17 below. Predictions of construction noise have been based on the corresponding 10 m sound pressure level (SPL) listed in Annex C of BS5228-

1:2009+A1:2014 for main stages of the construction programme, namely Landfall and Onshore Export Cable, Site Preparation, Onshore Substation and Grid Connection.

Table 10.17: Octave Band Noise Level Data for Construction Activities (SPL at 10 m), dB

BS5228 Annex C Table Ref.	Plant	Frequency, Hz							
		63	125	250	500	1 k	2 k	4 k	8 k
Landfall and Onshore Export Cable									
C.4, 76	Diesel Generator* (6.5 kW)	80	74	57	54	53	48	45	37
C.2, 19	Tracked Excavator (25 t)	95	84	79	73	70	68	64	57
C.2, 8	Wheeled Backhoe Loader (8 t)	74	66	64	64	63	60	59	50
C.2, 38	Roller (18 t)	80	75	77	72	67	62	54	46
C.10, 20	Conveyor Drive Unit (Winch Unit)	71	69	68	71	75	67	63	57
C.10, 23	Field Conveyor	58	52	52	43	43	42	47	47
Site Preparation									
C.4, 76	Diesel Generator* (6.5 kW)	80	74	57	54	53	48	45	37
C.2, 11	Dozer (28 t)	75	79	77	77	74	71	65	57
C.2, 19	Tracked Excavator (25 t)	95	84	79	73	70	68	64	57
C.2, 26	Wheeled Loader	87	82	77	78	73	70	64	57
C.2, 30	Dump Truck (29 t)	85	74	78	73	73	74	67	63
Onshore Substation									
C.4, 76	Diesel Generator* (6.5 kW)	80	74	57	54	53	48	45	37

BS5228 Annex C Table Ref.	Plant	Frequency, Hz							
		63	125	250	500	1 k	2 k	4 k	8 k
C.4, 46	Mobile Crane (50 t)	78	69	67	64	62	57	49	40
C.2, 35	Forklift / Telescopic Handler (10 t)	85	79	69	67	64	62	56	47
C.4, 57	Lifting Platform (8 t)	78	76	62	63	60	59	58	49
C.4, 74	Tractor**	79	71	78	75	78	70	61	55
Grid Connection at B1348									
C.3, 43	Cable Percussion Drilling Rig***	77	77	67	66	70	68	62	56
C.3, 44	Directional Drill (Generator)	67	80	74	72	72	72	68	61
C.4, 88	Water Pump (Diesel)	70	65	66	64	64	63	56	46
C.4, 76	Diesel Generator (6.5 kW)	80	74	57	54	53	48	45	37

* power for site cabin(s) / lighting

** towing equipment

***2 t, 150 mm diameter, 75 m depth

108 In order to model barrier attenuation from local topography, OS *'Terrain 5'* data (including the existing bunds) has been incorporated into the CadnaA® noise model; however, barrier attenuation from existing buildings has not been considered.

109 In addition, the predictions take into account the attenuation provided by 2.4m high hoarding, which would be erected around the perimeter of the site. The hoarding is assumed to be constructed from 18mm plywood with a timber frame, which would be sealed at the base and have no gaps (other than the site entrance).

110 The predicted construction noise levels have assumed the concurrent use and 100 per cent on-time for all plant for each stage of construction. In all cases, it is likely that plant would operate for much shorter periods and not all activities would occur at the same time, resulting

in lower noise levels. The assessment therefore presents a worst case scenario for construction noise levels.

111 Table 10.18 below presents the maximum ambient daytime noise level expected from the simultaneous operation of all anticipated plant during the identified stages of the construction programme. The table also provides an overall noise level, should these stages happen concurrently.

Table 10.18: Predicted Construction Noise Levels – Daytime, dB

NSR ID	NSR Name	Predicted Noise Level, L_{Aeq}				
		Landfall & Onshore Cable	Site Preparation	Substation	Grid Connect	Total
NSR01	No.1 & 2 Edinburgh Road	42	47	42	50	53
NSR02	West Harbour Road	40	45	39	42	48
NSR03	Cockenzie House & Gardens	38	43	37	43	47
NSR04	Hawthorn Terrace	41	47	44	50	53
NSR05	The Antiquaries	35	38	34	40	43
NSR06	Atholl View	27	31	25	27	34
NSR07	Appin Drive	35	39	34	37	43
NSR08	Hawthorn Bank	40	45	40	44	49

112 The predicted construction noise levels in Table 10.18 above have been assessed against an external daytime criterion of 70 dB L_{Aeq}. The predicted noise levels from the assumed construction plant for the construction of the Landfall and Onshore Export Cable route, site preparation and the construction of the Onshore Substation are shown to be below the adopted daytime criterion of 70 dB L_{Aeq} for all receptors.

113 With reference to the guidance of BS5228-1:2009+A1:2014, noise from construction sites *"should not exceed the level at which conversation in the nearest building would be difficult with the windows shut"*. The standard goes on to state that daytime noise levels *"should not exceed 70 decibels (dB(A))"* and this is applicable outside the *"nearest window of the occupied room closest to the site boundary"*.

114 As per Table 10.12, this results in no noise impact since the adopted daytime threshold value of 70 dB L_{Aeq} is not predicted to be exceeded. For daytime operations, the sensitivity of the receptors is defined as high, resulting in no significant effect as per Table 10.16.

115 This is the case for the total daytime construction noise level, if all construction activities are assumed to be operating concurrently. As this is unlikely to be the case, the total predicted noise levels in Table 10.18 above are therefore the maximum ambient noise levels predicted for the construction phase of the OnTW. Table 10.19 below presents the maximum ambient night-time noise level expected from the operation of plant associated with the Onshore Export Cable route only.

Table 10.19: Predicted Construction Noise Levels – Night-time, dB

NSR ID	NSR Name	Predicted Noise Level, L_{Aeq}
		Onshore Cable Route*
NSR01	No.1 & 2 Edinburgh Road	40
NSR02	West Harbour Road	37
NSR03	Cockenzie House & Gardens	36
NSR04	Hawthorn Terrace	39
NSR05	The Antiquaries	37
NSR06	Atholl View	25
NSR07	Appin Drive	37
NSR08	Hawthorn Bank	37
*Night-time working relating to the pull-in of each of the two export cables only. Each cable pull-in would occur separately, lasting for a maximum of two nights, with a period of two weeks between each.		

116 The predicted construction noise levels in Table 10.19 above, with respect to activities associated with the pull-in of the export cables, are shown to be below the adopted night-time criterion of 45 dB L_{Aeq} for all receptors.

117 As per Table 10.12, this results in no impact since the adopted night-time threshold value of 45 dB L_{Aeq} is not predicted to be exceeded. For night-time operations, the sensitivity of the receptors is defined as very high, resulting in no significant effect as per Table 10.16.

118 The predicted construction noise levels (L_{Aeq}) have been (logarithmically) added to the existing (measured) ambient noise levels (L_{Aeq}). This has been undertaken to determine the change (if any) in existing noise levels as a result of construction noise, and is detailed in Table 10.20 below for both the daytime and night-time period. Within Table 10.21 below, the predicted

night-time noise levels correspond to construction activity at the Landfall and Onshore Export Cable route only, whereby this work will be required to be undertaken out with daytime hours.

Table 10.20: Construction Noise – Change to Existing Ambient Noise Levels, L_{Aeq}

NSR ID	NSR Name	Assessment Period	Predicted Noise Level, dB L_{Aeq}	Existing Ambient Noise Level, dB L_{Aeq}	Cumulative Noise Level, dB L_{Aeq}	Change to Existing Ambient Noise Level, dB
NSR01	No. 1 & 2 Edinburgh Road	Daytime	53	68	68	0
		Night-time	40	54	54	0
NSR02	West Harbour Road	Daytime	48	51	53	+2
		Night-time	37	42	43	+1
NSR03	Cockenzie House & Gardens	Daytime	47	51	53	+2
		Night-time	36	42	43	+1
NSR04	Hawthorn Terrace	Daytime	53	50	55	+5
		Night-time	39	34	40	+6
NSR05	The Antiquaries	Daytime	43	60	60	0
		Night-time	37	51	51	0
NSR06	Atholl View	Daytime	34	46	46	0
		Night-time	25	44	44	0
NSR07	Appin Drive	Daytime	43	46	48	+2
		Night-time	37	44	45	+1
NSR08	Hawthorn Bank	Daytime	49	68	68	0
		Night-time	37	54	54	0

119 As per Table 10.20 above, it is shown that the predicted construction noise levels would not have an impact on the existing ambient noise levels, i.e. a change of less than 3 dB or no change, at the majority of receptors. As per the guidance of PAN 1/2011, *"a change of 3 dB is the minimum perceptible under normal conditions".*

120 As per Table 10.12, this results in no impact at NSR01, NSR05, NSR06 and NSR08, whereby there is no predicted change to the ambient daytime and night-time noise levels (L_{Aeq}). For daytime, the sensitivity of the receptors is defined as high resulting in no significant effect as per Table 10.16. This is also the case for night-time, whereby the sensitivity of the receptors is defined as very high.

121 For NSR02, NSR03 and NSR07, and as per Table 10.12, the resulting impact is negligible whereby the predicted change to the ambient daytime and night-time ambient noise levels is between 0.1 and 2.9 dB. For daytime, the sensitivity of the receptors is defined as high resulting in a negligible significant effect as per the criteria in Table 10.16. For night-time, the sensitivity of the receptors is defined as very high, and this also results in a negligible significant effect.

122 For NSR04 (Hawthorn Terrace) during the daytime period, the predicted increase in the ambient noise level (L_{Aeq}) due to construction noise is +5 dB, a change which may be perceptible against the existing ambient noise. As per Table 10.12, this results in a minor impact at NSR04, whereby the change to the ambient daytime noise level (L_{Aeq}) is predicted to be between 3.0 and 5.9 dB. For daytime operations, the sensitivity of this receptor is defined as high resulting in a minor significant effect.

123 For NSR04 at night, the predicted increase in the ambient noise level (L_{Aeq}) due to construction noise is +6 dB, which may also be perceptible against the existing ambient noise. As per Table 10.12, this results in a moderate impact at NSR04, whereby the change to the ambient night-time noise level (L_{Aeq}) is predicted to be between 6.0 and 9.9 dB. For night-time, the sensitivity of this receptor is very high resulting in a moderate significant effect.

124 However, it should be noted that, with respect to the daytime period, the predicted noise levels in Table 10.20 represent the worst case scenario, whereby all phases of construction are assumed to be occurring at the same time. This is unlikely to be the case, as activities would be phased over the anticipated construction programme and are therefore likely to result in lower noise levels at the closest receptors.

125 With respect to the night-time period for construction activities, this relates to the pull-in of each of the two Offshore Export Cables. Each cable pull-in would occur separately, lasting for a maximum of two nights, with a period of two weeks between each. Therefore, the resulting noise levels will only occur for a very short period during the night-time, and will not be indicative of 'normal' operations during the construction phase.

126 The assessment of construction noise has shown that the adopted daytime criterion of 70 dB L_{Aeq} is not expected to be exceeded at the closest NSRs. This is also applicable for the night-time period, whereby the predicted noise levels due to the construction of the landfall and onshore cable route are below the adopted night-time criterion of 45 dB L_{Aeq} at the closest NSRs. Considering these absolute threshold values, as per the guidance of BS5228-1:2009+A1:2014, it is considered that there is no resulting noise impact associated with the construction phase of the OnTW.

127 Notwithstanding this, several safeguards exist in order to control and minimize the effects of construction noise, and these would apply during the construction phase. These include:

- European Commission (EC) Directives and United Kingdom (UK) Statutory Instruments to control noise emissions from construction plant;
- The guidance within BS5228-1:2009+A1:2014 on the control of noise from construction sites; and
- Section 60 of the Control of Pollution Act 1974, which gives local authorities the power to control noise from construction sites.

128 The adoption of Best Practicable Means is usually the most effective means of controlling noise from construction sites. The precise noise mitigation measures to control noise from construction activities, with respect to the OnTW, may require agreement with ELC prior to the works starting. However, generic measures are provided below to illustrate the range of techniques available:

- Activities within the Application Site would be undertaken in locations where noise attenuation from existing landforms and structures would maximise the benefit to the closest receptors;
- Roads in the immediate vicinity of the Application Site would be kept clean and maintained in a good state of repair to avoid unwanted rattle from vehicles;
- Materials would be handled in a manner that minimises noise;
- All plant would have noise emission levels that comply with the limiting levels defined in EC Directive 2000/14/EC[4] (and UK Statutory Instrument 2001/1701[5]), and any subsequent amendments;
- Consideration would be given to the recommendations set out in Annex B of BS5228-1:2009+A1:2014 with respect to noise sources, remedies and their effectiveness;
- Plant would be operated in a proper manner with respect to minimising noise emissions, i.e. minimisation of drop heights, no unnecessary revving of engines, etc.;
- Plant would be started up sequentially rather than all at once;
- Plant would be subject to regular maintenance and kept in good working order to meet manufacturers' noise rating levels;
- Plant that is used intermittently would be shut down when not in use;
- Vehicles would not wait or queue on the public highway with engines idling; and
- Reversing alarms would incorporate one of the following features where practicable – directional sounders, broadband signals, self-adjusting sounders or flashing warning lights.

[4] *Directive 2000/14/EC – Noise – Equipment for Use Outdoors* (of the European Parliament of the Council of 8 May 2000 on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors)

[5] *The Noise Emission in the Environment by Equipment for use Outdoors Regulations 2001*

Alternative and comparable systems could be used to minimise noise and nuisance from reversing alarms.

129 Experience from other sites has shown that by implementing these measures, typical noise levels from construction activities could be reduced by 5 dB or more. Furthermore, problems concerning noise from construction works can sometimes be avoided by taking a considerate and neighbourly approach with local residents. Works will not be undertaken outside the hours agreed with the local authority.

130 As construction activities would be temporary, and noise levels have been predicted for a worst-case scenario, no further mitigation measures are considered necessary.

Construction Traffic

131 Additional traffic generated during the construction phase is referred to in *Chapter 11*: *Traffic and Transport*. The traffic assessment relates to the two-way traffic generated along the proposed transport route required to deliver construction materials and Onshore Substation components. The transport route for construction traffic would be via the A1, A198, B6371 and B1348, with a new access to the Application Site off the B1348.

132 The two-way traffic flows (18 hour) on each section of the proposed route, for '*baseline*' (in 2020) and '*baseline + development*', are shown in Table 10.21 below for the five-day average scenario and in Table 10.23 below for the Saturday peak scenario respectively. Both tables show the predicted increase in Heavy Good Vehicles (HGV) and total traffic flows and the figures have been reproduced from *Chapter 11: Traffic and Transport*.

Table 10.21: Traffic Assessment – 18 Hour Flows for 5-Day Average

Link & Road Section	Scenario	HGV	Total
1 – A198, between A1 overbridge and A18 roundabout	Baseline	1,197	16,610
	Baseline + Development	1,210	16,649
	Increase	**1.1 %**	**0.2 %**
2 – A198, approx. 250 m south of B1361 roundabout	Baseline	1,622	23,513
	Baseline + Development	1,637	23,595
	Increase	**0.9 %**	**0.3 %**
3 – B6371, approx. 300 m north of B1361 roundabout	Baseline	566	9,075
	Baseline + Development	596	9,157
	Increase	**5.3 %**	**0.9 %**
	Baseline	1,010	14,691

Link & Road Section	Scenario	HGV	Total
4 – A198, east of Meadowmill roundabout	Baseline + Development	1,010	14,692
	Increase	**0 %**	**<0.1 %**
5 – A198, west of Meadowmill roundabout	Baseline	814	11,615
	Baseline + Development	814	11,616
	Increase	**0 %**	**<0.1 %**
6 – A1, east of Bankton junction (Macmerry)	Baseline	2,781	31,268
	Baseline + Development	2,784	31,273
	Increase	**0.1 %**	**<0.1 %**
7 – A1, west of Bankton junction	Baseline	2,849	45,782
	Baseline + Development	2,875	45,856
	Increase	**0.9 %**	**0.2 %**
8 – B6371, between Alder Road and South Lorimer Place	Baseline	188	5,958
	Baseline + Development	217	6,041
	Increase	**15.4 %**	**1.4 %**
9 – B6371, between South Lorimer Place and B1348	Baseline	140	5,752
	Baseline + Development	170	5,834
	Increase	**21.4 %**	**1.4 %**
10 – B1348, Edinburgh Road	Baseline	324	8,430
	Baseline + Development	354	8,512
	Increase	**9.3 %**	**1.0 %**

Table 10.22: Traffic Assessment – 18 Hour Flows for Saturday Peak

Link & Road Section	Scenario	HGV	Total
1 – A198, between A1 overbridge and A18 roundabout	Baseline	578	14,007
	Baseline + Development	597	14,079
	Increase	**3.3 %**	**0.5 %**

Link & Road Section	Scenario	HGV	Total
2 – A198, approx. 250 m south of B1361 roundabout	Baseline	738	20,136
	Baseline + Development	776	20,287
	Increase	**5.1 %**	**0.8 %**
3 – B6371, approx. 300 m north of B1361 roundabout	Baseline	250	7,466
	Baseline + Development	287	7,621
	Increase	**14.8 %**	**2.1 %**
4 – A198, east of Meadowmill roundabout	Baseline	458	12,594
	Baseline + Development	458	12,596
	Increase	**0 %**	**<0.1 %**
5 – A198, west of Meadowmill roundabout	Baseline	368	9,934
	Baseline + Development	368	9,936
	Increase	**0 %**	**<0.1 %**
6 – A1, east of Bankton junction (Macmerry)	Baseline	2,338	26,289
	Baseline + Development	2,342	26,298
	Increase	**0.2 %**	**<0.1 %**
7 – A1, west of Bankton junction	Baseline	2,234	35,897
	Baseline + Development	2,267	36,032
	Increase	**1.5 %**	**0.4 %**
8 – B6371, between Alder Road and South Lorimer Place	Baseline	115	5,146
	Baseline + Development	152	5,296
	Increase	**32.2 %**	**2.9 %**
9 – B6371, between South Lorimer Place and B1348	Baseline	129	5,287
	Baseline + Development	167	5,438
	Increase	**29.5 %**	**2.9 %**
10 – B1348, Edinburgh Road	Baseline	320	8,930

Link & Road Section	Scenario	HGV	Total
	Baseline + Development	358	9,081
	Increase	**11.9 %**	**1.7 %**

133 According to DMRB, "a change in noise level of 1 dB is equivalent to a 25 per cent increase or 20 per cent decrease in traffic flow". By comparing the 18-hour two way 'baseline' and 'baseline + development' traffic flows for the five-day average scenario (Table 10.21 above), it can be seen that the increase in total traffic on the proposed transport route would be below 25 per cent for all road sections. Therefore, changes to the existing noise levels ($L_{A10,18hr}$) would be less than 1 dB, as per the guidance of DMRB. This relates to the average construction period (and corresponding average HGV movements) over an anticipated 22-month programme.

134 For Saturday peak traffic flows (as per Table 10.22 above), the predicted increase in HGVs would be more than 25 per cent for road sections 8 and 9; however, this relates to peak construction activities and HGV movements lasting for a maximum of two months. Notwithstanding this, the increase in total traffic is predicted to be below 25 per cent for all roads sections, and as such, changes to the existing noise levels ($L_{A10,18hr}$) (as a result of Saturday peak construction traffic) would also be less than 1 dB in accordance with the DMRB guidance.

135 As per Table 10.13, this results in a negligible impact whereby the change to the $L_{A10,18hr}$ noise level is predicted to be less than 1 dB. For the daytime period, the sensitivity is defined as high resulting in a negligible significant effect.

Construction Vibration

136 With reference to the construction phase of the OnTW, it is anticipated that the Onshore Substation buildings and equipment will be supported on simple reinforced concrete raft and strip foundations which would lie on top of a 2.3 m deep granular fill layer which has been placed over the existing reinforced concrete foundation slab (of the former Cockenzie Power Station.) Therefore, no piling, drilling or blasting activities are anticipated.

137 In addition, no deep excavation is required for the cable routes between the Landfall and the Onshore Substation. These require only relatively shallow trenches (with a maximum depth of 2.5 m). The onshore cable routes lengths are all short with the route from Landfall to the Onshore Substation and from the Onshore Substation to the nearby grid substation both being less than 200 m. Conventional earthmoving equipment would be used to create the onshore cable trenches.

138 It is anticipated that the construction of the Landfall for the Offshore Export Cables will be undertaken using open trench methodology, however there is a possibility that HDD may be utilised. Based on a review of the existing rock characteristics, the use of blasting is not anticipated. Conventional earthmoving equipment would be used on the onshore side of the

Landfall and a barge mounted backhoe excavator would be used to seaward of the seawall. However, a number of different methods are currently available for creating the open trench or tunnel through or under the seawall.

139 There are four existing conduits underneath the B1348 (Edinburgh Road) which were previously used to connect the former Cockenzie Power Station to the adjacent grid substation. It is anticipated that two of these conduits could be re-used for the Onshore Export Cables, therefore, no drilling or tunnelling is anticipated for this stage of the construction programme. However, if these existing conduits cannot be used, then open trenching or HDD will be used to create the cable crossings under the B1348.

140 Based on the above, it is unlikely that the proposed construction methods would give rise to significant vibration impacts at the closest receptors, as piling and/or blasting methods are not anticipated. This is also based on the distance between the assumed location of construction activities, with a minimum distance of approximately 180 m between the Application Site boundary and the closest residential receptors on the B1348 (Edinburgh Road) and Hawthorn Terrace. Levels of vibration are found to decrease rapidly with distance, whereby empirical data indicates that at a distance of 12 m from the source, HDD results in a PPV equal to 1.8 mms^{-1}. This value is below the threshold limits within BS5228-1:2009+A1:2014 for vibration impact. Furthermore, ground level plant is not considered to generate significant levels of vibration, with levels below those which would be likely to cause cosmetic damage. In the same respect, significant vibration impacts on biodiversity are not anticipated.

141 Notwithstanding this, and due to the potential use of tunnelling methods at the Landfall and open trenching or HDD for the Onshore and Offshore Export Cables, it will be appropriate to consider the potential vibration impact of sub-surface working once the exact construction methodology has been confirmed. As per the guidance of BS5228-2:2009+A1:2014, *"the mechanisms which give rise to the propagation of vibration through media such as soil are complex"* and *"will depend on the characteristics of the vibration source, the properties of the excavated ground, and the ground between the vibration source and receiver"*.

142 Therefore, this is likely to be undertaken when further detail on the methodology and ground conditions are known. However, for the purposes of this assessment, appropriate mitigation measures have been recommended in order to guide the design and phasing of the construction programme, in order to ensure that vibration levels can meet the guidance of BS5228-2:2009+A1:2014.

143 Best Practicable Means are applicable in order to minimise the effects of vibration from construction activities. Again, the precise mitigation measures may require agreement with ELC prior to the works starting; however, a list of measures are provided below to illustrate the range of techniques available:

- Where practicable, stationary plant would be isolated using resilient mountings, e.g. for generators, pumps, compressors;
- Plant would be operated in a proper manner with respect to minimising vibrations, i.e. low vibration working methods would be employed; and

- Consideration would be given to the most suitable plant and hours of working for operations which may give rise to perceptible vibrations and where practicable, these would be replaced by less intrusive plant and/or methods of working.
- Control of vibration at source, where practicable, by reducing the speed of plant, e.g. limiting the rotational speed or progress rate.

10.8.2 Effects of Operation and Maintenance

144 The prediction of operational sound has been undertaken using the CadnaA® noise model and the calculation algorithms set out in ISO 9613-2:1996. The noise model has assumed the following appropriate assumptions:

- Downwind propagation, i.e. a wind direction that assists the propagation of sound from source to receptor;
- A ground absorption factor of 0.5 (mixed ground);
- A reflection factor of 2; and
- A daytime receptor height of 1.5 m to represent a ground floor (living room) window and a night-time receptor height of 4 m to represent a first floor (bedroom) window.

145 In addition, barrier attenuation from local topography has been incorporated into the CadnaA® noise model using OS '*Terrain 5*' data and the proposed landscape mitigation plan; however, barrier attenuation from man-made structures has not been considered.

146 The specific sound sources associated with the OnTW have been identified and the corresponding sound power levels or sound pressure levels (at a stated distance) are presented in Table 10.23 below. The sound sources relate to the external components of the Onshore Substation only – components within the Static VAR Compensator (SVC) building and within the Filter building are not expected to be audible, due to the attenuation provided by the respective building envelopes.

147 The data in Table 10.23 has been based on the proposed layout (Figure 5.9 in *Chapter 5: Description of Development*). It should be noted however that the layout and design of the Onshore Substation is not yet finalised and is therefore indicative only at this stage. The layout and design will be subject to a further planning application should PPP be granted. The location of and the number of components identified within Table 10.23 below will therefore be finalised through the design process. As such, the assessment has been based on currently available sound level information associated with similar installations.

Table 10.23: Specific Sound Sources

Specific Sound Source	Sound Power Level (L_w) or Sound Pressure Level (L_p)	Number of Each
Shunt Reactors – Tanks* (SHR1, SHR2, SHR3 & SHR4)	L_w = 72 dB(A) **	4
Shunt Reactors – Coolers (SHR1, SHR2, SHR3 & SHR4)	L_w = 84 dB(A)	4
Transformers – Tanks* (SGT1 & SGT2)	L_w = 75 dB(A) **	2
Transformers – Coolers (SGT1 & SGT2)	L_w = 87 dB(A)	2
MSR Reactor 1; MSR Reactor 2	L_p = 65 dB(A) at 2m	3 reactors per circuit (6 in total)
SVC Phase Reactors (Reactor 1 & Reactor 2)	L_p = 62 dB(A) at 2m	2
SVC Coolers	L_p = 90 dB(A)	2
SVCPLUS Building – Air Conditioning (various)	L_p = 47 dB(A) at 10m L_p = 51 dB(A) at 10m	1 7
Filter Building – Air Handling Units	L_w = 85 dB(A)	6
SVC Control Building – Condenser Units (various)	L_w = 76 dB(A) L_w = 81 dB(A) L_w = 62 dB(A)	5 3 1
*Attenuation (20 dB) provided to these sound sources by acoustic enclosures **Sound power level after attenuation provided by acoustic enclosures		

148 The specific sound levels, due to the operation of the OnTW, have been predicted at the closest NSRs using the CadnaA® noise model and are shown in Table 10.24 below (rounded to the nearest dB). These predicted sound levels are representative of the worst case, whereby it has been assumed that all the identified sound sources are operating simultaneously and continuously, and on a 24/7 basis. These are therefore the maximum noise levels expected during operation of the OnTW.

Table 10.24: Predicted Operational Sound Levels, dB

NSR ID	NSR Name	Assessment Period	Predicted Sound Level, L_{Aeq}
NSR01	No. 1 & 2 Edinburgh Road	Daytime	28
		Night-time	28
NSR02	West Harbour Road	Daytime	25
		Night-time	26
NSR03	Cockenzie House & Gardens	Daytime	23
		Night-time	24
NSR04	Hawthorn Terrace	Daytime	29
		Night-time	29
NSR05	The Antiquaries	Daytime	24
		Night-time	25
NSR06	Atholl View	Daytime	16
		Night-time	19
NSR07	Appin Drive	Daytime	23
		Night-time	25
NSR08	Hawthorn Bank	Daytime	26
		Night-time	26

149 The acoustic character of each specific sound source, and the resulting sound penalty that would apply in accordance with BS4142:2014, is detailed in Table 10.25 below.

Table 10.25: Acoustic Characteristics of Specific Sound Sources

Specific Sound Source	Tonal Sound	Impulsive Sound	Intermittent Sound	Other Sound	Comment
Shunt Reactors – Tanks	Yes = 2 dB	No	No	No	At NSRs within 100 m (none identified), tones may be clearly perceptible (4 dB penalty), whilst at NSRs further afield, tones may be just perceptible (2 dB penalty). Reactors would run continuously.
Shunt Reactors – Coolers	No	No	No	No	Reactors would run continuously.
Transformers – Tanks	Yes = 2 dB	No	No	No	At NSRs within 100 m (none identified), tones may be clearly perceptible (4 dB penalty), whilst at NSRs further afield, tones may be just perceptible (2 dB penalty). Transformers would run continuously.
Transformers – Coolers	No	No	No	No	Transformers would run continuously.
MSR Reactors	No	No	No	No	Reactors would run continuously.
SVC Phase Reactors	Possibly = 2 dB	No	No	No	At NSRs within 100 m (none identified), tones may be clearly perceptible (4 dB penalty), whilst at NSRs further afield, tones may be just perceptible (2 dB penalty). Reactors would run continuously.
SVC Coolers	No	No	Yes = 3 dB	No	On/off conditions, corresponding to maximum and minimum temperature settings.

Specific Sound Source	Tonal Sound	Impulsive Sound	Intermittent Sound	Other Sound	Comment
SVCPLUS Building – Air Conditioning	Possibly = 2 dB	No	Yes = 3 dB	No	At NSRs within 100 m (none identified), tones may be clearly perceptible (4 dB penalty), whilst at NSRs further afield, tones may be just perceptible (2 dB penalty). On/off conditions, corresponding to maximum and minimum temperature settings.
Filter Building – Air Handling Units	Possibly = 2 dB	No	Yes = 3 dB	No	At NSRs within 100 m (none identified), tones may be clearly perceptible (4 dB penalty), whilst at NSRs further afield, tones may be just perceptible (2 dB penalty). On/off conditions, corresponding to maximum and minimum temperature settings.
SVC Control Building – Condenser Units	Possibly = 2 dB	No	Yes = 3 dB	No	At NSRs within 100 m (none identified), tones may be clearly perceptible (4 dB penalty), whilst at NSRs further afield, tones may be just perceptible (2 dB penalty). On/off conditions, corresponding to maximum and minimum temperature settings.

150 Based on the data presented in Table 10.25 above, a penalty of +5 dB is applicable to the predicted specific sound level at the closest NSRs in order to derive the corresponding rating levels.

151 The predicted rating levels have been compared to the measured background sound levels and assessed in accordance with BS4142:2014. The results of this assessment are shown in Table 10.26 below, where the predicted rating levels and the background sound levels have been rounded to the nearest dB.

Table 10.26: BS4142:2014 Assessment

NSR ID	NSR Name	Assessment Period	Predicted Rating Level, dB $L_{Ar,T}$ *	Background Sound Level, dB L_{A90}	Difference, dB
NSR01	No. 1 & 2 Edinburgh Road	Daytime	33	52	-19
		Night-time	33	35	-2
NSR02	West Harbour Road	Daytime	30	47	-17
		Night-time	31	36	-5
NSR03	Cockenzie House & Gardens	Daytime	28	47	-19
		Night-time	29	36	-7
NSR04	Hawthorn Terrace	Daytime	34	41	-7
		Night-time	34	29	+5
NSR05	The Antiquaries	Daytime	29	52	-23
		Night-time	30	30	0
NSR06	Atholl View	Daytime	21	34	-13
		Night-time	24	26	-2
NSR07	Appin Drive	Daytime	28	42	-14
		Night-time	30	26	+4
NSR08	Hawthorn Bank	Daytime	31	52	-21
		Night-time	31	35	-4
* Predicted specific sound level (as per Table 10.24 above), plus a BS4142:2014 penalty of +5 dB					

152 It can be seen from Table 10.26 above, that the daytime and night-time rating level at the closest NSRs is predicted to be below the corresponding background sound level at the majority of receptors. Where the rating levels are above the background sound level (at night-time at NSR04 (Hawthorn Terrace) and NSR07 (Appin Drive)), this is predicted to be no more than +5 dB.

153 For daytime, and as per Table 10.14, this results in no impact for the majority of receptors where the predicted rating level is more than 10 dB below the background sound level. For daytime operations, the sensitivity of the receptors is defined as high, resulting in no significant effect as per Table 10.16. For NSR04 during the daytime, a negligible impact is predicted whereby the predicted rating level is between 0 and 9.9 dB below the background sound level. The sensitivity of this receptor is also defined as high for the daytime period, resulting in a negligible significant effect.

154 For the majority of receptors at night-time, and as per Table 10.14, there is negligible impact. This corresponds to a predicted rating level which is between 0 and 9.9 dB below the background sound level. For night-time, the sensitivity of the receptors is very high resulting in a negligible significant effect.

155 For NSR04 and NSR07 at night-time, a minor impact is predicted whereby the rating level is +5 dB and +4 dB above the background sound level respectively. For night-time, the sensitivity of the receptors is defined as very high, resulting in a minor significant effect.

156 BS4142:2014 states that *"the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact"* and that *"a difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context"*.

157 With respect to context, BS4142:2014 goes on to state that *"where background sound level and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background"* and that *"this is especially true at night"*.

158 This is applicable here, as both the night-time background sound level and the predicted night-time rating level (particularly at NSR04 and NSR07) are considered to be low. In this context, an absolute noise limit is considered more appropriate and is in line with the recommendations of BS4142:2014.

159 In all cases, the predicted daytime and night-time rating level is below 35 dB L_{Aeq}. This is comfortably below 40 dB ($L_{night,outside}$), which is an external night-time noise limit recommended by the WHO within their *Night Noise Guidelines for Europe*. This limit is considered a *"health-based limit value"*, whereby the WHO states that *"the population should not be exposed to night noise levels greater than 40 dB $L_{night,outside}$ during the part of the night when most people are in bed"*.

160 Therefore, with regards to the highest (external) predicted rating level of 34 dB L_{Aeq} (at Hawthorn Terrace), this is unlikely to be significant in the context of absolute night-time noise limits as recommended by the WHO.

161 Furthermore (assuming 15 dB attenuation through a partially open window[6]), it can be concluded that the resulting internal daytime and night-time noise levels would be comfortably below the BS8233:2014 recommended noise limits of 35 dB and 30 dB L_{Aeq} respectively.

162 The 1999 WHO guidelines also refer to an internal night-time noise limit of 30 dB L_{Aeq}, in the context of night-time exposure to noise and sleep disturbance. The guidelines state that *"if negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dB(A) indoors for continuous noise"*. Again, it can be concluded that this recommended internal night-time noise limit would be achieved, based on the predicted values (rating levels) in Table 10.26 above.

163 With reference to maximum (or peak) noise levels associated with the operation of the Onshore Substation, Table 10.26 above presents the highest ambient noise levels expected and these correspond to all Onshore Substation components operating simultaneously and continuously. The operation of the Onshore Substation is not anticipated to generate 'one-off' or 'individual' noise events, and as such, the associated noise levels are likely to be constant.

164 Ultimately, it should be noted that the predicted rating levels represent the worst case, whereby all sound sources associated with the Onshore Substation are operating simultaneously and continuously. These are therefore the maximum noise levels predicted for the operation of the OnTW.

165 The predicted specific sound levels (L_{Aeq}) have been (logarithmically) added to the existing (measured) ambient noise levels (L_{Aeq}). This has been undertaken to determine the change (if any) in existing daytime and night-time noise levels as a result of operational sound, and is detailed in Table 10.27 below.

Table 10.27: Operational Sound – Change to Existing Ambient Noise Levels, L_{Aeq}

NSR ID	NSR Name	Assessment Period	Predicted Specific Sound Level, dB L_{Aeq}	Existing Ambient Noise Level, dB L_{Aeq}	Cumulative Noise Level, dB L_{Aeq}	Change to Existing Ambient Noise Level, dB
NSR01	No.1 & 2 Edinburgh Road	Daytime	28	68	68	0
		Night-time	28	54	54	0
NSR02	West Harbour Road	Daytime	25	51	51	0
		Night-time	26	42	42	0
NSR03		Daytime	23	51	51	0

[6] BS8233:2014, Annex G.1, *"if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB"*.

NSR ID	NSR Name	Assessment Period	Predicted Specific Sound Level, dB L_{Aeq}	Existing Ambient Noise Level, dB L_{Aeq}	Cumulative Noise Level, dB L_{Aeq}	Change to Existing Ambient Noise Level, dB
	Cockenzie House & Gardens	Night-time	24	42	42	0
NSR04	Hawthorn Terrace	Daytime	29	46	46	0
		Night-time	29	34	35	+1
NSR05	The Antiquaries	Daytime	24	60	60	0
		Night-time	25	51	51	0
NSR06	Atholl View	Daytime	16	46	46	0
		Night-time	19	44	44	0
NSR07	Appin Drive	Daytime	23	46	46	0
		Night-time	25	44	44	0
NSR08	Hawthorn Bank	Daytime	26	68	68	0
		Night-time	26	54	54	0

166 As per Table 10.27 above, it is shown that there would be no change to the existing ambient noise levels, L_{Aeq}, at the closest receptors, with the exception of a predicted increase at Hawthorn Terrace (NSR04) during the night-time period.

167 As per Table 10.14, no change to the ambient noise (L_{Aeq}) results in no impact. For the daytime period, the sensitivity of the receptors is high and as per Table 10.16, this results in no significant effect. This is also the case for the night-time period, where the sensitivity of the receptors is defined as very high.

168 For NSR04 at night-time, and as per Table 10.14, there is a minor impact whereby the predicted change to the ambient noise level is between 0.1 and 5.4 dB. For the night-time period, the sensitivity of the receptor is very high and as per Table 10.16, this results in a minor significant effect.

169 However, as per PAN 1/2011, *"a change of 3 dB is the minimum perceptible under normal conditions"* and the predicted cumulative ambient noise level of 35 dB L_{Aeq} at NSR04 is comfortably below the threshold of 40 dB $L_{night,outside}$ as recommended by the WHO. The

resulting internal night-time noise level is therefore likely to achieve the target limit of 30 dB $L_{Aeq,8hr}$ as recommended by BS8233:2014.

10.8.3 Effects of Decommissioning

170 It has been assumed that potential impacts associated with the decommissioning phase of the Onshore Substation would be similar to, and no worse than, those presented for the overall construction phase.

10.9 Cumulative Impact Assessment

10.9.1 Cumulative with Other Projects

171 A significant development project in the vicinity of the OnTW is the new settlement at Blindwells. In accordance with the East Lothian Local Plan 2008, this new residential-led development is to consist of approximately 1,600 homes – with a further expansion area earmarked for the future. As this development predominantly consists of residential properties, it is considered as *'noise-sensitive'* rather than *'noise-generating'*[7], and therefore would not have significant noise sources associated with its operation with the potential to affect the receptors within the study area for the OnTW.

172 In the same respect, and due to this development being *'noise-sensitive'*, the operation of the OnTW would not have a significant impact on the new residential properties. These properties at Blindwells would be located further from the OnTW than the closest receptors assessed herein. It has been demonstrated that for receptors closest to the OnTW, no significant impact has been predicted due the operation of the Onshore Substation; as such, it follows that it would also be the case at residential properties located further away, as noise decreases with increased distance from a source.

173 This is also the case for land at Longniddry South, which is allocated for *"a settlement expansion of circa 450 homes plus associated employment development, a small local centre, community facilities and infrastructure"* [8]. This development is also a residential-led development and as such is considered as *'noise-sensitive'* rather than *'noise-generating'*.

174 With regards to noise, vibration and traffic associated with construction activities, it is unlikely that the OnTW, the Blindwells and Longniddry South developments would be constructed at the same time. As a result, cumulative noise levels associated with the construction and operation of the OnTW, the Blindwells and Longniddry developments are not expected to be significant.

175 As per *Chapter 11: Traffic and Transport*, the timetables to gain planning consent, construct and occupy the developments at Blindwells and Longniddry South do not align with the timescales of the OnTW. In addition, and with respect to Longniddry South, this is a site allocation only and as such, there is no guarantee that the development will come forward.

[7] As per Chapter 2 of the TAN to PAN 1/2011
[8] www.longniddrydevelopment.com

176 In terms of *'noise-generating'* cumulative developments, the following project has been identified via the East Lothian planning portal:

- 17/00465/P – Change of use of former gas holder site to car wash facilities, erection of two storage containers, covered area and associated works for a temporary period of one year.

177 This development is for land at the former gas holder site on the B1348 (Edinburgh Road) which is located opposite the Application Site. The car wash was granted consent and is for temporary use.

178 With respect to the consented car wash at the former gas holder site, the decision notice states that ELC's Environmental Health Manager raised *"no objection to the proposed development, being satisfied that the car wash facility would not harm the privacy or amenity of any nearby land use or residential property in the locality"*.

179 There was no noise impact assessment undertaken for this development and as such, the level of noise associated with the facility is unknown. Therefore, the resulting cumulative impacts with the operation of the Onshore Substation cannot be quantified. Notwithstanding this, it is noted that the car wash facility is a temporary consent, for a period of one year only; therefore, based on the anticipated timescales for consent associated with the OnTW, it is not likely that the car wash facility and the Onshore Substation would be operational at the same time.

180 There are no other known noise-generating developments with the potential to significantly affect cumulative noise levels in the vicinity of the OnTW.

10.10 Impact Interactions

181 There is the potential for short term interactive effects to arise due to additional traffic movements associated with the construction of the OnTW. The assessment of noise impacts is therefore dependent on the results of the Traffic and Transport assessment, which quantifies the number of vehicle movements during the construction phase. However, the potential effects of this impact interaction are not considered to be significant, whereby the total increase in traffic flows is predicted to be less than 25 per cent resulting in increases to existing noise levels of less than 1 dB.

10.11 Conclusion and Residual Effects – Onshore Transmission Works

Table 10.28: Summary of effects before and with additional mitigation

Impact	Receptor	Effect (including embedded mitigation)	Additional Mitigation	Residual Effect (including additional mitigation)
Construction Noise – Daytime	All	Predicted construction noise levels are below an adopted daytime limit of 70 dB L_{Aeq}. No effect.	None required over adoption of best practicable means and good practice measures during construction.	No effect.
Construction Noise – Night-time	All	Predicted construction noise levels are below an adopted night-time limit of 45 dB L_{Aeq}. No effect.	None required over adoption of best practicable means and good practice measures during construction.	No effect.
Construction Vibration	All	It is unlikely that the proposed construction methods would give rise to significant vibration impacts at the closest receptors.	None required over the adoption of best practicable means and good practice measures during construction.	No effect.
Construction Traffic	All	Changes to the existing noise levels would be less than 1 dB, as per the guidance of DMRB. Negligible effect.	None required.	Negligible effect.
Operational Noise – Daytime	All	Predicted operational noise levels are below the daytime background sound level. Negligible effect.	None required over Embedded Mitigation.	Negligible effect.
Operational Noise – Night-time	All	Predicted operational noise levels are no more than 5 dB above background noise levels. Minor effect.	None required over Embedded Mitigation.	Minor effect.

Impact	Receptor	Effect (including embedded mitigation)	Additional Mitigation	Residual Effect (including additional mitigation)
Cumulative Noise	All	No cumulative noise effects associated with the construction and operation of the Onshore Substation. No effect.	None required.	No effect.

References

British Standards Institute (2014). BS5228-1:2009+A1:2014, *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise*

British Standards Institute (2014). BS5228-1:2009+A1:2014 (Annex C), *Current Sound Level Data on Site Equipment and Site Activities*

British Standards Institute (2014). BS5228-2:2009+A1:2014, *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration*

British Standards Institute (2014). BS4142:2014, *Methods for rating industrial and commercial sound*

British Standards Institute (2014). BS8233:2014, *Guidance on sound insulation and noise reduction for buildings*

British Standards Institute (2008). British Standard BS6472-1:2008, *Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*

British Standards Institute (1993). British Standard BS7385-2:1993, *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration*

Directive 2002/49/EC of the European Parliament and of the Council, of 25 June 2002, relating to the assessment and management of environmental noise

International Organisation for Standardisation (ISO) (1996). ISO 9613-2, *Acoustics – Attenuation of Sound during Propagation Outdoors: Part 2 – General Method of Calculation*

Scottish Statutory Instruments (2006 No.465). Environmental Protection, *The Environmental Noise (Scotland) Regulations 2006*

Scottish Government (2011). Planning Advice Note (PAN) 1/2011, *Planning and Noise* and the associated *Technical Advice Note* (TAN)

The Institute of Environmental Management and Assessment (IEMA) (2014). *Guidelines for Environmental Noise Impact Assessment*

The Institute of Environmental Management and Assessment (IEMA) (2014). *Guidelines for Environmental Noise Impact Assessment*

Transport Scotland (2011). *Design Manual for Roads and Bridges* (DMRB), Volume 11, Section 3, Part 7 (HD 213/11 – Revision 1), *Noise and Vibration*

World Health Organisation (1999). *Guidelines for Community Noise*

World Health Organisation (2009). *Night Noise Guidelines for Europe*