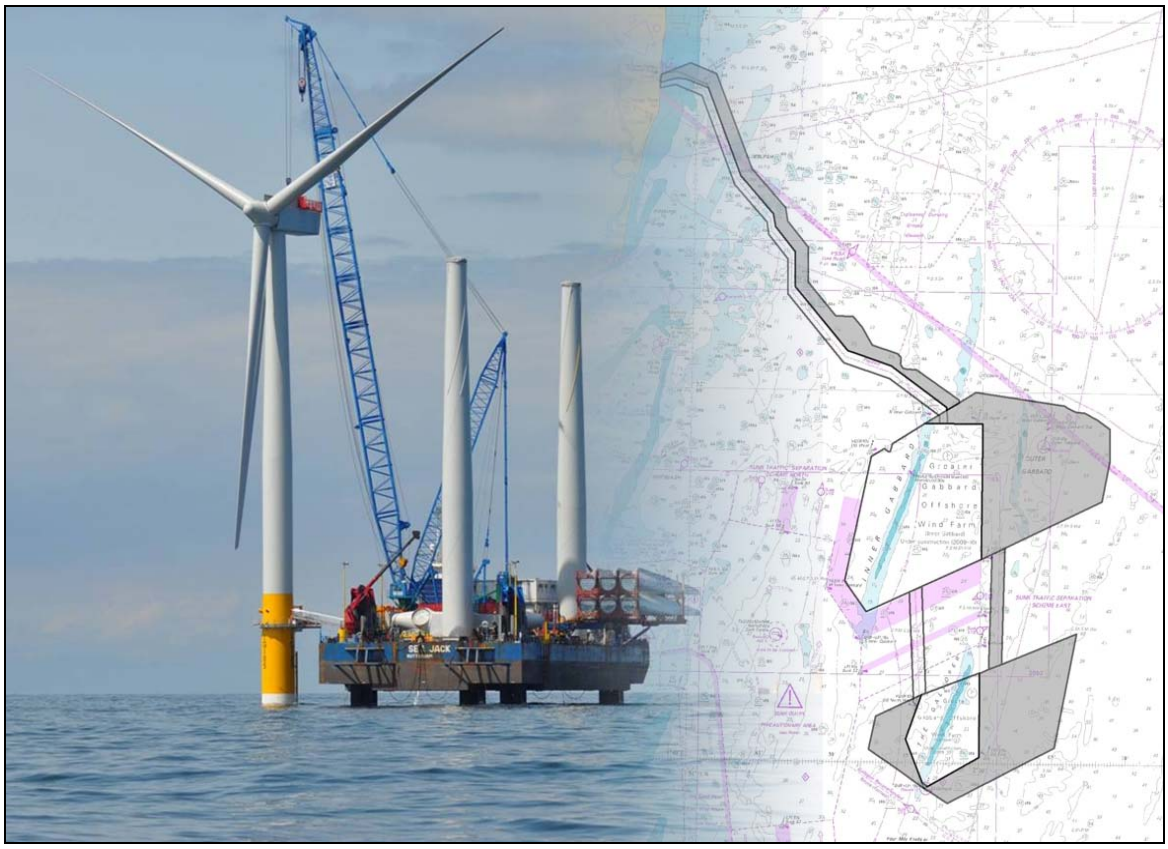

Galloper Wind Farm Project

Environmental Statement – Chapter 26: Noise

October 2011

Document Reference – 5.2.26

Galloper Wind Farm Limited

RWE npower renewables

SSE Renewables

ROYAL HASKONING Enhancing Society

Document title	Galloper Wind Farm Project Environmental Statement – Chapter 26: Noise
Document short title	Galloper Wind Farm ES
Document Reference	5.2.26
Regulation Reference	APFP Regulations, 5(2)(a)
Version	8
Status	Final Report
Date	October 2011
Project name	Galloper Wind Farm Project
Client	Galloper Wind Farm Limited
Royal Haskoning Reference	9V3083/R01/303424/Exet

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Date/initials approval		KH	01.11.2011

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26 NOISE

26.1 Introduction

26.1.1 This Chapter of the Environmental Statement (ES) assesses the potential noise and vibration impacts of the onshore electrical connection for Galloper Wind Farm (GWF) on nearby residences. This assessment includes noise and vibration impacts, for the construction (including construction traffic as well as construction plant), operation, and decommissioning phases of the development.

26.1.2 Subsea noise and vibration impacts associated with the construction, operation and de-commissioning of the wind turbines is discussed within **Chapter 13 Fish and shellfish** and **Chapter 14 Marine Mammal**s. Given the separation distance of the offshore development and the nearest onshore receptors (approximately 27km) an assessment of air borne noise associated with all phases of the offshore development has not been undertaken.

26.1.3 Potential noise impacts upon terrestrial ecology receptors are discussed within **Chapter 23 Terrestrial Ecology**.

26.2 Guidance and Consultation

National policy

26.2.1 National Policy Statements (NPS) provide the primary basis on which the Infrastructure Planning Commission (IPC) is required to make its decisions. In preparing this chapter the following NPS were reviewed:

- Overarching National Policy Statement (NPS) for Energy (EN-1) DECC, 2011a);
- NPS for Electricity Network Infrastructure (EN-5) (DECC, 2011b).

26.2.2 The specific assessment requirements for noise, as detailed within the NPSs, are repeated in the following paragraphs. The assessment requirements suggested within the NPSs have been applied to this assessment and where appropriate the specific sections of this Chapter that address the issues are indicated. Where any part of the NPS guidance has not been followed within this assessment, it is stated after the NPS text and a justification provided.

26.2.3 EN-1 sets out national policy for energy infrastructure. In relation to the noise and vibration, Sections 5.11.4 to 5.11.7 of the NPS state that, "*where noise impacts are likely to arise, the applicant should include:*

- *a description of the noise generating aspects of the development proposal leading to noise impacts including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise* (see **Sections 26.6** and **26.7**)*;*

- *identification of noise sensitive premises and noise sensitive areas that may be affected* (see **Section 26.4**)*;*
- *The characteristics of the existing noise environment* (see **Section 26.4**)*;*
- *A prediction of how the noise environment will change with the proposed development* (see **Section 26.6** and **26.7**)*;*
- *In the shorter term such as during the construction period* (see **Section 26.6**)*;*
- *In the longer term during the operating life of the infrastructure* (see **Section 26.7**)*;*
- *At particular times of the day, evening and night as appropriate* (see **Section 26.6** and **26.7**)*;*
- *An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas* (see **Section 26.6** and **26.7**)*; and*
- *Measures to be employed in mitigating noise* (see **Section 26.6** and **26.7**)*.*

26.2.4 The NPS also states that *"The nature and extent of the noise assessment should be proportionate to the likely noise impact"* and *"The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered"*

Increased road traffic is considered within **Section 26.6***.*

26.2.5 *"Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. Further information on assessment of particular noise sources may be contained in the technology-specific NPSs. In particular, for renewables (EN-3) and electricity networks (EN-5) there is assessment guidance for specific features of those technologies. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies"*

Details of the noise assessment methodology are contained within **Section 26.3***.*

26.2.6 *"The applicant should consult EA and Natural England (NE), or the Countryside Council for Wales (CCW), as necessary and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological*

assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account"

Details of potential noise impacts upon protected species are considered separately within **Chapters 13**, **14** and **23**.

26.2.7 EN-5 is the primary decision-making guidance document for nationally significant electricity network infrastructure in England and Wales. In relation to the assessment of noise, Sections 2.9.8 and 2.9.9 of EN-5 state:

26.2.8 "*While standard methods of assessment and interpretation using the principles of the relevant British Standards are satisfactory for dry weather conditions, they are not appropriate for assessing noise during rain, which is when overhead line noise mostly occurs, and when the background noise itself will vary according to the intensity of the rain*.

26.2.9 *Therefore an alternative noise assessment method to deal with rain-induced noise is needed, such as the one developed by National Grid as described in report TR(T)94,199319. This follows recommendations broadly outlined in ISO 1996 (BS 7445:1991)20 and in that respect is consistent with BS 4142:1997. The IPC is likely to be able to regard it as acceptable for the applicant to use this or another methodology that appropriately addresses these particular issues*."

Given their very minor extent, and their connection to more extensive existing lines, an assessment of the noise from the proposed lines associated with GWF has not been undertaken. This assessment therefore focuses on construction noise and noise associated with the operational GWF substation.

Local policy

26.2.10 NPS EN-1 notes that the IPC may also consider Development Plan Documents or other documents in the Local Development Framework. On this basis the following local policies were reviewed, but given less weight in their influence on the assessment process:

The Suffolk Coastal Local Development Framework Draft Core Strategy and Strategy Development Policies (Suffolk Coastal District Council, 2010)

26.2.11 Development Management Policy 23 sets out that Council will have regard to the noise and disturbance impacts of new development on residential amenity and that *'development will only be acceptable where it would not cause an unacceptable loss of amenity to adjoining or future occupiers of the development.'*

Standards and guidance

26.2.12 The following international, national standards and guidance documents were considered in preparing this Chapter:

- British Standard (BS) 5228:2008 "Noise and vibration control on construction and open sites", BSI 2009;
- Advisory Leaflet (AL) 72 (Department of the Environment (DoE), 1976
- International Standards Organisation (ISO) 9613: Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO, 1996);
- Calculation of Road Traffic Noise (CRTN), Department of Transport (Welsh Office) 1988;
- British Standard 4142 'Method for rating industrial noise affecting mixed residential and industrial areas'; and
- Design Manual for Road and Bridges (DMRB), Volume 11, Section 3, Part 7: Noise and Vibration (Highways Agency, February, 2011).

Consultation

26.2.13 As part of ongoing consultation, key stakeholders were invited to respond to a scoping document produced as part of the EIA process (GWFL, 2010). **Table 26.1** summarises issues that were highlighted by the consultees in the IPC Scoping Opinion (IPC, 2010) and indicates which sections of the assessment address each issue.

26.2.14 Further consultation was undertaken through formal Section 42 consultation under the Planning Act 2008 (see **Chapter 7 Consultation**) via the submission of a Preliminary Environmental Report (PER). Community consultation under Section 47 was also carried out in parallel with the Section 42/48 statutory consultation. **Table 21.1** summarises issues that were highlighted throughout the consultation period.

26.2.15 Full details of responses received are presented in the IPC Scoping Opinion report (IPC, 2010) and the Consultation Report that accompanies the Development Consent Order (DCO) for this application.

Table 26.1 Summary of consultation and issues

Date	Consultee	Summary of issue	Section where addressed
August 2010	IPC (Scoping Opinion)	Operational noise on fish and shellfish is not scoped out	Considered separately in Chapter 13
August	JNCC	Disturbance as a result of	Considered separately in

Date	Consultee	Summary of issue	Section where addressed
2010	(Scoping Opinion)	noise and vibration [on marine mammals] should be assessed.	Chapter 14
August 2010	JNCC (Scoping Opinion)	Impacts from noise and vibration on marine life should be assessed including during the operational phase of the proposed development.	Considered separately in Chapters 13 and 14
August 2010	JNCC (Scoping Opinion)	There is potential for [noise] impacts especially during the construction phase and decommissioning phases both on and offshore from both traffic and plant.	Potential for traffic related noise impacts for onshore ecological receptors are considered within Chapter 23 and noise impacts upon offshore ecological receptors are considered within Chapters 13 and 14
August 2010	IPC (Scoping Opinion)	The Commission recommends that the methodology and choice of noise receptors for the proposed on-shore development should be agreed with the relevant Environmental Health Department of the District Council and with the EA.	Undertaken and agreed with Suffolk Coastal District Council at meeting on 3 November 2010.
August 2010	IPC (Scoping Opinion)	Information should be provided on the types of vehicles and also on the type of plant to be used during the construction phase. Once operational, noise sources should be identified and measures identified to mitigate noise nuisance.	Provided in Sections 26.6 and 26.7.
August	IPC	Noise impacts on people	Noise impacts on people

Date	Consultee	Summary of issue	Section where addressed
2010	(Scoping Opinion)	should be specifically addressed and particularly any potential noise disturbance at night and other unsocial hours such as weekends and public holidays.	associated with the onshore development, including potential noise disturbance at night, are considered in Sections 26.6 and 26.7. Noise impacts associated with the offshore development will not be experienced onshore (given the distance of separation).
August 2010	IPC (Scoping Opinion)	Noise and vibration levels along the foreshore potentially affecting birds and fish should be also be addressed.	Impacts on ornithology and fish are considered separately in Chapters 11 and 13
August 2010	IPC (Scoping Opinion)	The assessment should take account of the traffic assessment and consider noise and vibration impacts along access routes, especially during the construction phase.	Traffic related noise and vibration during the construction phase is assessed in Section 26.6
November 2010	SCDC	Scope of work and baseline dataset agreed.	The agreed scope and baseline environment are set out in Section 26.3 and 26.4
June 2011	Public Exhibitions (Section 42)	Concern over the construction and operation noise associated with GWF, particularly at the nearest properties.	Construction and operation noise limits have been discussed extensively with SCDC to ensure that the nearest properties are not significantly affected. Noise impacts associated with the onshore development are considered in Sections 26.6 and 26.7.

Date	Consultee	Summary of issue	Section where addressed
July 2011	SCDC (Section 42)	SCDC provide suggested operational noise limits at Rosery Cottages (40dBA), Home Farm (32dBA) and Halfway Cottages (30dBA).	Operational noise limits of 40dB(A) at Rosery Cottages and 33dB(A) at Home Farm and Halfway Cottages were incorporated into the assessment of impact magnitude for operational noise (see Section 26.7) as a result of a subsequent meeting with SCDC in August 2011.
July 2011	SCDC	SCDC stated that a cumulative noise level 3dB higher than that permitted for GGOWF would be accepted in this case. GWFL to ensure reference is made to the cumulative noise from both substations equalling 3dB over the proposed noise limit in the cumulative impact section of the ES	A 3dB increase above that permitted for GGOWF has been adopted as the cumulative noise limits. Impacts are discussed in Section 26.10
July 2011	SCDC (Section 42)	SCDC requested that where residents are likely to be affected by construction noise exceeding 64dB LAeq(1h) they shall be notified at least 24 hours in advance and given an estimate of the duration of this event	The suggested construction noise level where advance notice would be required has been incorporated into the assessment of impact magnitude for construction noise (see Section 26.3). This will be incorporated into the Construction Code of Practice.
August 2011	SCDC	Meeting to discuss outcomes of noise impact modelling, including proposed mitigation landform. During this meeting	Operational noise limits of 40dBA at Rosery Cottages and 33dBA at Home Farm and Halfway Cottages have

Date	Consultee	Summary of issue	Section where addressed
		SCDC agreed that noise limits of 40dBA at Rosery Cottages and 33dBA at Home Farm and Halfway Cottages would be appropriate given the low level of background noise in the area.	been incorporated into the assessment of impact magnitude for operational noise (see Section 26.3).

26.3 Methodology

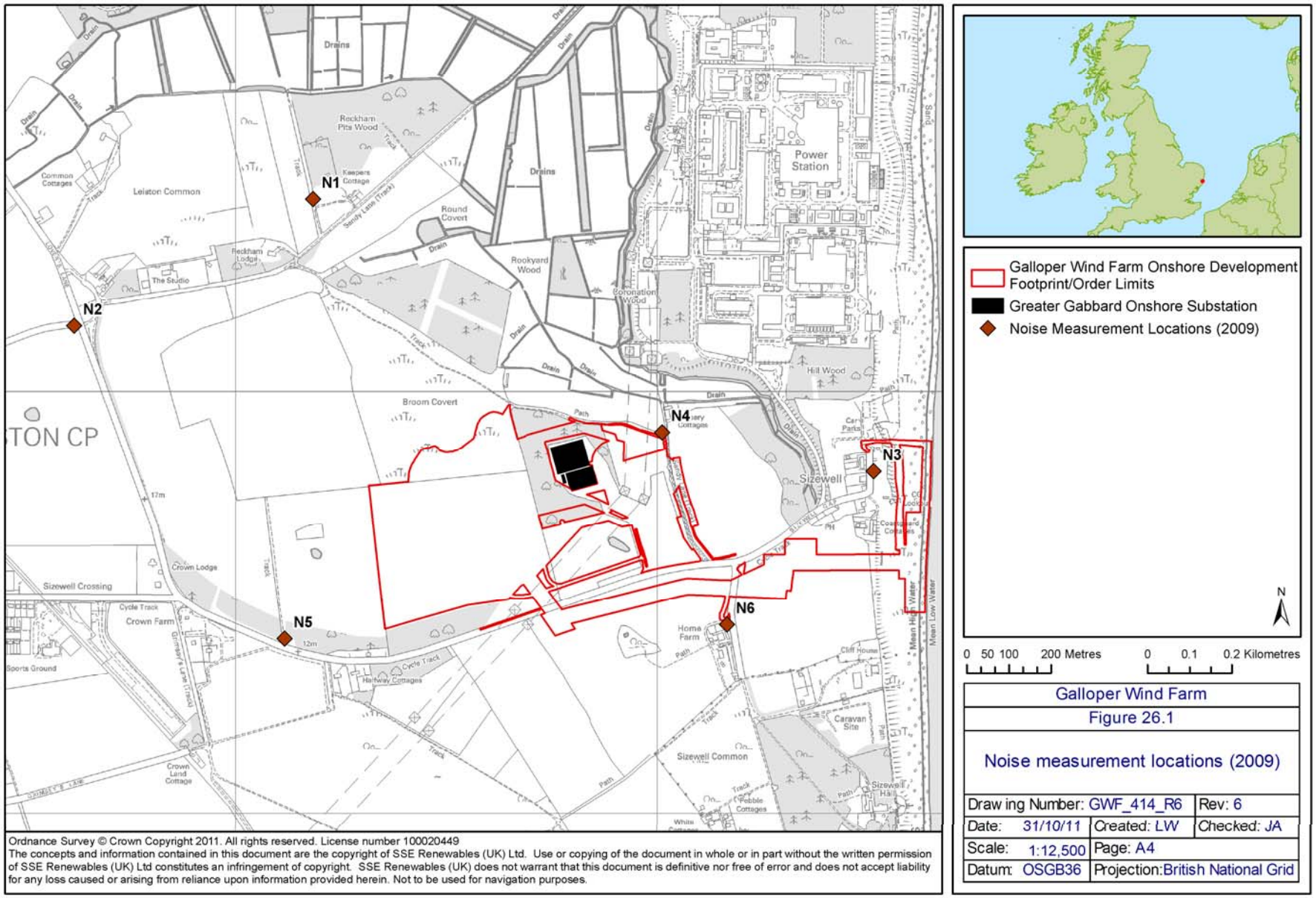
Characterisation of existing environment

26.3.1 The baseline noise data was sourced from the Sizewell B Dry Fuel Store Environmental Statement (British Energy Generation Ltd, 2010) and its suitability to inform the GWF EIA was confirmed with SCDC.

26.3.2 **Table 26.2** includes properties labelled N1 to N5 derived from the Sizewell B Dry Fuel Store Environmental Statement (British Energy Generation Ltd, 2010). These were agreed with SCDC as appropriate receptors for the purposes of conducting the noise impact assessment for GWF. In addition receptor N6 was included, as this location is the closest dwelling to the onshore cable corridor. These locations are also shown on **Figure 26.1**.

Table 26.2 Baseline noise measurement locations

Location	Description	National Grid Reference (NGR)
N1	Near to last house on Sandy Lane, next to Reckham Pitts Wood	YM 46185 63456
N2	At junction of Lovers Lane and Valley Road, opposite Common Farm – 7m from Carriageway	YM 45618 63155
N3	Sizewell village – 10m from Beach Road	YM 47516 62809
N4	Rosery Cottages	YM 47014 62902
N5	Adjacent to Lovers Lane, between Crown Farm and Halfway Cottages – 10m from Carriageway	YM 46118 62412
N6	Home Farm	YM 47150 62432



Galloper Wind Farm		
Figure 26.1		
Noise measurement locations (2009)		
Drawing Number: GWF_414_R6		Rev: 6
Date: 31/10/11	Created: LW	Checked: JA
Scale: 1:12,500	Page: A4	
Datum: OSGB36	Projection: British National Grid	

26.3.3 Noise measurement locations N3 – N5 are the closest to the proposed GWF substation and cable corridor and are the main focus of the impact assessment. As no baseline information is available for N6, the baseline noise data for N4 was used as an indication of the typical ambient noise levels.

26.3.4 The noise measurement survey reported within the Sizewell B Dry Fuel Store ES (British Energy Generation Ltd, 2010) was undertaken on 8th and 9th of September 2009. This comprised both attended and unattended quantitative measurements, supplemented by observations, of the existing noise climate at the five locations.

26.3.5 The monitoring survey was undertaken using the following UKAS calibrated equipment:

- Rion type NL-32 Sound Level Meter (SLM) – S/N 00151045; and
- Bruel & Kjær type 4230 Sound Calibrator – S/N 861172

26.3.6 The survey comprised 15-minute measurements during the day and evening and 5-minute measurements at night following standard methodology set out in British Standard (BS) 7445 '*Description and measurement of environmental noise'*. Multiple measurements were taken at each location to ensure consistency of data gathered. During attended measurements the SLM was mounted on a tripod, between 1.2m and 1.5m above ground and at least 3.5m away from any reflective surface other than the ground (i.e. in free-field conditions). The noise indices measured included the parameters L_{Aeq}, L_{A90}, L_{A10}, and L_{Amax}, which are defined as:

- L_{Aeq} is the equivalent continuous noise level over a given time period;
- L_{Amax} is the maximum noise level measured;
- L_{A10} is the statistical 10th percentile, i.e. it is the level exceeded for 10% of the measurement period. It is generally accepted as a high maximum level and correlates highly with traffic noise levels; and
- L_{A90} is the statistical 90th percentile, i.e. the level exceeded for 90% of the time. It is used as an indicator of the background noise level.

26.3.7 All noise levels were measured with an 'A' weighting applied. The A-weighting is applied to measured sound pressure levels so that these levels correspond more closely to the subjective response.

26.3.8 Both attended and unattended elements of the noise survey were conducted in accordance with the guidance in BS 7445. At the beginning and end of the attended and unattended monitoring periods, the calibration of the SLM was checked using a sound calibrator; no change in calibration level was noted

during the survey. Meteorological conditions during the survey period were dry with low wind speeds, measured with a hand held anemometer at the height of the SLM; average wind speeds were typically below 3 m/s. At location N3 wind speeds were higher, with gusts occasionally exceeding 5 m/s. The background noise levels are set out in Section 26.4.

Assessment of impacts

Onshore construction

26.3.9 The potential onshore construction noise and vibration impacts generated by the GWF development will comprise the following components:

- Onshore construction noise for the GWF substation and sealing end compounds, including earth moving, general construction activities, piling and construction-related traffic;
- Construction activities along the onshore cable corridor, including directional drilling, cable pulling and the onshore transition bays temporary works activities; and
- Cable laying; and the offshore construction of the turbine foundations. The potential subsea noise impacts associated with offshore construction activities are considered within **Chapter 13 Fish and Shellfish Resources** and **Chapter 14 Marine Mammals**.

26.3.10 The method of assessing noise and vibration impacts from construction activities followed the guidance contained in British Standard 5228:2009 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' Parts 1 and 2. BS 5228 Part 1 provides methods for predicting noise levels arising from a construction site, accounting for:

- The type and number of plant and equipment on site;
- The noise rating of identified plant;
- The relative full power operating time (on-time) of plant, as a percentage of the working day/assessment period;
- The distance to receptors;
- The intervening ground type; and
- Acoustic screening by barriers or terrain.

26.3.11 **Table 26.3** provides an assumed equipment list that would be used during the various phases of onshore construction. All source noise levels were derived from the dataset contained in BS 5228.

Table 26.3 Onshore works construction plant

Phase	Plant*	Ref	Source	LAeq @ 10m (dB)	On-time (%)
Site Preparation (including landform)	Dump Truck 25t	C.4.1	12 hour	81	40
	Mobile Crane	C.3.29	12 hour	70	20
	Grader	C.6.31	12 hour	86	20
	Compressor for site cabin	C.4.76	12 hour	61	100
	Tracked excavator	C.4.63	12 hour	77	40
	Hydraulic Piling	C.3.1	12 hour	89	20
Substation works (including sealing end compounds)	Generator	C.4.96	12 hour	77	100
	Mobile Crane	C.3.29	12 hour	70	20
	Concrete pump and cement mixer	C.4.28	12 hour	75	80
	Wheeled loader	C.2.28	12 hour	76	40
	Tracked excavator	C.2.29	12 hour	79	60
Onshore cabling	Lorry	C.6.21	12 hour	80	40
	Tracked excavator	C.2.29	12 hour	79	60
Transition bays	Concrete pump and cement mixer	C.4.28	12 hour	75	80
	Tracked excavator	C.2.29	12 hour	76	60
	Dump truck 25t	C.4.1	12 hour	81	40
HDD works	Directional drill generator	C.4.96	12 hour	77	100
	Tracked excavator	C.2.29	12 hour	76	60
Cable pull	Cable pull generator	C.4.96	24 hour	77	100
	Tracked excavator	C.2.29	12 hour	76	60
Site demobilisation	Mobile Crane	C.3.29	12 hour	70	40
	Lorry	C.6.21	12 hour	80	40

Source BS5228-1:2009, Tables C1 – C6

* Should there be a requirement for 24 hour security lighting during any stages of the works silent generators will be used during unsociable hours.

Construction-related traffic noise impacts

26.3.12 Increased numbers of construction related vehicles could potentially affect noise sensitive receptors adjacent to the proposed construction vehicle route. The relative increase in noise levels due to this additional traffic was calculated using the methods defined in CRTN.

26.3.13 Expected daily construction vehicle numbers and the baseline traffic data, presented as the 18-hour annual average weekday traffic flows (AAWT), are provided in the Transport Assessment carried out for the project and repeated within **Chapter 25 Traffic and Transport**. This data was used to calculate the relative change in noise levels, for 'with' and 'without' construction traffic scenarios for the assumed year 2014 and how receptors adjacent to the road links used as access to the site might be affected.

26.3.14 Due to the nature of the construction work, the number of daily vehicle movements will not be constant throughout the construction period; there will be short periods of intensive activity resulting in peak traffic flows, with lower traffic flows for the remainder of the time. Peak construction traffic flows will be expected to occur during concrete pours for the base of the transformer bays (up to three transformer bays for the GWF compound and up to two for the transmission compound).

26.3.15 Since the level of construction traffic will be variable, with a large difference between the peak and typical daily construction traffic flows the peak (worst case) scenario was assessed. Peak traffic assumes a maximum of 144 lorries visiting the site in a single day during the most intensive of these concrete pours, although this is only be expected to occur on two consecutive days during the construction phase.

26.3.16 Following the methodology contained in DMRB, Volume 11, Section 3, Chapter 3 an initial screening assessment was undertaken to assess whether there were any significant changes in traffic volumes as a result of construction. Any road links with a predicted increase in traffic volume of 25%, or a decrease of 20%, from construction, were identified in the initial part of the assessment. Such changes in traffic volume would correspond to a 1dB(A) change in noise level at the relevant road link. A change in noise level of less than 1dB(A) is regarded as imperceptible and therefore negligible with regard to impact significance. If there are no increases greater than 25% or less than 20%, then the guidance indicates that no further assessment needs to be conducted (Highways Agency, 2011).

26.3.17 Where road links were predicted to have an increase of greater than 25% or less than 20%, a basic noise level (BNL) calculation should be undertaken following the procedure outlined in CRTN. The change in noise level between the baseline noise year (2009) and the construction year (2014) would then be quantified for receptors along the affected road links. The change in noise level then provides an indication for the magnitude, and therefore significance, of any noise impacts.

Construction - vibration impacts

26.3.18 The construction activity with the greatest potential for ground borne vibration is piling. The recommended separation distance between people and piling activities is 100m, and for sensitive properties and piling activities is approximately 30m (Rockhill, Bolton and White, 2003). Due to the large separation distance between the substation site (and sealing end compounds) and the closest receptor (approximately 200m between the sealing end compounds and Rosery Cottages), adverse vibration impacts from on-site construction works are considered unlikely and are not considered further.

26.3.19 With regard to ground-borne vibration from off-site construction traffic, it is not possible to quantitatively predict the potential vibration levels that may arise from this aspect of the construction. This is because the levels of vibration caused would be dependant upon complex site and vehicle specific factors that are difficult to obtain and not currently available. A qualitative assessment of ground-borne vibration impacts has therefore been conducted.

26.3.20 People within dwellings or commercial properties adjacent to the cable corridor, may perceive increased vibration levels due to the increase in HGVs, as ground-borne vibration from vehicles travelling over uneven road surfaces, or as airborne vibration re-radiated through structures due to low frequency noise emissions from the vehicles engine. The Design Manual for Road and Bridges (Volume 11, Section 3, Part 7) *Traffic Noise and Vibration* (Highways Agency UK, 2008) cites research which has shown that:

26.3.21 "*No evidence has been found to support the theory that traffic induced vibrations are a source of significant damage to buildings. Minor cracking of plaster may possibly occur at high exposure sites (i.e. existing heavily trafficked roads with poor surfaces and subgrade conditions) but it is very unlikely that this would be distinguishable from cracking due to other causes. There was no evidence that exposure to airborne vibration had caused even minor damage*."

Operational noise impacts

26.3.22 Operational noise from the substation was assessed in accordance with British Standard 4142:1997 '*Method for Rating industrial noise affecting mixed residential and industrial areas'* which contains relevant guidance on the assessment of noise of an industrial nature and the likelihood of complaints from residents affected by such sources.

26.3.23 The methodology compares industrial noise levels at the noise sensitive receptors with existing background noise levels. A difference of +10dB or more between the existing background level and the industrial noise source indicates that complaints are likely, whereas +5dB difference is considered to be of marginal significance. For differences of less than +5dB, the likelihood

of complaints reduces further, with a difference of -10dB being a positive indication that complaints are unlikely.

26.3.24 BS 4142 states that "*For the purposes of this standard, background noise levels below about 30 dB and [source noise] rating levels below about 35 dB are considered to be very low*" and that, where noise levels are below these stated thresholds, the BS 4142 method is not suitable for assessing impact.

26.3.25 As background noise levels at night were measured to be less than 30dB, specific noise limits were agreed with SCDC for the three closest receptors (Rosery Cottages, Home Farm and Halfway Cottages).

26.3.26 Once commissioned, the substation will operate continuously 24 hours per day. As ambient noise levels are likely to be at their lowest during the night-time, it is at this time that there is the greatest potential for noise from the installation to give rise to disturbance. If it can be demonstrated that noise from the substation does not give rise to disturbance during the night-time, it can be concluded that noise in the daytime should also not cause disturbance, when background noise levels are higher.

Significance of impacts

Receptor sensitivity

26.3.27 To identify the significance of any potential noise and vibration impacts the sensitivity of the receptor has been considered based on the criteria provided within **Table 26.5**.

Table 26.5 Definition of terms relating to the sensitivity of generic receptors

Sensitivity	Definition
High	Hospitals, care homes at night
Medium	Residential accommodation, private gardens, hospitals, care homes, schools, universities, research facilities, national parks, during the day and temporary holiday accommodation at all times
Low	Offices, shops, outdoor amenity areas, long distance footpaths, doctors surgeries, sports facilities places of worship
Negligible	Warehouses, light industry, car parks, agricultural land

Impact magnitude - construction noise

26.3.28 The impact magnitude for construction noise has been derived with consideration to the 'ABC' method contained in BS 5228:2008 and the Advisory Leaflet (AL) 72. The noise levels likely to be experienced at nearby receptors during construction would be temporary and sporadic in nature. The magnitude of impact would be greater than for long-term impacts (i.e. for

operational noise) but much shorter in duration, the definitions for impact magnitude in **Table 26.6** reflects this difference.

26.3.29 Advisory Leaflet (AL) 72 (Department of the Environment (DoE), 1976) suggests that a maximum noise level of 70dB(A) is a suitable limit for noise from construction sites in rural, suburban and urban areas away from main road traffic and industrial noise. Further guidance provided within BS 5228 provides noise increments of 65dBA, 70dBA and 75dBA as appropriate to consider for noise impacts. In this assessment a noise level of 70-75dB(A) has therefore been considered to have a medium impact and noise levels of 75dB(A) or above a high impact.

26.3.30 During consultation on the proposed development the SCDC Environmental Health department has suggested that "*Where residents are likely to be affected by construction noise exceeding 64dB $L_{Aeq(1h)}$ they shall be notified at least 24 hours in advance and given an estimate of the duration of this event*". 65dB(A) $L_{Aeq,12hr}$ has therefore been set as the 'Low' impact threshold in this assessment. The impact magnitudes applied to construction noise for this assessment are shown in **Table 26.6**.

Table 26.6 Impact magnitude for construction noise

Magnitude	Definition
High	>75dB
Medium	70 – 75dB
Low	65 – 70dB
Negligible	Greater than the baseline noise levels but less than 65dB
No change	Equal or less than the baseline situation

Impact magnitude - construction related traffic noise

26.3.31 The construction related traffic noise was calculated in accordance with CRTN and the impact magnitude rated using the criteria for short-term noise impacts contained in the DMRB.

Table 26.7 Impact magnitude for construction related traffic noise

Noise change dB $L_{A10(18hr)}$	Magnitude
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Low
3 – 4.9	Medium
5+	High

Impact magnitude - operational noise

26.3.32 The impact magnitude for the operational noise of the substation was derived from the criteria contained in BS 4142. This method of evaluating noise impacts compares the source noise level (in dB L_{Aeq}) to the background noise level (in dB L_{A90}) at the noise-sensitive property. This impact criterion states that a change in noise levels due to operations of +10dB above the background levels is likely to lead to complaints from the noise-sensitive property, a +5dB increase has a medium likelihood of complaints and -10dB change is an indication that complaints are unlikely. These are shown in **Table 26.8**.

Table 26.8 Operational noise impact magnitude

Impact Magnitude	Difference in Noise Level (dB)
No Change	-10
Negligible	-9.9 – 0
Low	0 – 4.9
Medium	5 – 9.9
High	> 10

26.3.33 BS 4142 states that "*For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low*" and that, where noise levels are below these stated thresholds, the BS 4142 method is not suitable for assessing impact. As the existing night-time noise levels in the area are below 35dB, it has been agreed with SCDC that night-time operational noise limits are appropriate at the nearest receptors to the substation (Rosery Cottage, Home Farm and Halfway Cottages). The limits agreed with SCDC at these locations are as follows:

- 40dBA at Rosery Cottage; and
- 33dBA at Home Farm and Halfway Cottages.

26.3.34 33dBA has therefore been set as the threshold for a low impact due to operational night-time noise at Home Farm and Halfway Cottages, with 40dBA set as the threshold at Rosery Cottages.

Impact significance

26.3.35 Following the identification of receptor sensitivity and impact magnitude, it is possible to calculate the significance of the impact following the criteria in **Table 26.9**.

Table 26.9 Significance of an impact resulting from each combination of receptor sensitivity and the magnitude of the effect upon it

		Sensitivity			
		High	**Medium**	**Low**	**Negligible**
Magnitude	**High**	*Major*	*Major*	*Moderate*	*Minor*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*
	No effect	*No impact*	*No impact*	*No impact*	*No impact*

26.4 Existing Environment

26.4.1 The existing noise climate at noise sensitive properties was established following the procedure described in **Sections 26.3.1** – **26.3.5**. **Table 26.10** presents the summarised daytime and night time noise levels from the baseline survey. The equivalent continuous level (L_{Aeq}) and the 90th and 10th percentile ($L_{A90,}$ and L_{A10}) measurements are averaged over the measurement period, with the maximum L_{Amax} and minimum L_{Amin} noise levels shown for the respective time periods.

Table 26.10 Summarised measured baseline noise levels

Location	Period	L_{Aeq} *(dB)*	L_{A90} *(dB)*	L_{A10} *(dB)*	L_{Amax} *(dB)*	L_{Amin} *(dB)*
N1	Day	40.6	37.7	40.6	60.9	32.4
	Night	34.4	33.5	35.2	48.6	32.0
N2	Day	64.0	41.4	57.6	88.8	35.3
	Night	31.7	28.7	33.7	47.6	25.6
N3	Day	50.4	45.3	50.1	71.4	39.6
	Night	43.9	40.5	45.5	65.1	37.1
N4	Day	45.1	42.5	45.2	67.9	36.9
	Night	40.5	36.4	40.4	54.1	32.1
N5*	Day	62.6	59.0	65.9	82.0	35.7
	Night	26.6	24.6	27.5	47.8	22.4
N6**	Day	45.1	42.5	45.2	67.9	36.9
	Night	40.5	36.4	40.4	54.1	32.1

* Background noise data for N5 is considered to be a suitable dataset for Halfway Cottages given that it is located within 150m and recorded on Sizewell Gap.

** Data from N4 has been used as a proxy dataset for N6 (Coastguard Cottages).

26.4.2 At locations away from the road network (N1 and N4) the noise climate was generally steady and quiet, with contributions from vehicles on distant roads, faint noise from a nearby construction site (location N4) / recycling plant (location N1) and distant broadband plant equipment noise emanating from the direction of Sizewell power station. Additionally, local natural noise sources were observed, such as birds singing and wind rustling nearby vegetation.

26.4.3 At roadside locations (N2, N3 and N5) the dominant noise source was road traffic. This was more significant at locations N2 and N5 where the traffic was more frequent and travelling at a greater speed than traffic on Beach Road in Sizewell village. At locations N2 and N5, no other significant sources of noise were noted during the survey. At location N3 noise contributions also arose from wave noise on the nearby shoreline.

26.4.4 During the night the noise levels dropped significantly, with the greatest difference at the roadside locations as no traffic was recorded on Sizewell Gap or Lover's Lane. At locations N1 and N2 pump noise from a nearby sewage treatment plant was clearly audible and was present throughout the survey. The operation of the sewage treatment plant appeared to be continuous; therefore it was assumed that it forms part of the existing noise climate.

26.4.5 At location N4, the plant equipment noise from the direction of Sizewell power station was more clearly audible at night than during the day, and a faint low frequency noise from the direction of a nearby construction site could be heard but was not identified. This noise was not considered to be of a level high enough to affect the measured noise levels. In Sizewell village, at location N3, sound from waves breaking on the shore made a contribution to the measured noise levels.

26.5 Assessment of Impacts – 'Worst Case' Definition

26.5.1 Full details on the range of flexibility being considered by Galloper Wind Farm Ltd are provided in **Chapter 5 Project Details**. For the purpose of the noise assessment, it has been assumed that construction plant and operational equipment will have the same characteristics and quantity for any of the range of options proposed within **Chapter 5**.

26.5.2 Noise levels generated by the substation have been calculated at the receptors using assumed source noise levels for the substation equipment, based on equivalent equipment specifications at existing substations. The source noise levels used for this study are considered to be a realistic worst case scenario.

26.5.3 Within the onshore development footprint appreciable flexibility is only permitted within the GWF compound, transmission compound and onshore cable corridor. Flexibility within the two compounds applies to equipment / building location and the finished floor level.

26.5.4 For the purpose of noise modelling, equipment associated with both the transmission compound and GWF compound has been located in a typical arrangement based on similar substation design. The arrangement is considered to represent a realistic worst case scenario.

26.5.5 Flexibility within the cable corridor permits the permanent works to lie within a defined overall extent of the temporary works. Since this assessment considers the impact of the entire temporary works, and there is no distinction between that temporary or permanent nature, the flexibility is not relevant to this assessment.

26.5.6 The flexibility in the design of the landform surrounding the GWF compound will include a range in height of the landform between -100mm to +300mm. As the landform will help to attenuate noise from the GWF substation the worst case scenario has been identified as a deviation of -100mm to the landform height.

26.5.7 The finished floor level of the substation will be less than 9m AOD. For this assessment a worse case scenario of 9m AOD has been assumed.

26.5.8 Daytime working (07.00 – 19.00) has been assumed throughout construction. However, some activities, such as the cable pull and concrete pours have the potential to extend beyond these hours for very brief periods (two of the concrete pours at the substation site each lasting 18 hours, and three cable pulls that may require generators to operate for a maximum of 5-7 days for each pull).

26.6 Assessment of Impacts during Construction

Onshore construction noise (daytime working)

26.6.1 The onshore construction will contain static and mobile phases of work. The cable laying activities will be mobile and temporary in nature with regard to the duration the noise that will be experienced at any one receptor. The substation, directional drilling works and cable landfall will be static and any noise impacts generated by these work phases are expected to be longer in duration.

26.6.2 The initial site preparation of the substation will entail enabling works involving earthmoving, vegetation strip and moving/excavating spoil to the boundaries of the substation compound. The substation compound will be leveled and the spoil generated by this process will be used to construct an earth landform around the perimeter of the compound. This earth landform will serve to reduce both noise and visual impacts during the operation of the substation.

26.6.3 The noise levels generated by the construction activities identified in **Table 26.3** were used to calculate the noise levels at the receptor locations. The distances between the sources of noise and the receptor was measured and shown in **Table 26.11**.

26.6.4 The calculated noise levels at each of the receptor locations utilised the method outlined in **Section 26.3**. The calculation has assumed that noise will propagate over approximately 80% soft ground (not rock, concrete, tarmac, etc) between the source and receptor and that all construction activity will take place during normal working hours of Monday to Saturday 0700hrs to 1900hrs, with no work on Sundays. The calculated noise levels for the phases of construction work are shown in **Table 26.12**.

Table 26.11 Source to receptor distances (in metres) at nearest point

Phase	N1	N2	N3	N4	N5	N6
	Property on Sandy Lane	Common Farm	Sizewell Village	Rosery Cottages	Near to Halfway Cottages	Home Farm
Site Preparation	730	1000	760	290	570	475
Substation works*	730	1000	760	290	570	475
Onshore cabling**	730	1000	150	340	600	80
Transition bays	1300	1700	280	360	1130	150
Directional drilling works	1500	1900	150	550	1400	400
Cable pull	1300	1700	150	360	1130	150
Site demobilisation	730	1000	760	290	570	475

* Including the sealing end compounds

** The cabling works are a mobile activity but the closest distance to the receptor was used as a conservative estimate.

Table 26.12 Calculated construction noise levels

Phase	L_{Aeq} (dB) at receptor:					
	N1	N2	N3	N4	N5	N6
Site Preparation	40.4	36.6	40.0	50.9	43.3	45.4
Substation works	31.6	27.9	31.2	42.1	34.5	36.6
Onshore cabling	34.9	31.1	52.5	43.6	37.2	59.2
Transition bays	25.3	21.8	43.3	40.5	27.1	50.0
Directional drilling works	24.7	21.5	51.3	37.0	25.6	40.6
Cable pull	25.3	21.8	51.3	40.5	27.1	50.0

Site demobilization	31.9	28.1	31.5	42.4	34.8	36.9

26.6.5 All the predicted noise levels are beneath the noise level of 65dB L_{Aeq}, for daytime working, corresponding to a low magnitude effect therefore the construction effects on each receptor will either be negligible or there will be no effect. To assess whether a negligible effect is likely the predicted noise levels were then compared to the measured ambient noise levels at the receptor locations. This comparison matrix is shown in **Table 26.13**.

Table 26.13 Construction noise impact matrix

Activity	N1		N2		N3		N4		N5		N6	
	Predicted construction noise - LAeq,10h (dB)	Comparison with existing daytime noise levels (dB)	Predicted construction noise - LAeq,10h (dB)	Comparison with existing daytime noise levels (dB)	Predicted construction noise - LAeq,10h (dB)	Comparison with existing daytime noise levels (dB)	Predicted construction noise - LAeq,10h (dB)	Comparison with existing daytime noise levels (dB)	Predicted construction noise - LAeq,10h (dB)	Comparison with existing daytime noise levels (dB)	Predicted construction noise - LAeq,10h (dB)	Comparison with existing daytime noise levels (dB)
Site Preparation	**40**	-0	**37**	-27	**40**	-10	**51**	+6	**43**	-23	**45**	-5
Substation works	**32**	-9	**28**	-36	**31**	-19	**42**	-3	**35**	-31	**37**	-14
Onshore cabling	**35**	-6	**31**	-33	**53**	**+2**	**44**	-1	**37**	-10	**59**	+9
Transition bays	**25**	-15	**22**	-42	**43**	-7	**40**	-5	**27**	-19	**50**	-0
Directional drilling works	**25**	-16	**21**	-43	**51**	+1	**37**	-8	**26**	-11	**41**	-10
Cable pull	**25**	-16	**22**	-42	**51**	+1	**40**	-5	**27**	-19	**50**	-0
Site demobilisation	**32**	-9	**28**	-36	**31**	-19	**42**	-3	**35**	-31	**37**	-14

26.6.6 Noise levels due to construction are predicted to be higher than the baseline during five elements of the construction work: site preparation works at Rosery Cottages (N4), onshore cabling works at Sizewell village (N3) and Home Farm (N6) and for directional drilling works and the cable pull at Home Farm (N6). However, as all three are predicted to remain below 65dB, this represents an effect of negligible magnitude and an impact of **negligible significance**.

26.6.7 For all other daytime construction works phases there is assessed to be **no effect** associated with construction noise.

26.6.8 The results of the construction noise calculations indicate that residents are not likely to be affected by construction noise levels exceeding 64dB $L_{Aeq(1h)}$ as recommended by SCDC in their response to the PER, dated 13 July 2011.

Mitigation measures and residual impacts

26.6.9 Although the only impacts identified have been assessed as negligible, best practice noise control and management techniques should be carried out during the construction phase. These could include:

- Plant will be located as far away from noise sensitive receptors as is practicable for the particular activity;
- Plant and equipment covers and hatches will be properly secured with no loose fixings causing rattling;
- Equipment will be properly maintained and operated by trained staff;
- Silenced equipment will be used where practicable, in particular silenced power generators if night time power generation is required for site security or lighting;
- Particularly noisy activities or plant will be replaced with quieter alternatives where practicable, for example using pressure-based rather than percussive-based equipment for breaking concrete;
- Vehicles and mobile plant will be well maintained such that loose body fittings or exhausts do not rattle or vibrate;
- Plant machinery will be turned off when not in use;
- Good public relations will be maintained with local residents that may be affected by noise from the construction works. An effective public relations campaign will be put in place, keeping local residents informed of the type and timing of works involved, paying particular attention to potential evening and night time works and activities which may occur in proximity to receptors; and
- Contact details will be provided for a site representative in the event that disturbance due to noise or vibration from the construction works occurs; ensuring that any complaints are dealt with proactively and that subsequent resolutions are communicated to the complainant.

26.6.10 These measures will ensure that construction related noise is further minimised and closer to existing baseline noise.

Onshore construction noise (unsociable hours)

26.6.11 There is the potential for a small number of short-lived construction activities to extend beyond the expected 07.00 – 19.00 working hours. These activities are:

- Substation build – each of the two super-grid transformer bays will require an 18 hour continuous concrete pour. This will result in construction activities (plant movement and generators operating) extending briefly beyond 19.00 on two days during the construction stage (the three pours associated with the GWF transformer bays are not expected to extend beyond normal working hours): and
- Cable pull – each of the three cable pulls is programmed to take place over a maximum of 5-7 days. This activity may require 24 hour security lighting with an associated generator operating throughout during these brief periods.

26.6.12 There are no accepted criteria or standards to assess the impact of construction activities that take place during unsociable hours as it is an activity that should be avoided where practicable. **Table 26.14** presents the calculated noise levels associated with these two activities. It is evident that receptors N3 (Sizewell Village), N4 (Rosery Cottages) and N6 (Home Farm) will potentially experience noise levels significantly higher than background levels should these activities extend beyond accepted daytime working hours.

Table 26.14 Calculated construction noise levels

Phase	L_{Aeq} (dB) at receptor:					
	N1	N2	N3	N4	N5	N6
Background night time noise levels	34.4	31.7	43.9	40.5	26.6	40.5
Substation works	31.6	27.9	31.2	42.1	34.5	36.6
Cable pull	25.3	21.8	51.3	40.5	27.1	50.0

26.6.13 These activities will be very short-lived; however there remains the potential for a **significant short-term adverse impact** at receptors N3 (Sizewell Village) and N6 (Home Farm) during the cable pulls, and at N4 (Rosery Cottages) and N5 (near to Halfway Cottages) during the continuous concrete pours.

Mitigation measures and residual impacts

26.6.14 Best practice noise control and management techniques should be carried out during the construction phase. These could include:

- The timing of these activities will be agreed in advance with SCDC;

- Silenced equipment will be used where possible, in particular silenced power generators if night time power generation is required for site security or lighting;
- Plant machinery will be turned off when not in use;
- Local residents that may be affected by noise from the construction works will be contacted in advance of the works. They will be informed of the type and timing of works involved, paying particular attention to potential evening and night time works and activities which may occur in proximity to receptors; and
- Contact details for a site representative will be provided to local residents who may potentially be affected by construction noise; ensuring that any complaints are dealt with proactively and that subsequent resolutions are communicated to the complainant.

26.6.15 These activities will be very short-lived; however there remains the potential for a **significant short-term adverse residual impact**.

Construction related traffic noise

26.6.16 Baseline traffic data has been utilised to identify whether any road links will have an increase in traffic of 25% as a result of the GWF construction (refer to **Table 26.15)**

26.6.17 Road link 19 - Galloper Wind Farm entrance, as presented in **Chapter 25 Traffic and Transport**, has not been included in the assessment. This is because the entrance route has no immediately adjacent noise sensitive receptors and the increases in traffic for receptors adjacent to Lovers Lane have already been accounted for (links 18 and 20).

Table 26.15 Change in road links - baseline vs. construction year

Link Ref	Link	2014 Baseline	2014* Construction	% change
		AAWT**(18h)	AAWT(18h)	AAWT(18h)
1	B1125 Blythburgh Road (N of Dunwich Road)	2403	2403	0%
2	B1122 Abbey Road (Lover Lane - Potters Street)	1864	2086	11.9%
3	Lover's Lane (Valley Road - Abbey Road)	862	1064	23.4%
4	King George Avenue (Lover Lane - B1122)	1234	1342	8.8%
5	Lover's Lane (E of King George Avenue)	1792	2132	19.0%
6	Aldeburgh Road (N of B1353)	5215	5313	1.9%
7	B1069 Snape Road	5536	5634	1.8%

Link Ref	Link	2014 Baseline	2014* Construction	% change
		AAWT**(18h)	AAWT(18h)	AAWT(18h)
	(N j/w A1094)			
8	B1069 Snape Road (N j/w B1069)	2946	2946	0%
9	A1094 Farnham Road (j/w Church Road)	7178	7276	1.4%
10	B1119 Church Hill (Grove Road / Church Road)	3193	3213	0.6%
11	A12 Main Road (B1121 / B1122)	11778	12000	1.9%
12	B1122 Middleton Road (A12 - Littlemoor Road)	3152	3374	7.1%
13	Lover's Lane (E of Abbey Road)	835	1027	23.0%
14	B1122 Abbey Road (south of Lover's Lane)	1304	1314	0.8%
15	Sizewell Gap (west of Sizewell entrance)	1638	1638	0%
16	Sizewell Entrance	1598	1598	0%
17	Sizewell Gap (east of Sizewell entrance)	41	41	0%
18	Lover's Lane (west of GWF entrance)	1791	2131	19.0%
20	Lover's Lane (east of GWF entrance)	1638	1638	0%

* Assumed worst case scenario that the substation build would occur over a 12 month period

** AAWT: 18-hour annual average weekday traffic flow

26.6.18 Based on the CTRN methodology, as there are no predicted traffic increases greater than 25% or less than 20%, no further assessment of potential noise impacts was conducted. Any change in noise level is predicted to be less than 1dB(A) and is regarded as imperceptible and therefore an effect of negligible magnitude and of **negligible** significance.

Mitigation measures and residual impacts

26.6.19 Although impacts have been assessed as negligible, best practice noise control and management techniques should be carried out during the construction phase. These will include:

- Ensuring that vehicles and mobile plant are well maintained such that loose body fittings or exhausts do not rattle or vibrate;
- Ensuring that vehicles do not park or queue for long periods outside residential properties with engines running unnecessarily;
- Maintaining good public relations with local residents that may be affected by noise from the construction works. An effective public relations campaign will be put in place, keeping local residents

informed of the type and timing of works involved, paying particular attention to potential evening and night time works and activities which may occur in close proximity to receptors. Leaflet drops, posters and public meetings or exhibitions are an effective method of keeping local residents informed; and

- Provision of contact details for a site representative in the event that disturbance due to noise or vibration from the construction works occurs; ensuring that any complaints are dealt with pro-actively and that subsequent resolutions are communicated to the complainant.

26.6.20 Implementation of the measures outlined above will ensure that the impacts remain as **negligible**.

26.7 Assessment of Impacts during Operation

26.7.1 The magnitude of the operational impacts of the substation was calculated using the procedure outlined in ISO 9613-1, incorporating distance attenuation, ground absorption, atmospheric absorption and any intervening barriers or screening. The calculation also defaults to a positive wind vector component from the source to receiver (i.e. assuming a mild wind blowing from the source to each receptor location).

26.7.2 Operational substation noise was modelled using SoundPlan noise modelling software, which directly implements the calculation methods outlined in ISO 9613-1 and other nationally and internationally recognised acoustic standards.

26.7.3 The proposed GWF compound will house up to three transformers bays along with associated reactors and cooling fans. The transmission compound will house up to two Super Grid Transformers along with associated reactors and cooling fans. The exact specification of the substation equipment is yet to be finalised, therefore noise data for these items has been based on existing installations and information from suppliers.

26.7.4 Expected maximum noise levels associated with this equipment are presented in **Table 26.16** and **26.17**. These list the most prominent noise producing equipment expected for the GWF compound and the transmission compound.

Table 26.16 Expected maximum noise levels for GWF compound equipment

Item	Number	Sound Power Level (L_w dB)
25MVA Reactors	6	87
2 x 17.5 MVA Statcom – Cooling	3	90

Item	Number	Sound Power Level (L_w dB)
fans		
90MVA Transformer	3	90
50MVA Reactors	6	90
35 MVA Harmonic Filter	3	90

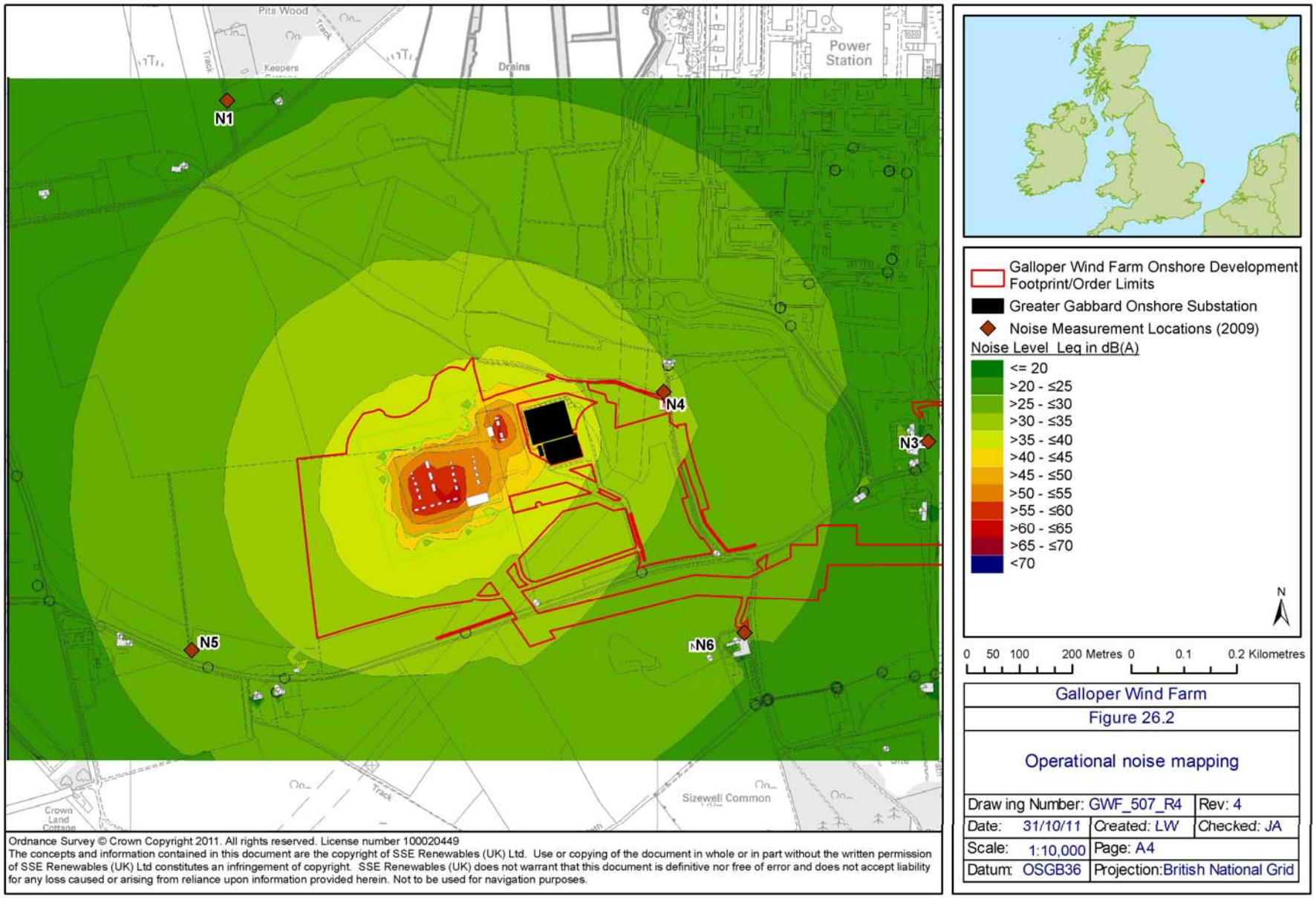
Table 26.17 Expected maximum noise levels for transmission compound equipment

Item	Number	Sound Power Level (L_w dB)
Super Grid Transformers	2	91
Cooling bank	2	87

26.7.5 The noise level predictions have assumed the following:

- All substation equipment will be operating continuously;
- Equipment noise levels are as shown in **Table 26.16** and **26.17**;
- The intervening ground between source and receptor is soft ground;
- The floor level of the substation is 9 metres AOD;
- An earth landform will surround the substation compound with a crest height of approximately 15-17m AOD along the southern boundary, approximately 15-16m AOD to the west and 13-16m AOD to the northern boundary and
- The calculated noise levels are free-field noise levels, with no corrections for facades or barrier effects.

26.7.6 **Figure 26.2** presents a noise contour plot showing the modelled operational noise from the substation.



26.7.7 Noise levels arising from the operation of all substation equipment operating continuously were calculated at the closest receptor locations (Rosery Cottages, Home Farm and Halfway Cottages). The results of these noise calculations were compared to the noise limits outlined in **Sections 26.3**, and presented in **Table 26.18**.

26.7.8 It is anticipated that some of the substation equipment may contain distinct tones at low frequencies, although this cannot be confirmed until the equipment has been selected during the detailed design stage. The calculated noise levels have therefore been compared to the noise limits requested by SCDC both for normal frequency content and with a 5dB reduction for the potential presence of low frequency content.

Table 26.18 Operational noise level predictions

Name	Floor	Aspect	L_{Aeq} *(dB)*	Limit *(dB)*	Diff. *(dB)*	Limit inc. Low Freq. *(dB)*	Diff. *(dB)*
Rosery Cottages	1. Floor	W	29.9	40	-10.1	35	-5.1
Rosery Cottages	2. Floor	W	30.2	40	-9.8	35	-4.8
Rosery Cottages	1. Floor	S	29.8	40	-10.2	35	-5.2
Rosery Cottages	2. Floor	S	30.0	40	-10.0	35	-5.0
Home Farm	1. Floor	N	25.7	33	-7.3	28	-2.3
Home Farm	2. Floor	N	25.8	33	-7.2	28	-2.2
Halfway Cottages	1. Floor	N	27.7	33	-5.3	28	-0.3
Halfway Cottages	2. Floor	N	27.9	33	-5.1	28	-0.1

26.7.9 Noise levels less than 30dB L_{Aeq} are considered to be very low and this level of noise at night is very unlikely to disturb people within a dwelling. The noise level recommended by the World Health Organisation (1999) to avoid sleep disturbance at night is 45dB $L_{Aeq(8h)}$, inside a property, 1 metre from a bedroom window. All noise levels calculated in this assessment satisfy this criterion. Furthermore, a noise level of 30dB L_{Aeq} outside of a property would imply that the noise level inside the dwelling would be approximately 20dB L_{Aeq}, even with windows open for ventilation. This is considered to be a very good standard of internal noise level for resting and sleeping.

26.7.10 The predicted noise levels at normal frequencies generated by the substation equipment are between 5.1dB and 10.2dB beneath the requested noise limits at the three assessment locations specified by SCDC, namely Rosery Cottages, Halfway cottages and Home Farm. This represents an effect of negligible magnitude, which equates to an impact of **negligible significance**.

26.7.11 The predicted noise levels generated by the substation equipment are between 0.1dB and 5.2dB beneath the noise limits including the 5dB reduction for the presence of tonal low frequency content at the three assessment locations. This also represents an effect of negligible magnitude, which equates to an impact of **negligible significance**.

Table 26.19 Operational noise - significance of impacts

Receptor	Impact significance	
	Day	Night
Rosery Cottages	Negligible	Negligible
Halfway Cottages	Negligible	Negligible
Home Farm	Negligible	Negligible

Mitigation measures and residual impacts

26.7.12 No mitigation measures are proposed as the impacts have been assessed as **negligible** and the assessment already incorporates the primary mitigation provided by the earth landform, introduced for visual and noise purposes.

26.8 Assessment of Impacts during Decommissioning

26.8.1 When GWF is decommissioned it will adhere to any future or modified legislation relevant at that time. The specific onshore decommissioning processes are expected to include:

- Export cables between the landfall and the substation site will be disconnected and left in situ;
- Any equipment installed within the onshore transition bays will remain in situ, unless otherwise agreed with the relevant planning authority;
- The above ground substation assets (comprising the GWF compound and the transmission compound) will be dismantled and removed from site;
- The substation foundations will be removed to 1m below ground level; and
- The landform will be retained.

26.8.2 During decommissioning there will be no requirement for activities to extend into unsociable hours, as there will be no requirement for continuous concrete pours or the activities associated with the cable pull. Therefore, decommissioning noise impacts are expected to be no worse than those experienced during daytime construction. As such, the impact of noise related disturbance during the decommissioning of GWF is expected to be of **negligible significance**. Implementing the range of mitigation measures outlined in Section 26.6.19 will ensure that impacts remain negligible during decommissioning,

26.9 Inter-relationships

26.9.1 **Table 26.20** summarises those inter-relationships that are considered of relevance to noise and identifies where within the ES these relationships have been considered.

26.9.2 **Chapter 29 Assessment of Inter-relationships** provides a more detailed holistic overview of the potential impacts that may manifest on noise receptors.

Table 26.20 Noise inter-relationships

Inter-relationship	Section where addressed	Linked Chapter
Influence of construction air quality on local amenity	Section 27.6	Chapter 27 Air quality
Influence of local footpath closures during construction on local amenity	Section 24.6	Chapter 24 Land use, tourism and recreation
Influence of construction traffic on local amenity	Section 25.6	Chapter 25 Traffic and transport

26.10 Cumulative Impacts

26.10.1 No noise impacts have been identified above negligible during the construction (**Section 26.6**), operation (**Section 26.7**), or decommissioning phases (**Section 26.8**) of the GWF project and therefore there are no significant impacts that are expected to result in a cumulative impact with any other planned activities.

26.10.2 The proposed GWF substation and GGOWF substation will be located adjacent to each other within Sizewell Wents. The cumulative noise from both operating substations has the potential to affect receptor locations close to both sites.

26.10.3 Consultation with SCDC identified that a similar noise level reaching a receptor from two separate sources, i.e. both operating substations, is expected to result in a cumulative noise increase of 3dB at those receptors. Following consultation with SCDC, operational noise limits have been set in such a way as to ensure that the cumulative noise from both operating substations will remain at an acceptable level at the nearest receptors. As such, on the basis that GWF and GGOWF achieve their agreed operational noise limits there will not be a cumulative noise impact.

26.10.4 The cumulative noise levels that are predicted at each of the receptors are shown in **Table 26.21**. Operational noise levels for GGOWF have been predicted based on the assumption that GGOWF's specified noise limits are satisfied at the three locations stipulated in their planning consent (Rosery Cottages, Home Farm and a point on Sizewell Gap approximately 75m east of Halfway Cottages).

Table 26.21 Cumulative noise levels (GWF and GGOWF substations both operating) based on GGOWF achieving SCDC prescribed noise limits

Receptor	NGR	GWF	GGOWF	Cumulative Noise
		Predicted Operational Noise	Permitted Operational Noise*	
		(dB L_{Aeq})	(dB L_{Aeq})	(dB L_{Aeq})
Rosery Cottages	YM 47026 62959	30.2	40	40.4
Halfway Cottages	YM 46283 62337	27.9	30.4	32.3
Home Farm	YM 47150 62432	25.8	33.1	33.8

* numbers derived from GGOWF maximum permitted noise limits

26.10.5 The noise level recommended by the World Health Organisation (1999) to avoid sleep disturbance at night is 45dB $L_{Aeq(8h)}$, inside a property, 1 metre from a bedroom window. All cumulative noise levels calculated in this assessment satisfy this criterion.

26.10.6 In addition, it has been agreed with SCDC that provided GWF and GGOWF achieve their agreed operational noise limits there will not be a cumulative noise impact. Therefore, the cumulative noise impact of both GWF and GGOWF substation in operation is predicted to be of **negligible significance**.

26.10.1 It is not anticipated that a mitigation strategy will be required for potential cumulative noise given that levels for GWF are predicted to be below the operational noise limits agreed with SCDC and the assessment inherently includes the primary mitigation provided by the earth landform.

26.11 Summary

26.11.1 **Table 26.22** provides a summary of the predicted impacts associated with the construction, operation and decommissioning of GWF, upon the identified noise receptors.

Table 26.22 Summary

Description of Impact	Impact	Potential Mitigation Measures	Residual impact
Construction Phase			
Construction noise (daytime working).	Negligible	Implementing best practice noise control and management techniques, which include: If noisy plant cannot be located away	Negligible

Description of Impact	Impact	Potential Mitigation Measures	Residual impact
		from sensitive receptors, temporary screening or an enclosure should be provided; Using silenced equipment where possible, in particular silenced power generators if night time power generation is required for site security or lighting; and Ensuring plant machinery is turned off when not in use.	
Construction noise (unsociable hours).	Short-term significant adverse	The timing of these activities will be agreed in advance with SCDC; Silenced equipment will be used where practicable Local residents that may be affected by noise from the construction works will be contacted in advance of the works. Contact details for a site representative will be provided to local residents who may potentially be affected by construction noise.	Short-term significant adverse
Construction traffic related noise	Negligible	Ensuring that vehicles and mobile plant are well maintained such that loose body fittings or exhausts do not rattle or vibrate; Ensuring that vehicles do not park or queue for long periods outside residential properties with engines running unnecessarily; and Ensuring, where practicable, that access routes are in good condition with no pot-holes or other significant surface	Negligible

Description of Impact	Impact	Potential Mitigation Measures	Residual impact
		irregularities.	
Operation Phase			
Operational impacts	Negligible	A mitigating landform surrounding the north, south and western sides of the substation has been incorporated into the design to offer additional noise attenuation.	Negligible
Decommissioning Phase			
Decommissioning impacts	Negligible	As construction	n/a

26.11.2 The substations for the GGOWF scheme and the GWF scheme are located adjacent to each other. The cumulative noise from both operating substations is expected to result in a noise increase of 3dB, associated with a similar noise level reaching a receptor from two separate sources. However, the cumulative effect is expected to be of **negligible significance** at the three nearest receptors (Rosery Cottages, Halfway Cottages and Home Farm).

26.12 References

British Energy Generation Ltd (2010) Sizewell B Dry Fuel Store Environmental Statement

British Nuclear Group (2005) Sizewell A Nuclear Power Station Environmental Statement

The British Standards Institute (1997) British Standard (BS) 4142 '*Method for rating industrial noise affecting mixed residential and industrial areas'*

The British Standards Institute (2009) British Standard (BS) 5228:2008 *Noise and vibration control on construction and open sites*

Department of Energy and Climate Change (2011a) Overarching National Policy Statement for Energy (EN-1)

Department of Energy and Climate Change (2011b) National Policy Statement for Electricity Network Infrastructure (EN-5)

Department of the Environment (1976) Advisory Leaflet (AL) 72 *Noise control on building sites*

Department of Transport (Welsh Office) (1988) Calculation of Road Traffic Noise (CRTN)

Highways Agency (2011) *Design Manual for Road and Bridges (DMRB), Volume 11, Section 3, Part 7: Noise and Vibration*

Infrastructure Planning Commission (2010) Scoping Opinion: Proposed Galloper Wind Farm Project

International Standards Organisation (1996) (ISO) 9613: *Attenuation of sound during propagation outdoors – Part 2: General method of calculation*

Rockhill, D.J., Bolton, M.D. and White, D.J. (2003) Ground-borne vibrations due to press-in piling operations. Cambridge University Engineering Department

Suffolk Coastal District Council (2010) *Core Strategy & Development Management Policies Development Plan Document Interim Planning Policy - June 2010*

World Health Organisation (1999) Guidelines for Community Noise