

Wylfa Newydd Project

6.5.6 ES Volume E - Off-Site Power Station

**Facilities: AECC, ESL and MEEG E6 -
Noise and vibration**

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6 Noise and vibration

6.1 Introduction

6.1.1 This chapter describes the assessment of potential noise and vibration effects resulting from the construction, operation and decommissioning of the Off-Site Power Station Facilities.

6.1.2 The chapter excludes noise and vibration effects associated with road traffic. These are considered in the assessment contained within chapter C5 (noise and vibration effects of traffic) (Application Reference Number: 6.3.5) which covers project-wide effects of traffic upon noise and vibration.

6.1.3 Please refer to chapter B6 (noise and vibration) (Application Reference Number: 6.2.6) for the technical basis for the assessment including a summary of legislation, policy and guidance; key points arising in consultation that have guided the noise and vibration assessment; and assessment methodologies and criteria.

6.2 Study area

6.2.1 This section describes the study area(s) relevant to the noise and vibration assessment for the Off-Site Power Station Facilities.

6.2.2 The Off-Site Power Station Facilities comprise the following:

- the Alternative Emergency Control Centre (AECC);
- the Environmental Survey Laboratory (ESL); and
- the Mobile Emergency Equipment Garage (MEEG).

6.2.3 The study area for the assessment of the construction and operation of the Off-Site Power Station Facilities has been identified as a zone measuring approximately 600m from the boundary of the site.

6.2.4 The sensitivity scale set out in chapter B6 (Application Reference Number: 6.2.6) has been adopted to enable the categorisation of noise-sensitive receptors relevant to the construction, operation and decommissioning of the Off-Site Power Station Facilities, and is presented in table E6-1.

Table E6-1 Human receptor sensitivities to noise effects

Sensitivity	Noise-sensitive receptor categories
High	Dwellings, hospitals, schools and hotels
Medium	Places of worship, open-air amenities used for recreation, community facilities and offices
Low	Commercial premises
Negligible	Industrial installations

Identified receptors

6.2.5 The following groups of residential receptors near to the Off-Site Power Station Facilities site have been defined (as shown in figure E6-1 (Application Reference Number: 6.5.27) along with the study area):

- residential properties within 150m of the boundary of the site;
- residential properties approximately 300m southwest of the boundary of the site in Llanfaethlu village;
- outlying residential properties north of the boundary of the site;
- outlying residential properties east of the boundary of the site; and
- outlying residential properties southeast of the boundary of the site.

6.2.6 Other identified receptors are users of the following:

- Llanfaethlu Primary School;
- St Maethlu's Church, Llanfaethlu;
- the Village Hall in Llanfaethlu;
- the playing field in Llanfaethlu;
- Public Rights of Way (PRoWs); and
- buildings used for retail and other commercial premises in and around Llanfaethlu Village.

6.2.7 Residential or non-residential buildings scheduled to be demolished as part of the Off-Site Power Station Facilities development, are not considered to be sensitive receptors.

6.2.8 The Telephone Exchange building and communications mast in Llanfaethlu have been identified as vibration sensitive infrastructure receptors.

6.2.9 The key ecological receptors are described in chapter E9 (terrestrial and freshwater ecology) (Application Reference Number: 6.5.9).

6.2.10 The key heritage receptors are described in chapter E11 (cultural heritage) (Application Reference Number: 6.5.11).

6.3 Baseline environment

6.3.1 This section provides a summary of the baseline conditions for noise and vibration within the study area described in section 6.2.

Noise

6.3.2 Various baseline noise measurement surveys have been completed for the Wylfa Newydd Project. Refer to appendix B6-1 (baseline noise monitoring, Application Reference Number: 6.2.20) for details of the surveys undertaken. A baseline noise measurement survey was undertaken in 2015 at multiple locations for the proposed A5025 Off-line and On-line Highways Improvements, including at locations near to the proposed Off-Site Power Station Facilities site.

6.3.3 Locations of the baseline noise monitoring points in the vicinity of the Off-Site Power Station Facilities are shown in figure E6-1 (Application Reference Number: 6.5.27). Details of the noise monitoring locations and survey duration are presented in table E6-2, whilst the noise monitoring results are summarised in table E6-3.

Table E6-2 Off-Site Power Station Facilities baseline monitoring locations

Survey	Monitoring point reference	Location	Comments
A5025 Off-line and On-line Highway Improvements 2015	R4a	Rhos Mawr Ty	Long-term set up in rear garden of house
	R4b	Bryn Gwyn	Long-term set up in adjacent field (north of house)
	R4c	Layby north of Rhos Mawr Ty	Short-term set up in Layby north of Rhos Ty Mawr

6.3.4 Table E6-3 presents the measured noise levels for the daytime, evening/weekend and night-time periods, used for the construction assessment (based on the time periods described in the example 'ABC' methodology in BS 5228-1:2009+A1:2014 [RD1]) obtained from the two long-term measurement locations (R4a and R4b).

Table E6-3 Baseline noise level – summary of measured $L_{Aeq,T}$ noise levels for use in construction noise assessment

Monitoring point reference	$L_{Aeq,T}$ dB		
	Daytime	Evening and weekends	Night-time
R4a	49	44	41
R4b	49	43	39

6.3.5 Table E6-4 presents the measured background noise levels (L_{A90}) from the three relevant surveys used for the operational noise assessment, which refers to the methodology in BS 4142:2014 [RD2].

Table E6-4 Baseline noise level – summary of measured L_{A90} noise levels for use in operational noise assessment

Monitoring point reference	Average		
	Daytime $L_{A90,16h}$ dB	Night-time $L_{A90,8h}$ dB	Night-time $L_{A90,15}$ min dB
R4a	35	31	-
R4b	32	26	-

Monitoring point reference	Average		
	Daytime $L_{A90,16h}$ dB	Night-time $L_{A90,8h}$ dB	Night-time $L_{A90,15}$ min dB
R4c	-	-	31

Vibration

6.3.6 No significant sources of vibration were identified in the vicinity of the Off-Site Power Station Facilities, and consequently no baseline vibration measurements have been undertaken.

Evolution of the baseline

6.3.7 In the period between the completion of the baseline noise surveys and the commencement of the construction and operation of the Off-Site Power Station Facilities, baseline noise levels (i.e. those that would occur in the absence of the Wylfa Newydd Project) may have changed, or may be likely to change, due to a number of non-project-related factors.

6.3.8 Road traffic flows are likely to increase slightly over time, in common with most areas of the UK, and may also increase due to committed development in the area including Llanfaethlu Primary School. However, an increase of 25% in traffic flow in the short-term (i.e. on opening) would generally be required before an increase in traffic noise is likely to be perceptible. A traffic flow increase of this level is considered to be unlikely to occur between the 2014 baseline survey and completion of construction of the Off-Site Power Station Facilities.

6.4 Design basis and activities

6.4.1 This section sets out the design basis for this assessment of effects. It sets out where any assumptions have been made to enable the assessment to be carried out at this stage in the evolution of the design. This section also identifies the embedded and good practice mitigation that will be adopted to reduce adverse effects as inherent design features or by implementation of standard industry good working practice.

6.4.2 As described in chapter E1 (proposed development) (Application Reference Number: 6.5.1), the application for development consent is based on a parameter approach. The assessment described within this chapter has taken into consideration the flexibility afforded by the parameters. A worst case scenario has therefore been assessed from a noise and vibration perspective within the parameters described in chapter E1 (Application Reference Number: 6.5.1).

Construction

6.4.3 There is a potential for noise effects at existing receptors in the vicinity of the Off-Site Power Station Facilities, due to the various proposed construction activities. These activities include:

- demolition of existing buildings;

- site clearance and groundworks;
- laying grasscrete paving surfaces for emergency car park;
- construction of the Off-Site Power Station Facilities (including the MEEG/AECC building and the ESL building);
- site road surface construction; and
- laying paths and landscaping.

Basis of assessment and assumptions

6.4.4 Noise levels have been calculated for the Off-Site Power Station Facilities construction activities using the CadnaA noise modelling software published by DataKustik GmbH. The CadnaA noise modelling software has been selected for this assessment due to its widespread use and proven track record. The prediction of noise within the CadnaA model aims to represent activity noise levels that could occur within a worst case period as described in appendix B6-2 (Noise and Vibration Modelling and Assessment Methodology Report, Application Reference Number: 6.2.21) for daytime construction activities.

6.4.5 The construction programme would begin with demolition of the existing buildings within the site. Noise modelling of this activity has considered the use of a tracked excavator, an excavator mounted breaker, articulated dump truck and tipper lorry.

6.4.6 Site clearance and groundworks would involve earthworks excavation including topsoil strip to prepare and level the site for construction works. Noise modelling of this activity has considered the use of a tracked excavator, dozer, dumper truck and tipper lorry.

6.4.7 Laying grasscrete and paving surfaces for the emergency car park would involve concrete works and compaction. Noise modelling of this activity has considered the use of a cement mixer truck, vibratory roller, concrete pump, forklift truck and dumper truck.

6.4.8 Construction of the MEEG/AECC building and ESL building would involve continuous flight auger (CFA) piling, pouring of concrete building foundations and erection of the building structures. Noise modelling of this activity has considered the use of a piling rig, mobile crane, tracked excavator, concrete pump and dumper truck.

6.4.9 Site road surface construction, laying paths and landscaping would involve the preparation of sub surfaces, laying of tarmac road surfaces, laying paths and landscaping of the site. Noise modelling of this activity has considered the use of a road planer, vibratory roller, vibratory plate, backhoe loader, circular saw, dumper truck and tipper lorry.

6.4.10 The site works occurring on the A5025 Off-line Highway Improvements road section have not been considered in this chapter. These works are considered in chapter G6 (noise and vibration) (Application Reference Number: 6.7.6).

6.4.11 The potential vibration effects have been considered from all activities. Steady state vibration levels arising from the use of vibratory rollers have been predicted.

6.4.12 The detailed information used for the construction noise and vibration assessments undertaken for the Off-Site Power Station Facilities is presented in appendix E6-1 (Noise Model Inputs and Outputs, Application Reference Number: 6.5.14). This appendix includes details of the construction noise and vibration sources, assumed quantities, as well as emission data and periods of operation. Other model and calculation inputs are also presented.

Embedded mitigation

6.4.13 Embedded mitigation measures included to reduce potential noise and vibration effects during construction are presented below.

6.4.14 The construction site boundary fences would take the form of solid hoarding style fencing with a height of 1.8m, as per the Off-Site Power Station Facilities sub-Code of Construction Practice (CoCP) (Application Reference Number: 8.9).

6.4.15 Standard working will be in accordance with the daytime hours specified by BS 5228-1 [RD1] and contained within the Off-Site Power Station Facilities sub-CoCP (Application Reference Number: 8.9):

- Monday - Friday: 07:00 - 19:00; and
- Saturday: 07:00 - 13:00.
- If construction work is required at these sites outside of these hours, this would be identified and justified in the Section 61 Control of Pollution Act 1974 application to the Isle of Anglesey County Council in advance of the works. The Section 61 Control of Pollution Act 1974 application would also detail the noise control measures to be applied to the works.

Good practice mitigation

6.4.16 The construction of the Off-Site Power Station Facilities would meet the requirements as set out in the noise and vibration management strategies within the Wylfa Newydd CoCP (Application Reference Number: 8.6) and the Off-Site Power Station Facilities sub-CoCP (Application Reference Number: 8.9).

6.4.17 Good practice mitigation includes adopting Best Practicable Means (as defined in section 72 of the Control of Pollution Act 1974). Where practicable, the control measures set out in BS 5228-1 [RD1] section 8 and BS 5228-2 [RD3] section 8 would be implemented. Generic noise and vibration control measures as per the Wylfa Newydd CoCP (Application Reference Number: 8.6) include:

- choice of methodology/technique for operations (including site layout) would be considered in order to eliminate or reduce emissions received at sensitive locations;

- fixed items of construction plant would be electrically powered in preference to diesel or petrol driven;
- where reasonably practicable, plant and/or methods of work causing significant levels of vibration at sensitive premises should be replaced by other less intrusive plant and/or methods of working;
- where reasonably practicable, stationary plant (e.g. generators, pumps, compressors) should be positioned away from connected structures to sensitive premises or isolated using resilient mountings;
- wherever practicable, fabrication would be undertaken off site;
- noisy plant and plant producing high levels of vibration would be kept as far away as possible from sensitive areas;
- equipment would be well-maintained and would be used in the mode of operation that reduces noise;
- equipment would be shut down when not in use or throttled down to a minimum during any waiting periods;
- vehicles and mechanical plant employed for any activity associated with the construction works would be fitted with effective exhaust silencers/suppression equipment;
- plant employed for any activity associated with the construction works would be operated in a manner such that noise and vibration emissions would be controlled and limited as far as reasonably practicable;
- vehicles would not wait or queue on the public highway with engines running (unless the engine was required to power the operation of the vehicle e.g. concrete wagon); and
- all materials would be handled in a manner that would reduce noise.

6.4.18 It should be noted that all works would be carried out under a Prior Consent agreement under Section 61 of the Control of Pollution Act 1974 (s61). Monitoring at locations representative of noise sensitive receptors during construction would ensure noise levels remain within the permitted levels under the s61 approval. The s61 application would set out the thresholds and details of the monitoring programme including monitoring equipment, locations, frequency and duration of measurement and personnel skills required. The proposed monitoring programme is likely to involve a combination of continuous and short-term spot check measurements, and review of these initial results to determine if ongoing monitoring is required, as per the Off-Site Power Station Facilities sub-CoCP (Application Reference Number: 8.9). Actions to be undertaken in the event that monitoring identifies a breach of a threshold are set out in the Wylfa Newydd CoCP (Application Reference Number: 8.6).

Operation

6.4.19 There is potential for noise effects during the operation of the Off-Site Power Station Facilities. These operational effects include noise from fixed plant and vehicle movements within the site premises. It is considered that vibration

levels resulting from the operation of fixed plant of this development will not be significant at any identified receptors in the study area due to the nature of the operations and the appropriate selection of plant.

Basis of assessment and assumptions

6.4.20 Noise levels have been calculated for the Off-Site Power Station Facilities operational activities using the CadnaA noise modelling software. The prediction of noise within the CadnaA model aims to represent activity noise levels that could occur within a worst case period for daytime and night-time operation.

6.4.21 To allow a worst case assessment, the Off-Site Power Station Facilities are considered to support 24 hour per day working, 7 days a week. Emergency operation is not included in the modelled assessment. There is therefore the potential for operational noise effects to arise during both daytime and night-time periods.

6.4.22 Potential operational noise effects may arise from the following noise sources:

- heating, ventilation and air conditioning and other building services fixed plant;
- backup generator;
- kitchen and toilet extract fans;
- the electrical substation;
- vehicle movements of staff cars in and out of the site; and
- training and emergency exercises including movements of emergency vehicles.

6.4.23 Daytime operation has included the modelling of the above noise sources with testing of the backup generator included. Night-time operation has not included testing of the generator.

6.4.24 Indicative emission data has been used to model the noise sources associated with operation of the Off-Site Power Station Facilities.

6.4.25 Considering the transformer design and its relative distance to the closest residential receptor within 150m of the boundary of the site, it would be expected for a tone to be just perceptible at the closest receptor as a worse case. An acoustic feature correction of 2dB has therefore been applied to account for the potential tonality of the transformer. Transformers may cause a noise with a noticeable or discrete note (e.g. a humming sound) which could be described as tonal.

6.4.26 The detailed input information used for the operational noise assessments undertaken for the Off-Site Power Station Facilities are presented in appendix E6-1 (Application Reference Number: 6.5.14). This appendix includes details of the operational noise including numbers, sound emissions data and periods of operation. Other model and calculation inputs are also detailed.

Embedded mitigation

6.4.27 The following embedded mitigation has been identified for inclusion in the design and layout of the operational Off-Site Power Station Facilities.

- The stone walls to the north and east of the site would be retained to provide some noise screening by reducing the likelihood of direct lines of sight between noise sources (e.g. fixed plant and vehicles) and nearby sensitive receptors, as per volume 3 of the Design and Access Statement (Associated Developments and Off-Site Power Station Facilities) (Application Reference Number: 8.2.3).
- Where safety and operational requirements allow, the location of plant and orientation of buildings would screen noise sources from nearby noise-sensitive receptors. The closest residential receptors (to the south of the boundary of the site) would be screened from the fixed plant area and substation by the MEEG/AECC building and ESL building respectively, as per volume 3 of the Design and Access Statement (Application Reference Number: 8.2.3).
- Testing of the emergency mobile generators stored in the MEEG/AECC building would take place at the main Power Station Site, as per the Wylfa Newydd Code of Operational Practice (Application Reference Number: 8.13).

Good practice mitigation

6.4.28 The operation of the Off-Site Power Station Facilities would meet the requirements as set out in the Wylfa Newydd Code of Operational Practice (Application Reference Number: 8.13).

6.4.29 Designing fixed plant, as far as practicable, to reduce day time and night time noises, to meet specified noise levels at nearest receptors. These noise levels would be agreed with the Isle of Anglesey County Council before operation, as per volume 3 of the Design and Access Statement (Application Reference Number: 8.2.3).

Decommissioning

6.4.30 There is potential for noise effects at receptors in the vicinity of the Off-Site Power Station Facilities, due to the proposed decommissioning activity. Decommissioning would involve removal of both the MEEG/AECC building and ESL building and removal of the grasscrete in the southern portion of the site.

Good practice mitigation

6.4.31 The good practice measures for the decommissioning phase would be the same as those good practice measures employed for the construction phase.

6.5 Assessment of effects

6.5.1 This section presents the findings of the assessment of effects associated with the construction, operation and decommissioning of the Off-site Power Station Facilities.

Construction

Effects of noise at residential receptors

6.5.2 Residential receptors are considered to have high sensitivity. Free field noise levels have been calculated for each elevation and for each floor of each residential building within the study area, and for each month of the indicative programme. In order to provide a façade noise level, a +3dB correction has been applied to the model results.

6.5.3 This has enabled the magnitude of change to be established at all residential receptors potentially affected by the Off-Site Power Station Facilities, and given an indication of the worst case duration in months that the effects could occur.

6.5.4 Table E6-5 presents the criteria used to assess the magnitude of change from the construction works associated with the Off-Site Power Station Facilities. Further information on the basis of these magnitude scales is provided in chapter B6 (Application Reference Number: 6.2.6).

Table E6-5 Adopted magnitude scale for construction noise

Magnitude of change	Façade construction noise level $L_{Aeq,T}$ 07:00–19:00 hours Mon to Fri 07:00–13:00 hours Sat	Comments
Large	≥ 75.0	75dB(A) is presented in BS 5228-1 as an example threshold for the determination of noise insulation eligibility.
Medium	70.0 – 74.9	-
Small	65.0 – 69.9	-
Negligible	$< 65.0^*$	65dB(A) is a threshold of significance defined by examples in BS 5228-1 for low ambient noise areas.

* or less than a 3.0dB increase in the pre-existing ambient noise level

6.5.5 The highest predicted free-field noise level on any floor and on any side of a building in any month across the entire Off-Site Power Station Facilities construction works programme has been used for the determination of the likely effects. This approach ensures that a precautionary assessment is carried out and reported.

6.5.6 Appendix E6-1 (Application Reference Number: 6.5.14) shows a month-by-month summary of the magnitudes of change with a sum of the affected residential receptors.

6.5.7 Table E6-6 provides a summary of the total numbers of residential receptors within the study area falling into each effect magnitude category, and an indication of the maximum duration of the likely effects.

Table E6-6 Summary of noise effects at residential receptors (high sensitivity)

Magnitude of change	Noise level from plant and machinery $L_{Aeq,T}$	Significance of effect at residential receptor (high sensitivity)	Approximate number of residential properties affected during day (07:00–19:00)	Maximum number of months that effect occurs
Large	≥ 75.0	Major	3	9
Medium	70.0 – 74.9	Major	5	14
Small	65.0 – 69.9	Moderate	6	14
Negligible	<65.0*	Minor (not significant)	109	21

* or less than a 3.0dB increase in the pre-existing ambient noise level

6.5.8 Of the 123 residential receptors that fall within the 600m study area of the Off-Site Power Station Facilities site, 14 are expected to experience significant effects (either moderate or major). These effects would occur during the day period (07:00–19:00) for a maximum of 14 months.

6.5.9 The residential receptors expected to experience effects of major or moderate significance due to construction activities are all within 150m of the site boundary.

6.5.10 All other residential receptors assessed, including the residential properties in Llanfaethlu village; the outlying residential properties north of the site; the outlying residential properties east of the site and the outlying residential properties southeast of the site, are expected to experience minor (not significant) noise effects.

6.5.11 Table E6-6 presents the likely significant effects at residential receptors based upon the approach of determining and assessing the calculated noise levels likely (and typical) of those occurring during each month; considered to be a likely worst case.

Sensitivity testing

6.5.12 Outside of the requirement (under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009) to identify the likely significant effects, a further series of noise levels have been calculated as part of a sensitivity testing exercise to provide an indication of the higher noise levels which may occur during certain transient phases of the works within any calendar month.

These noise levels correspond to scenarios that assume the activities, which can take place over large areas across the site, are situated and concentrated at the closest practicable locations to the most sensitive receptors simultaneously. In combination with the other worst case and cautious assumptions already applied to the assessment (and described in chapter B6 (Application Reference Number: 6.2.6)) these circumstances are therefore considered to be highly unlikely and, in any case, would only occur for very short periods of time. These values are therefore reported for information only.

6.5.13 Table E6-7 presents a summary of the highest predicted monthly noise level at the residential areas likely to experience significant effects, along with indicative maximum transitory noise levels possible for activities taking place closest to the significantly affected areas for periods less than a month. The table also indicates the difference in levels in parentheses.

Table E6-7 Indicative highest noise levels during transient activities close to significantly affected residential receptors

Residential area likely to experience significant effects	Highest monthly noise level causing significant effect dB $L_{Aeq,T}$	Highest noise level during transient activities close to significantly affected receptors
Residential properties within 150m of the boundary of the site	79.5	81.8 (<2.5)
Residential properties in Llanfaethlu village	59.6	58.9 (<1)
Outlying residential properties north of the boundary of the site	61.2	61.5 (<1)
Outlying residential properties east of the boundary of the site	60.8	60.8 (<1)
Outlying residential properties southeast of the boundary of the site	60.4	60.8 (<1)

6.5.14 The values presented in table E6-7 show that in the areas where significant effects have been identified from likely noise levels during each month, it is possible that the worst case noise levels during short-lived transient activities would be between 0dB and 2.5dB higher.

6.5.15 Figures E6-2, E6-3 and E6-4 (Application Reference Number: 6.5.27) present predicted noise contours for the associated construction scenario that corresponds to the highest predicted monthly noise levels over the entire programme. The contours have been calculated at a height of 4m above ground to represent the worst affected floor of any receptor.

6.5.16 The predicted worst noise levels would occur in month three of the Off-Site Power Station Facilities construction programme when demolition, site clearance and groundworks would be undertaken.

Effects of noise at non-residential receptors

6.5.17 Appendix E6-1 (Application Reference Number: 6.5.14) presents the predicted noise levels at the non-residential receptors identified. The magnitude criteria presented in table E6-5 above has been applied for the assessment of noise at non-residential receptors. The effects of noise at non-residential receptors would occur during the day period (07:00–19:00).

6.5.18 Noise levels at Llanfaethlu Primary School (high sensitivity receptor) are expected to be below 65dB(A) which are minor and therefore not significant.

6.5.19 Noise levels at St Maethlu's Church, Llanfaethlu (medium sensitivity receptor) are expected to be lower than 60dB(A) and therefore of negligible magnitude and thus not significant.

6.5.20 Noise levels at the Village Hall in Llanfaethlu (medium sensitivity receptor) are expected to be lower than 55dB(A), which is a negligible effect. This facility is the only community facility identified within the 600m study area, and is assessed as not significant.

6.5.21 Noise levels at the playing field in Llanfaethlu (which is assumed to be of medium sensitivity) are expected to be lower than 45dB(A), which is a negligible effect. Noise at this recreational facility has been assessed as not significant.

6.5.22 The sensitivity of PRoWs is considered to be lower than that of residential properties, as users are mobile and would experience the noise effects for a matter of minutes rather than several hours or days. There are a number of PRoWs surrounding the Off-Site Power Station Facilities and users would typically be subject to noise levels below 65dB(A). This has been assessed as a negligible effect.

6.5.23 All retail and commercial premises within Llanfaethlu village (low sensitivity receptors) are predicted to experience noise levels less than 55dB(A) which is of negligible magnitude and thus assessed as not significant.

Effects of vibration at residential receptors

6.5.24 Table E6-8 presents both the effect magnitudes and criteria values that have been adopted to assess the magnitude of change from construction vibration. These values have been adopted to jointly cater for the potential effects on building occupants and building damage. In terms of sensitivity, see table E6-1 which is applicable for building occupants. For building structures, a sensitivity value of medium has been assigned when assessing for building damage. The significance of these effects is considered based on the methodology set out in chapter B1 (introduction to the assessment process) (Application Reference Number: 6.2.1).

Table E6-8 Adopted magnitude scale for construction vibration

Magnitude of change	Vibration level threshold (peak particle velocity mm/s)
Large	≥ 10.0
Medium	5.0 - 9.9
Small	1.0-4.9
Negligible	<1.0

Piling at buildings

6.5.25 The piling method proposed for the construction of the Off-Site Power Station Facilities is CFA piling. CFA piling typically generates relatively low levels of vibration compared with other piling techniques such as hammer driven sheet piling.

6.5.26 The closest residential property is approximately 20m from the boundary of the areas where CFA piling would take place. BS 5228-2 [RD3] presents a summary of historic case history on vibration levels measured during rotary bored piling, presenting a peak particle velocity value of 0.54mm/s at a distance of 5m during augering mode. As such, vibration effects associated with CFA piling activities at the Off-Site Power Station Facilities at distance of 5m and beyond from the activity would be expected to be negligible and have not been considered further within this chapter.

Vibratory compaction

6.5.27 The results of predictions of steady state vibration arising from the use of vibratory rollers during the Off-Site Power Station Facilities construction works are presented in table E6-9. The radial distance from the vibratory roller, where free field vibration levels are likely to be equal to the guideline vibration levels, has been determined using the calculation methodology in BS 5228-2 [RD3].

Table E6-9 Assessment of vibratory rollers during steady state operation

Magnitude of change	Vibration level threshold (peak particle velocity mm/s)	Distance from source during steady state operation
Large	≥ 10.0	12m
Medium	5.0-9.9	20m
Small	1.0-4.9	62m
Negligible	<1.0	>62m

6.5.28 Vibratory rollers would be operational during the activities of laying grasscrete paving surfaces and site road surface construction which have combined programme duration of 10 months. Potential effects would therefore only occur during these activities.

6.5.29 It has been identified that two residential properties are between 12m and 20m of the boundary of the areas where vibratory rollers would be operational.

These properties would experience vibration levels between 5.0mm/s and 9.9mm/s, which have been assigned a magnitude of medium and therefore assessed as major significance.

6.5.30 An additional five properties have been identified to lie between 20m and 62m of the boundary of the areas where vibratory rollers would be operational. These properties would experience vibration levels between 1.0mm/s and 5.0mm/s, which would be assigned a magnitude of small and therefore assessed as moderate significance.

Effects of vibration at non-residential receptors

Effects on humans

6.5.31 All medium and low sensitivity non-residential receptors including St Maethlu's Church, Llanfaethlu Village Hall, playing fields in Llanfaethlu and retail and commercial in Llanfaethlu lie beyond 250m from the boundary of the areas where vibratory rollers would be used. These properties would therefore experience vibration levels of less than 1.0mm/s, which would be assigned an effect magnitude of negligible and would not be significant.

6.5.32 Vibratory roller activity would not occur within 20m of nearby PRoWs. PRoW users walking over 20m but less than 62m from vibratory roller activity would experience small magnitudes of change, which would be considered as minor i.e. not significant for these receptors. PRoW users further than 62m from vibratory roller activity would experience negligible magnitudes of effect leading to an assessment of negligible (i.e. not significant) effects.

Effects on building structures

6.5.33 The Telephone Exchange building and communications mast in Llanfaethlu lie beyond 300m from the boundary of the areas where vibratory rollers would be used. These structures would therefore experience vibration levels of less than 1.0mm/s, which would be assigned a magnitude of change of negligible and would not be significant.

6.5.34 The potential sensitivity of any equipment within these building structures would be established through consultation with the relevant stakeholder and any obligated vibration thresholds would not be exceeded.

Operation

Effects of noise at residential receptors

6.5.35 There is potential for noise effects at existing receptors in the vicinity of the proposed Off-Site Power Station Facilities during operation.

6.5.36 There would be a requirement for the Off-Site Power Station Facilities to support 24-hour working, seven days a week, and as such, the operation of building services including fixed plant, and staff vehicle movements would potentially occur throughout the daytime and night-time period.

6.5.37 The activities that are considered in this section include noise generated by:

- heating, ventilation and air conditioning and other building services fixed plant located adjacent to the MEEG/AECC building;
- on-site generator (including testing);
- kitchen and toilet extractor fans for both the MEEG/AECC building and ESL building;
- 600kVA transformer as part of the electrical substation;
- fuel pump;
- vehicle movements of staff cars in and out of the site; and
- emergency scenario and training exercises including movements of emergency vehicles.

6.5.38 The location of the above sources is presented in figure E6-7 (Application Reference Number: 6.5.27).

6.5.39 Indicative noise emission data have been used for a representative worst case assessment. Final selections of fixed plant have not yet been decided and would be specified at a later stage.

6.5.40 Operational activities associated with the Off-Site Power Station Facilities have been assessed using an assessment methodology based upon the method described in BS 4142:2014 [RD2]. For further background on operational assessment methodology and derivation of the criteria, please refer to chapter B6 (Application Reference Number: 6.2.6).

6.5.41 The following tables, E6-10 and E6-11 set out the criteria used for the assessment.

Table E6-10 Operational noise – magnitude of change at residential receptors

Magnitude of change	BS 4142 difference between rating and background noise levels (dB)	Description of impact from BS 4142
Large	≥15	A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
Medium	10–14	A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
Small	5–9	No description in BS 4142, but described as between low and adverse impact for the purpose of this assessment.
Negligible	0–4	Where the rating level marginally exceeds the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
	<0	

6.5.42 To ensure consistency with the assessment methodology described in BS 4142 [RD2], the criteria presented in table E6-10 are used to determine an 'initial estimate' of the noise effect. Further evaluation of this 'initial estimate' is carried out by placing the noise into 'context' enabling the overall significance of the effect to be determined. Further details on this approach are provided in appendix B6-2 (Application Reference Number: 6.2.21).

6.5.43 Residential properties within 150m of the boundary of the site would experience an initial magnitude of change of high with noise level differences greater than 15dB between rating and background noise levels during the day period. These properties are therefore expected to experience major operational noise effects.

6.5.44 Two residential properties within 150m of the boundary of the site would experience an initial magnitude of change of small with noise level differences between 5dB to 10dB between rating and background noise levels during the night period. These properties are therefore expected to experience moderate operational noise effects.

Table E6-11 Guideline values used to inform the context of operational noise levels at residential receptors

Free-field noise level	Description of effect
<50dB $L_{Aeq,16h}$ (07:00–23:00)	Moderate annoyance for community noise in outdoor living areas, from <i>Guidelines for Community Noise</i> [RD4].
<45dB $L_{Aeq,8h}$ (23:00–07:00)	Sleep disturbance with a window open, when measured outside, from <i>Guidelines for Community Noise</i> [RD4].
Annual average of 40dB L_{night}	Lowest observed adverse effect level for night noise. A health-based limit value for protection of 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, from <i>Night Noise Guidelines</i> [RD5].

6.5.45 Figures E6-5 and E6-6 (Application Reference Number: 6.5.27) present the predicted noise contours for the daytime and night-time operational scenarios respectively. The contours have been calculated at a height of 4m above ground to represent the worst affected floor of any receptor.

6.5.46 The initial estimates of the noise effect (as set out in table E6-10) conducted in accordance with BS 4142 [RD2] would indicate that high magnitudes of change are likely as a result of the operational activities at the Off-Site Power Station Facilities. However, existing background sound levels are low (along with the rating sound levels) and BS 4142 [RD2] advises to consider further the context of both the existing and new sound sources. The standard suggests that absolute (or benchmark) noise levels may be as, if not more, important in such circumstances, and as such absolute noise criteria have been considered further. This is provided for in the criteria set out in table E6-10 above.

6.5.47 All other residential properties in the study area are expected to experience noise levels below the absolute criteria stated in table E6-10 i.e. less than 50dB $L_{Aeq,T}$ during the daytime and less than 40dB $L_{Aeq,T}$ during the night-time. As such, the significance of effect at these properties is considered minor (not significant).

6.5.48 During an emergency scenario or training exercise to simulate an emergency response event, it is expected for residential properties to experience higher rating noise levels. However, an emergency scenario is not considered reasonably likely. The frequency of a training simulation would only occur once or twice a year and as such, the significance of the effect is reduced. Nearby residents would be prior warned and informed of any training simulation exercises.

Effects of vibration at residential receptors

6.5.49 Fixed plant within the premises or within buildings are not recognised as sources of high levels of environmental vibration. The effects of operational activities of the Off-Site Power Station Facilities have therefore, not been considered further in this chapter.

Decommissioning

6.5.50 Noise levels arising from the decommissioning activities are not predicted to be worse than those calculated for the construction phase of the Off-Site Power Station Facilities.

6.5.51 Refer to table E6-6 for the summary of noise effects at residential receptors for the construction phase.

6.6 Additional mitigation

6.6.1 In accordance with chapter B1 (Application Reference Number: 6.2.1), embedded and good practice mitigation measures relevant to noise and vibration were taken into account when determining the 'pre-mitigation' significance of effects. These are detailed in the design basis and activities section of this chapter.

6.6.2 Additional mitigation measures would be implemented to address potential significant effects identified in the assessment of effects section. These additional mitigation measures for construction are summarised in table E6-12.

6.6.3 The following additional mitigation measures for the Off-Site Power Station Facilities site have been proposed.

Construction

Table E6-12 Additional mitigation measures – construction

Additional mitigation measures	Objective	Achievement criteria and reporting requirements
<p>Increase the height of the solid site hoarding style fencing, to create up to a 3.6m barrier on the site perimeter. This hoarding would comprise of acoustically reflective materials.</p> <p>Use of temporary mobile barriers for specific plant or activities.</p> <p>Selection of quieter plant.</p> <p>Alteration of working methods.</p> <p>The final measures to be adopted would be determined through an application for prior consent under S61 COPA.</p>	<p>To reduce noise from plant and machinery during daytime construction period, as per the Off-Site Power Station Facilities sub-CoCP (Application Reference Number: 8.9).</p>	<p>Reduce significant effects</p>
<p>Horizon would undertake a vibration risk assessment as part of the s61 application for any construction activity involving vibratory or impact equipment (such as vibratory rollers) to be used at the Off-Site Power Station Facilities. The assessment would establish whether safe working distances are available or alternative equipment and working methods can be adopted to mitigate vibration effects on sensitive receptors.</p>	<p>To reduce vibration levels from construction activities during daytime construction period, as per the Off-Site Power Station Facilities sub-CoCP (Application Reference Number: 8.9).</p>	<p>Reduce significant effects</p>

Operation

6.6.4 Details of operational monitoring would be established as part of the final specification of the equipment and operations at the Off-Site Power Station Facilities. It is anticipated that the eventual monitoring would most likely involve off-site spot check noise surveys at receptors, and some onsite monitoring near particular noise sources at long-term intervals, to be agreed. The following additional mitigation measures for the Off-Site Power Station Facilities site would be implemented during operation, as per the Wylfa Newydd Code of Operational Practice (Application Reference Number: 8.13).

- The combined noise rating level from all fixed plant would be designed to be as quiet as reasonably practicable and no greater than background level (L_{A90}) + 5dB at the nearest residential receptors.
- Testing of the backup generator would be carried out during daytime periods only.
- The use of the fuel pump would be restricted to use during the daytime period only, except during an incident or emergency.

Decommissioning

6.6.5 No specific noise or vibration additional mitigation measures have been recommended in this chapter for decommissioning. Mitigation measures would be similar to those that would be used during the construction phase.

6.7 Residual effects

6.7.1 This section describes the residual effects for noise and vibration having taken into account the embedded, good practice and additional mitigation described above. Table E6-13 provides a summary of significant residual effects identified either prior to or post application of additional mitigation for construction/decommissioning and operation.

6.7.2 No significant adverse effects were identified for vibration during the operational phase.

6.7.3 Additionally, all effects of minor significance or greater identified in the assessment of effects section are summarised in appendix I3-1 (master residual effects table, Application Reference Number: 6.9.8).

6.7.4 Application of the mitigation measures detailed reduces the significance of effects at sensitive receptors. Implementation of a 3.6m high site hoarding would be expected to reduce the noise levels of all construction activities. With the mitigation measures, there remains the potential for moderate and major significant residual effects at eight properties within 150m of the site boundary.

6.7.5 Two residential properties lie within 20m of the boundary where vibratory rollers could operate during construction. These properties would be subject to medium magnitude changes during the activities of laying grasscrete paving surfaces and site road surface construction. Five residential properties lie within 62m of the boundary of vibratory roller activity. These effects can be reduced to small and therefore minor significance with the implementation of exclusion zones to restrict roller usage to further than 62m from occupied residential receptors.

6.7.6 Residential properties within 150m of the site boundary would be expected to experience a high-level magnitude of change and therefore major significance from the operation of the Off-Site Power Station Facilities. This can be remedied through design and specification of the plant associated with the Off-Site Power Station Facilities to not exceed the prescribed noise limit at closest residential receptors. Further mitigation to restrict the use of the fuel pump to the daytime period only would be employed. This would result in an initial small magnitude of change at three receptors within 150m of the site boundary

during the daytime period and an initial small magnitude of change at two receptors during the night-time period.

- 6.7.7 Residential receptors within 150m of the site boundary would be expected to experience specific noise levels of less than 50dB $L_{Aeq,T}$ during the daytime period (07:00–23:00) and less than 40dB $L_{Aeq,T}$ during the night period (23:00–07:00) during operation of the Off-Site Power Station Facilities. Residential receptors within 150m of the site boundary are also subjected to existing road noise. As such, the potential for noise effects and subsequent residual significant effects are therefore considered minor (not significant) due to consideration of the context of the site.
- 6.7.8 For each potentially significant noise and vibration effect, the significance before and after the additional mitigation identified is presented in table E6-13. Effects not considered to be significant before any additional mitigation are not included in table E6-13.

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Table E6-13 Summary of residual effects

Receptor (or group of receptors)	Sensitivity of receptor(s)	Description of potential effect	Nature of effect	Potential magnitude of change	Potential significance of effect	Additional mitigation	Post- mitigation magnitude of change	Significance of residual effect
Construction *() = No. of residential properties								
Residential properties within 150m of the site boundary	High	Increased noise levels due to noise from plant and machinery during daytime periods only. Noise will vary depending on the type and location of activities.	Adverse short-term	Large (3)* Medium (5) Small (6)	Major (8) Moderate (6)	3.6m hoarding to be constructed on site perimeter.	Large (1) Medium (4) Small (3)	Major (5) Moderate (3)
Occupants of two residential properties affected by the use of vibratory rollers within 20m distance	High	Increased vibration levels due to use of vibratory rollers during daytime periods only. Vibration levels will vary depending on the location of the activities.	Adverse short-term	Medium	Moderate adverse	No vibratory rollers to be used unless a vibration risk assessment confirms safe working distances can be employed.	Small	Minor adverse

Receptor (or group of receptors)	Sensitivity of receptor(s)	Description of potential effect	Nature of effect	Potential magnitude of change	Potential significance of effect	Additional mitigation	Post- mitigation magnitude of change	Significance of residual effect
Occupants of five residential properties affected by the use of vibratory rollers within 62m distance	High	Increased vibration levels due to use of vibratory rollers during daytime periods only. Vibration levels will vary depending on the location of the activities.	Adverse short- term	Medium	Moderate adverse	As above.	Small	Minor adverse

Receptor (or group of receptors)	Sensitivity of receptor(s)	Description of potential effect	Nature of effect	Potential magnitude of change	Potential significance of effect	Additional mitigation	Post- mitigation magnitude of change	Significance of residual effect
Operation								
Residential properties within 150m of the site boundary	High	Increased noise levels from the operation of Off-Site Power Station Facilities site from fixed plant and vehicle movements.	Long-term	Large	Major adverse	Details of operational monitoring would be established as part of the final specification. The combined noise rating level from all fixed plant would be no greater than background level (L_{A90}) + 5dB at the nearest residential receptors.	Small	Minor adverse

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6.8 References

Table E6-14 Schedule of references

ID	Reference
RD1	British Standards Institution. 2014. <i>BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 1 Noise</i> . London: British Standards Institution.
RD2	British Standards Institution. 2014. <i>BS 4142:2014 Methods for rating and assessing industrial and commercial sound</i> . London: British Standards Institution.
RD3	British Standards Institution. 2014. <i>BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 2 Vibration</i> . London: British Standards Institution.
RD4	Berglund, B., Lindvall, T. and Schwela, D.H. (eds.) 1999. <i>Guidelines for Community Noise</i> . Geneva: World Health Organization
RD5	Hurtley, C. (ed.) 2009. <i>Night Noise Guidelines for Europe</i> . Copenhagen: World Health Organization for Europe.

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