14 Noise and Vibration

Introduction

14.1 This Section of the Screening and Scoping Report considers the scope of assessment required for noise and vibration from the construction, operation and decommissioning phases of the Proposed Project.

Legislation and Policy

Construction and Decommissioning Phase

14.2 Construction noise and vibration impacts are not covered directly by legislation, however, the Control of Pollution Act (1974) (CoPA, 1974) and Part III of the Environmental Protection Act (EPA), 1990 contain sections which can be applied to construction noise and vibration.

14.3 Under Section 60 of the CoPA a Local Authority can serve a notice on a contractor in order to control construction works. Section 60, Part III of the CoPA refers to the control of noise on construction sites. It provides legislation by which local planning authorities can control noise from construction sites to prevent noise disturbance occurring. In addition, it recommends that guidance provided by British Standard (BS) 5228 be implemented to ensure compliance with Section 60.

14.4 Under Section 61 of the CoPA a contractor can apply for 'prior consent' to carry out construction works, in order to agree in advance with the Local Authority the details of the works and the methods to be employed to minimise noise.

14.5 Under the EPA a Local Authority can serve an abatement notice on a contractor if they consider noise or vibration from construction works to amount to a statutory nuisance. In addition, individuals can also pursue private action under the EPA. The EPA can also be used by the Local Authority, or a member of the public, to take action against industrial or commercial sources of noise affecting residential properties.

14.6 BS 5228 is a two-part standard which comprises:

- BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (British Standards Institution (BSI), 2014a); and
- BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration' (BSI, 2014b).

14.7 The BS provides guidance, information and procedures on the control of noise and vibration from demolition and construction sites. There are no set standards for the definition of the significance of construction noise effects. However, for noise, example criteria are provided in Part 1 (BS Institution, 2014a) Annex E and for vibration, example criteria are provided in Part 2 (BS Institution, 2014b) Annex B. The assessment of whether changes in noise levels due to construction activity constitute significant effects are dependent on the absolute levels of ambient and construction noise, as well as the magnitude, duration, time of occurrence and frequency of the noise change.

14.8 Part 1 of the BS provides basic information and recommendations for methods of noise control relating to construction and open sites where work activities/operations generate significant noise levels. It includes sections on: community relations; noise and persons on site, neighbourhood nuisance; project supervision; and control of noise. However, annexes include: information on legislative background; noise sources, remedies and their effectiveness (mitigation options); current and historic sound level data on site equipment

and site activities; significance of noise effects; calculation procedures estimating sound emissions from sites and sound level monitoring; types of piling; and air overpressure.

14.9 Part 2 of the BS provides basic information and recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels. It includes sections on: community relations; vibration and persons on site; neighbourhood nuisance; project supervision; control of vibration and measurement. BS 5228-2:2009+A1:2014 refers to BS ISO 4866:2010 (BSI, 2010); BS 7385-2:1993 (BSI, 1993); and BS 6472:2008 (Parts 1 and 2) (BSI, 2008a and BS Institution, 2008b) for further advice on the significance of vibration.

Operational Phase

14.10 Planning Policy Wales (PPW) (Welsh Government, 2016) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes. PPW provides the following introduction to national planning policy with regards to noise (and by implication vibration):

'Noise can affect people's health and well-being and have a direct impact on wildlife and local amenity. Noise levels provide an indicator of local environmental quality. The objective of a policy for noise is to minimise emissions and reduce ambient noise levels to an acceptable standard'.

14.11 Technical Advice Note (TAN) 11, Noise Planning Guidance Wales (Welsh Assembly Government,1997) states that Local Planning Authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. In the case of industrial development, for example, the character of the noise should be taken into account as well as its level. Sudden impulses, irregular noise or noise which contains a distinguishable continuous tone would require special consideration.

14.12 BS 4142:2014 Methods for rating and assessing industrial and commercial sound (BSI, 2014). This BS describes the methods for rating and assessing sound of an industrial and/or commercial nature, which includes sound from fixed installations, i.e. mechanical and electrical plant and equipment. The methods described in this BS use outdoor sound levels to assess the likely effects of sound on people residing at dwellings or premises used for residential purposes upon which sound is incident.

14.13 The World Health Organisation (WHO) Guidelines for Community Noise (WHO, 1999) and the WHO Night Noise Guidelines for Europe (WHO, 2009) provide guidance on absolute noise levels suitable for outside amenity spaces, indoor living areas and conditions required for good sleeping conditions that are considered necessary for well-being and good health. The guidance provided in these documents will be considered in relation to this Proposed Project.

Baseline Environment

14.14 Baseline noise measurements will be undertaken as part of the assessment where necessary. However, it is likely that baseline noise levels will be low in the area of the Proposed Project given its rural nature.

14.15 Existing sources of noise will include quarrying, road traffic on major roads such as the A487, activity on the local railway line and at the Minffordd, Penrhyndeudraeth and Llandecwyn rail stations, and local road traffic. Dependent on climatic conditions, there is also potential for corona discharge noise from the existing 4ZC OHL.

14.16 The Area of Search for Permanent and Temporary Works (Area of Search) includes the outer regions of the conurbations of Minffordd and Penrhyndeudraeth to the west and border the rural hamlet area of Cilfor to the east. The western part of the Area of Search borders the

Snowdonia Business Park and the Dwyryd Estuary. There are a number of receptors within and close to the Area of Search which may be affected by noise from the Proposed Project.

14.17 As the existing 4ZC OHL passes close to a number of residential properties and some conurbations, there could be potential noise impacts at these properties from the removal of the existing VIP subsection (pylons, conductors and associated components).

14.18 A consultation document has been prepared and submitted to the Environmental Health Officer (EHO) at Gwynedd Council to agree the noise monitoring strategy. The baseline noise monitoring locations proposed in the consultation document will be used to establish baseline conditions against which potential construction noise impacts and operational noise impacts will be assessed.

14.19 A desktop review of the Area of Search has been carried out which is a mix of rural and residential to the east and more built up residential and commercial to the west. The Area of Search lies within Snowdonia National Park and baseline noise levels around the estuary and rural parts of the Area of Search are expected to be low.

14.20 The western part of the Area of Search borders the Snowdonia Business Park and the Dwyryd Estuary. There are a number of receptors within and close to the Area of Search which may be affected by noise from construction works dependent on the final selected sealing end compound (SEC) and tunnel head house locations.

14.21 For the operational noise assessment baseline surveys will be carried out in the residential areas around the proposed tunnel head house locations. Daytime and night-time baseline monitoring will be required to consider operational noise effects. Night-time typically represents the potential worst-case scenario when baseline noise levels are at their lowest (as traffic and other daytime noise sources reduce at night) and any operational noise would be more noticeable.

14.22 It is proposed to undertake long duration unattended monitoring (five to seven days) at the closest accessible receptor location to each tunnel head house to consider typical daytime and night-time background noise levels (LA90) over a weekday and a weekend. The intention is to place the noise monitoring equipment within the garden of the closest representative residential receptor. In accordance with BS4142, meteorological data will also be recorded during the baseline surveys for considering operational noise.

14.23 Tunnelling activities will be a continuous operation seven days a week (24 hours a day).

14.24 Other construction activities will generally be carried out on weekdays and Saturday 0800-1300, however there may also be a requirement for works to be carried out on Saturdays and Sundays. The ambient noise levels on weekends are expected to be typical of a rural setting, with slightly elevated noise levels.

14.25 For considering construction noise it is therefore proposed that noise monitoring be carried out for four hours at representative locations outside of periods with peak traffic flows. Data collected for the operational noise assessment will also be used to inform the construction noise assessment.

Potential Impacts

Construction and Decommissioning Phase

14.26 During construction, OHL removal and decommissioning, the main noise sources will be use of heavy earth moving plant, they potential use of a helicopter to remove pylons in the marine environment, construction of the temporary pylon and temporary OHL division, foundation works for the temporary pylon, new terminal pylon and SEC at Cilfor (which may include the need for piling works), and movement of construction related vehicles on specific haul roads and the local road infrastructure.

14.27 Activities which can give rise to appreciable vibration include tunnel and shaft construction. Tunnelling techniques vary considerably but known sources of vibration include tunnel boring machines, road-headers and excavators; tunnel segmental lining placement and drill-and-blast operations. Depending on the progress rates and techniques employed, these effects can be relatively short-lived but might expose a sensitive receiver to high magnitudes of vibration.

14.28 The tunnelling works are unlikely to result in significant levels of vibration unless passing directly under or in very close proximity to sensitive receptors. The proposed tunnel depth of 35m on the western side and 85m on the eastern side would indicate that vibration impacts are unlikely, subject to confirmation of the geology of the area.

14.29 Shafts are likely to be constructed by a combination of secant pile walling (embedded retaining wall made of overlapping circular piles), the use of mechanical excavators (using a 360° digger with a breaker) and potentially using the drill and blast technique. Noise and vibration impacts can be mitigated through adopting appropriate techniques and selecting less intrusive methods. Drill and blast techniques are well established to minimise noise and vibration impacts.

14.30 Most of the proposed works on the new SEC, SEC extension, terminal pylon, cable burial and pylon dismantling are unlikely to result in significant levels of vibration, with the exception of any piling works which may be required for foundations of the temporary pylon and new terminal pylon. The requirement for these works is likely to be dependent on the ground conditions at the selected location, and any vibration impacts would be temporary, intermittent and localised in the vicinity of the pylon and dependent on the type of piling undertaken.

14.31 The construction traffic noise assessment would be based upon short term comparisons calculated from traffic data, both with and without construction vehicles. The assessment will take account of total vehicle numbers, the percentage of heavy vehicles that make up the traffic flows, vehicle speeds and road surface type. The significance of noise from construction vehicle movements is determined by the change in existing (baseline) traffic flows compared against traffic flows that include the predicted construction flows.

14.32 The effects of construction traffic on temporary access roads would be assessed in accordance with the methodology for mobile plant and equipment as set out in BS5228 Part 1 (BSI, 2014a).

14.33 Noise and vibration sensitive receptors affected by the construction and decommissioning works may include residential properties close to the works, schools, places of worship and other community facilities, and ecological receptors.

14.34 Any construction noise and vibration effects would be temporary and limited to the duration of nearby construction works.

14.35 The precise locations of the terminal pylon and SEC/ tunnel head houses are subject to environmental and engineering input. However, the areas Area of Search identified that there could be noise and vibration sensitive receptors (particularly residential properties) close to these, or close to access routes required during construction and decommissioning.

14.36 During the removal of the VIP subsection, the major sources of noise will be construction traffic and plant and potentially helicopter noise should this method of removal be used for pylon removal in the marine environment.

14.37 Noise and vibration impacts from the decommissioning phase will be less to those experienced during the construction phase. As discussed in Section 2 (Project Description), unless there was a compelling need the tunnel, shafts and underground cable would not be decommissioned and instead would be maintained to extend their operational life; and hence impacts would be limited to the vicinity of the terminal pylon and SEC.

Operational Phase

14.38 This section considers the potential operational noise impacts of the Proposed Project due to the operation of:

- Underground cabling;
- New SEC;
- Replacement terminal pylon; and
- Two cable tunnel head houses.

Underground Cables

14.39 The tunnel containing the cables will not be a source of noise or vibration when in operation. It is therefore proposed to scope out underground cables from the operational noise and vibration assessment.

Sealing End Compounds (SEC)

14.40 The SEC at Cilfor will form the transition between the cables as they emerge from underground and the OHL wires (conductors). SECs do not vibrate or make noise when in operation. It is therefore proposed to scope out the proposed Cilfor SEC from the operational noise and vibration assessment.

Terminal Pylon

14.41 Terminal pylons and their associated fixtures and fittings do not vibrate in operation and hence it is proposed to scope out operation vibration from the terminal pylon.

14.42 The principal source of noise from most OHLs is a phenomenon known as ‘corona discharge’. Corona discharge is a function of conductor surface electrical stress. For this design of OHL the level of electrical stress is low meaning the OHL may make some noise (usually described as a crackle, a buzz or a hum) primarily depending on weather conditions. For the VIP subsection to be removed this noise source will consequently be removed.

14.43 It is therefore proposed to scope out operational noise from the wires and down droppers associated with the new terminal pylon and SEC.

14.44 The noise characteristic of the existing OHL is also likely to include noise associated with the fixtures and fittings – principally the insulators which hold the wires to the cross arms of the pylons. This noise is most likely to be heard during damp or wet weather as a ‘crackle’ or a ‘buzz’.

14.45 The noise characteristic of the new terminal pylon will be the same as the existing pylons as the fixtures and fittings will be of the same type and design.

14.46 Pylon fittings, such as insulators, dampers, spacers and clamps are designed and procured in accordance with a series of National Grid Technical Specifications. The technical specifications define National Grid functional and performance requirements for new equipment associated with electricity transmission.

14.47 To be approved for use on the National Grid high voltage electricity transmission network, each design must be Type Registered. Type Registration comprises a series of tests on the fitting in question to ensure compliance with the relevant technical specification. These tests include performance requirements to test for the absence of corona and audible noise on all fittings along with wind tunnel testing of insulators for the absence of audible tones generated by Aeolian mechanisms.

14.48 Once a piece of equipment has been type registered and approved for use, a number of further tests are carried out post-manufacture in the form of Sample Testing. This ensures the fitting conforms to the specification in the type registration documentation.

14.49 The Technical Specification and Type Registration processes include tests for the absence of corona discharge and audible noise and reduce the potential for audible noise and tones to occur from all types of fittings, including insulators. Where noise does occur it is likely to be localised and of short duration. If due to a fault appropriate actions can usually be taken to retrospectively remedy or mitigate the noise, usually through cleaning or replacement of the relevant fitting.

14.50 It is therefore proposed to scope out noise from terminal pylon insulators, fixtures and fittings.

Tunnel Head Houses Vibration

14.51 The requirement for tunnel head house ventilation depends on the potential cooling demand of the cable circuits which at the current scoping stage is undetermined. Tunnel head house ventilation plant is not a source of vibration and it is proposed to scope out vibration from the operational assessment.

Tunnel Head House Noise

14.52 Noise from tunnel head houses would be due to the operation of ventilation mechanical services within the head house and would be broadband in nature. The noise level would vary according to the cooling duty and hence design requirements are usually based around meeting statutory limits assuming 'worst case' 100% and 75% of duty. If relevant, the actual operating scenarios considered in the EIA will be selected on the basis of predicted operating regimes which at the current scoping stage are not fully determined.

Proposed Assessment Methodology

Construction and Decommissioning Phase

Construction Noise

14.53 A full list of potentially affected noise and vibration sensitive receptors will be developed, from local knowledge, review of local mapping and liaison with Snowdonia National Park Authority and Gwynedd Council. In addition, these will be reviewed in conjunction with the ecology assessment to ensure that relevant ecological receptors are considered.

14.54 Where necessary and as agreed with Gwynedd Council, baseline sound surveys would be undertaken to ascertain typical existing sound levels. Baseline surveys will be undertaken during typical conditions when the weather conditions meet the guidance set-out in BS7445 Description and Measurement of Environmental Noise (BSI, 2003) and in accordance with the requirements in BS5228 Part 1 (BSI, 2014a).

14.55 Given the semi-rural nature of the Area of Search, it is likely that the construction noise and vibration impacts from much of the Proposed Project will be moderate due to the distance between the works and any sensitive receptors.

14.56 Levels of construction noise will be predicted in accordance with the methodology set out in BS 5228:2009+A1:2014, (Code of practice for noise and vibration control on construction and open sites) (BSI, 2014 a & b) which consists of two parts which provide guidance on the prediction, assessment and control of noise and vibration from construction works.

14.57 This assessment requires details of proposed construction methodologies, plant to be used, operating times, etc. Where these detailed data are not available, an outline assessment

would be completed based on expected construction methods. Should a helicopter be used to remove pylons in the marine environment this will be taken into account in the noise assessment.

14.58 If any works likely to result in significant levels of vibration (such as piling or tunnelling close under sensitive receptors), are likely to be required, vibration impacts will be assessed using data and methodology from BS 5228 Part 2 (BSI, 2014b).

14.59 The effects of construction traffic on the public road network will be assessed in accordance with the Calculation of Road Traffic Noise (CRTN) (Department for Transport and Welsh Office, 1988) and the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part Noise and Vibration (HD 213/11) (The Department for Transport, 2011).

14.60 The effects of construction traffic on temporary access roads would be assessed in accordance with the methodology for mobile plant and equipment as set out in BS 5228 Part 1 (BSI, 2014a).

Ground-borne vibration

14.61 Construction vibration is considered in accordance with BS5228 Part 2: Vibration. BS5228 provides guidance in relation to the effects of construction vibration upon the surroundings. BS 5228-2 Annex B provides guidance on effects of vibration levels on humans in terms of ppv. The guidance is based upon human response to vibration contained within BS6472-1:2008. The assessment criteria based on BS5228-2 are summarised in Table 14.1. The criteria in BS 5228-2 are set for residential buildings. The same criteria have been used for other occupied buildings such as schools or hospitals.

Table 14.1: Vibration effect levels for residential buildings

Vibration Level	Effect	Magnitude
0.14mm.s^{-1}	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Negligible
0.3mm.s^{-1}	Vibration might be just perceptible in residential environments.	Low
1.0mm.s^{-1}	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Medium
10mm.s^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	High

14.62 Vibration sensitive receptors would only experience effects if the vibrations produced by the Project are in close proximity to them. Vibration impacts from the passage of the TBM and a

drill and blast tunnelling method will be assessed using the methodology set out in BS5228 Part 2.

14.63 BS5228 Part 2 sets empirical formulae for predicting vibration. Vibration from tunnelling is predicted using the following formula:

$$Vres = \frac{180}{x^{1.3}}$$

Where x is the distance in metres (m)

14.64 BS5228 Part to refers to guidance in BSISO 4866:2010 Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures and BS7385 Part 2 (1993) Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration set guideline values for building vibrations based on the lowest vibration above which damage has been credibly demonstrated.

14.65 The response of a building to ground-borne vibration is affected by various features of the building such as, the type of foundation, underlying ground conditions, type of building construction, the state of repair, etc. The response also depends upon whether the vibration is continuous or transient/intermittent.

14.66 Most construction activities are not significant sources of ground-borne vibration. Activities such as earth-working, crane activities and concreting would produce relatively low levels of ground borne vibration. Piling activities could produce perceptible levels of vibration, depending on the method used.

14.67 In accordance with BSISO 4866:2010, limits for transient vibration above which cosmetic damage could occur to a light framed structure or a residential building is 15mm/s peak particle velocity (ppv) at 4Hz increasing to 20mm/s at 15Hz. BS7385 also considers that there is little probability of fatigue damage occurring in residential buildings due to construction activities.

14.68 The effects of vibration may give rise to effects on receptors within buildings (i.e. human response to vibration). Predicted vibration during construction is assessed by reference to BS6472-1:2008, which provides guidance on predicting the human response to vibration in buildings over the range 0.5Hz to 80Hz. The way in which people perceive building vibration depends on various factors, including the vibration frequency and direction. Perception thresholds for continuous whole-body vibration vary widely among individuals. BS6472 states that the effect of building vibration on people is assessed by finding the appropriate vibration dose and is best evaluated with the vibration dose value (VDV).

14.69 BS6472 sets out the threshold of vibration for humans together with the levels that are considered acceptable for the time of day and night and for the type of activity or building use.

Operational Phase

14.70 Tunnel head house operational noise will be assessed using the method outlined in BS 4142:2014 (BSI, 2014). Predicted plant rating levels calculated at the facades of sensitive receptors will be compared to a minimum background noise level of 30dB LA90 or that measured at representative locations during the baseline surveys.

14.71 The BS 4142 method will be applied to identify potentially significant adverse effects and will be used to specify appropriate design criteria and noise mitigation for the tunnel head house

equipment to ensure identified sensitive receptors will not be adversely affected by noise emitted from the ventilation plant.

14.72 Baseline surveys will be carried out in the residential areas around the proposed head house locations. A proportionate and appropriate approach will be taken.

14.73 Baseline surveys would be undertaken on both a long term and a short-term attended basis looking to establish noise levels through key parts of the 24hr period, namely morning, typical working daytime, evening and overnight.

14.74 The baseline surveys will be undertaken in accordance with BS7445-1:2003 (BSI, 2003) and BS4142:2014. Monitoring locations representative of sensitive receptors will usually be selected using professional judgement at safely accessible locations beside the public highway, based upon the outcome of the desk-based review to identify receptors. National Grid will discuss the selection of appropriate locations with the relevant Environmental Health Officer (EHO).

14.75 It is proposed to undertake long duration unattended monitoring at the closest accessible receptor location, subject to agreement with the Local Planning Authority and access to secure monitoring locations. In accordance with BS4142, meteorological data will also be recorded during the baseline surveys for considering operational noise.

14.76 Night-time baseline monitoring will be required to consider operational night-time noise effects. This represents the potential worst-case scenario when baseline noise levels are at their lowest (as traffic and other daytime noise sources reduce at night) and any operational noise would be more noticeable.

14.77 For the assessment of significance, it is proposed to assume a minimum night-time noise background of 30dB LA90, except in locations where the survey results confirm this value should be higher.

14.78 Although the tunnel head house ventilation would be in operation depending on cooling demand, the Operational Noise assessment will focus on night-time noise levels when background noise levels are likely to be at their lowest and predicted effects would consequently be greater.

14.79 The predicted effects are calculated at the external façades of sensitive receptors; hence internal noise levels will be even lower due to attenuation across the façade.

14.80 Detailed noise modelling of receptors where the magnitude of impact is likely to be classified as significant will be undertaken using a proprietary noise modelling package, such as SoundPlan.

14.81 Receptors to be considered are listed in Table 14.2 and include dwellings in Minffordd and Cilfor.

Table 14.2: Receptors to be Considered and their Sensitivity

Sensitivity	Receptor description
High	Patients in hospitals/hospices/care homes etc. – defined as a “vulnerable subgroup” with very high or continuous rates of occupancy
Medium	Residential receptors, including residential schools
Low	Area used primarily for leisure activities, including Public Rights of Way, sports facilities and sites of historic/ cultural importance, schools and businesses
Very Low	Other areas such as those used primarily for industrial or agricultural purposes.

14.82 Residential receptors (i.e. including care homes and hospices) listed in Table 14.2 are classified as having high or medium sensitivity. The detailed assessment will consider potential night-time impacts on residential receptors only. As this is considered worst-case, it is not proposed to carry out a daytime assessment on residential receptors, as the significance of effect (see Tables 14.3 and 14.4) will always be less than it is at night. Non-residential receptors in Table 14.2 are classified as having a low or negligible sensitivity. As they are daytime receptors, it is anticipated that these receptors will be screened out of full assessment, as the highest level of significance of effect in accordance with the significance matrices proposed for the assessment (see Tables 14.2 and 14.3) is moderate (and therefore not significant) and the assessment outcomes are likely to be negligible or minor.

Assessment Criteria

14.83 The significance of likely effects arising from operational noise from the Proposed Project will be determined by identifying the magnitude of impact and the sensitivity of the receptor. The magnitude of impact criteria in Table 14.3 are consistent with the criteria presented in BS 4142:2014. The magnitude of impact assessments will be based upon reasonable worst case assumptions. The amount by which thresholds are exceeded, along with duration of effect will be taken into account. The magnitude ratings in the tables below include a certain degree of professional judgement.

Table 14.3: Magnitude of Impact – Operational Noise

Magnitude of Impact	Operational Noise – Tunnel Head House
High	Predicted rating levels are 5dB or more above the higher of existing background noise levels or 30dB
Medium	Predicted rating levels are between 5dB and 0dB above the higher of existing background noise levels or 30dB
Low	Predicted rating levels are between 0dB and 5dB below the higher of existing background noise levels or 30dB
Very Low	Predicted rating noise levels are between 5dB and 10dB below the higher of existing background noise levels or 30dB
No effect	Predicted rating noise levels are 10dB or more below the higher of existing background noise levels or 30dB

Table 14.4: Significance of Effect – Operational Noise

Sensitivity of Receptor	Magnitude of Impact			
	High	**Medium**	**Low**	**Very Low**
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

14.84 It is highly unlikely that significant effects will occur due to operational noise from the Proposed Project.

Proposed Mitigation Measures

Construction and Decommissioning Phase

14.85 Construction noise mitigation will be by means of the application of best practice, as set out in BS 5228. This can be formalised within a Construction Environmental Management Plan (CEMP). This is likely to include agreement of working days and hours, working methods, plant and techniques, and potentially permitted noise levels which construction works should comply with.

14.86 If piling works are required and predicted to result in significant vibration impacts on nearby receptors, consideration should be given to alternative piling methods, where possible, to mitigate these impacts.

14.87 Opportunities for practicable mitigation of ground borne noise and vibration from TBM activities are limited. An important way of reducing public response to the passage of a TBM is through community engagement. Direct communication with residents predicted to experience an adverse effect explaining what can be expected, its duration and identifying a person to contact with any direct concerns can result in reduced reaction from the communities concerned.

14.88 Appropriate blast and drill techniques are well established and will be selected to minimise noise and vibration effects.

Operational Phase

14.89 The tunnel head house design will include specification for the sound power of ventilation plant such that the calculated rating level at nearby residential receptors does not exceed defined limits. It is anticipated that design mitigation at head house locations will meet acceptable noise limits and therefore bespoke mitigation will not be required at these locations.

Issues to be Scoped Out

Construction and Decommissioning Phase

14.90 Vibration surveys would not generally be undertaken due to ground borne vibration criteria relating generally to absolute limits. There are no obvious existing sources of vibration that would warrant baseline ground borne vibration surveys.

Operational Phase

14.91 It is proposed to scope out operational noise and vibration from the underground cables, SEC and terminal pylon, including fixtures and fittings, as well as vibration from tunnel head house ventilation plant.

14.92 During operation vehicle movements will be occasional only relating to routine inspection and maintenance. The assessment of operational traffic noise is therefore scoped out.

Overview of the Likely Significance of Effect

14.93 From the information currently available, it is not anticipated that the Proposed Project will give rise to significant residual impacts as experience from similar projects indicates that

mitigation options are available to minimise operational noise as well as construction noise and vibration.

Construction and Decommissioning Phase

Noise

14.94 During the construction phase of the Proposed Project, there is the potential for temporary high levels of noise generated by surface construction activities such as tunnel shaft excavation, construction of a new underground connection (constructed within a tunnel); a new SEC and associated terminal pylon and extension to the existing Garth SEC.

14.95 Tunnel shafts are likely to be constructed by a combination of Secant pile walling (embedded retaining wall made of overlapping circular piles), the use of mechanical excavators (using a 360° digger with a breaker) and potentially using the drill and blast technique. The method will be selected once a main works contractor has been selected.

14.96 Appropriate noise mitigation measures (set out above) would be proposed to minimise any adverse noise effects to within acceptable levels relative to appropriate guidance. These mitigation measures typically fall into the following categories and would be included in the CEMP:

14.97 Construction vehicle movements both on-site and on the local road network also have the potential to cause noise at sensitive receptors in the vicinity of the designated haul roads. Without appropriate control measures significant effects attributable to construction noise traffic could be anticipated during the construction phase and therefore the assessment of off-site construction traffic noise is scoped in for all sites and haulage routes. As above, with the implementation of appropriate control measures such as a traffic management plan, routing plans and vehicle control it is considered that the effects are unlikely to be significant.

Construction Vibration

14.98 The depth of the tunnelling works means that significant vibration impacts from tunnelling are unlikely. The potential effects of tunnel vibration are very much dependent on the nature of the geology of the area. The first stage of the detailed assessment would therefore be to consider the results of the geotechnical ground investigation being undertaken.

14.99 Opportunities for practicable mitigation of ground borne noise and vibration from TBM activities are limited and few. Direct communication with residents predicted to experience an adverse effect explaining what can be expected, its duration and identifying a person to contact with any direct concerns can result in reduced public response to tunnelling works.

14.100 Selection of appropriate piling techniques and the timing of piling works will minimise vibration impacts.

14.101 Vibration monitoring can be carried out at the closest vibration sensitive locations during construction works to ensure that vibration trigger levels are not exceeded.

Operational Phase

14.102 The operational noise assessment will consider plant noise levels in relation to measure background (LA90) noise levels. The background noise levels will be used to establish appropriate operational plant noise target levels. Mitigation would be specified through design to achieve appropriately specified limits.

14.103 Appropriate mitigation through design will ensure that operational noise effects are not significant.