



Chapter 21.0

Terrestrial Noise and Vibration

21.0 Terrestrial Noise and Vibration

21.1 Overview of existing situation

- 21.1.0.1 Estuaries by their nature (relatively shallow with large volumes of water movements) are naturally noisy environments due to the action of waves on the coastline. Along the extent of the Project the land uses are diverse, ranging from Cardiff Docks to remote tranquil areas to the east of Cardiff. The waters are also subject to a number of varied uses including water based recreational activities, dredging and disposal of materials, fishing and commercial port and shipping activities.
- 21.1.0.2 In addition to the offshore noise sources, there are a diverse range of terrestrial noise generators in the area including road traffic, businesses, industrial sources, air traffic and natural sources such as wild birds.
- 21.1.0.3 Baseline noise and vibration levels will vary along the coastline according to the type of local noise generating the sources and their proximity to roads and time of day, with most sources varying in a diurnal pattern.
- 21.1.0.4 The noise and vibration sensitive receivers will be various, with many clustered in settlements, such as near Cardiff itself, and less in more rural areas, where wildlife may be the only noise sensitive receivers in some locations.

21.2 Scope of potential impact to be assessed

- 21.2.0.1 Noise and vibration will arise from the construction, operation and decommissioning of the Project and could potentially affect a variety of receptors in the terrestrial environment. The magnitude of noise arising from the Project will be quantified in order to inform other specialist topics including Coastal Birds (Chapter 15), Terrestrial Ecology (Chapter 16), Socio-economics (Chapter 24) and Tourism and Recreation (Chapter 25).
- 21.2.0.2 The assessment will consider the following aspects during the various Project phases:
- i. Construction: Construction noise arising from offshore operations including capital dredging, vessels associated with construction works, construction of the breakwater, temporary cofferdam, turbine and sluice gate housings and foundations, which may include piling (vibro or impact). Construction noise and vibration arising from onshore operations including site vehicles, construction compounds, construction plant.

- ii. Operation: Operational offshore noise levels from the operational turbines and maintenance dredging activities within the tidal lagoon. Operational offshore noise is most likely to be relatively localised in nature. Operational onshore noise levels associated with any landbased facilities or vehicles accessing these areas.
- iii. Decommissioning: the noise and vibration arising from decommissioning will depend on the scenario progressed (see Chapter 6 Project Description). A worst case scenario will be examined as part of the EIA process.

21.2.0.3 The potential cumulative effects will also be considered as discussed in Chapter 3 Structure of the Environmental Statement.

21.3 Existing baseline data, consultation and need for survey

21.3.0.1 An overview of environmental noise levels in the wider area can be gained from the Welsh Noise Map¹, which gives a good impression of the prevalence of road, rail and industrial noise sources in the area.

21.3.0.2 Noise and vibration surveys will be undertaken in a range of positions agreed with the local Environmental Health Department. These will be in locations considered representative of a group of receptors and, where possible, will try to capture the most affected receivers to ensure a robust assessment.

21.3.0.3 Where possible, the airborne noise survey will be co-ordinated with underwater survey activities around the study area. Both will be subject to contingency planning to allow for the influence of adverse meteorological conditions, relatively benign weather conditions being required for both activities.

21.3.0.4 Automated monitoring of both noise and vibration will be undertaken at the agreed survey locations over a period comprising at least 24 hours, with additional manual noise measurements undertaken in further locations to better understand the local noise climate.

21.3.0.5 Following liaison with City of Cardiff Council and Newport City Council, it was agreed the automated noise monitoring should be undertaken at residential locations near to the landfall at either end of the tidal lagoon. Suggestions at this stage include Penarth Marina or Ferry Court and a location in Tremorfa at the Cardiff end of the breakwater and a location in Saint Brides Wentlooge to the eastern end of the breakwater.

21.3.0.6 In addition to this, survey measurements of noise levels at the two landfall points and at a location sited midway along the coastal path in the more rural area, would be undertaken to ascertain background noise levels in relation to wildlife (and particular non-breeding birds) in the coastal area. The timing of the surveys

¹ <http://data.wales.gov.uk/apps/noise/>

will take into account the presence of features that may be affected by an increase in noise levels, e.g. non-breeding birds.

- 21.3.0.7 In addition to this, noise and vibration monitoring would be undertaken on potential access routes either in Duffryn, or between Duffryn and St Brides Wentlooge, at the eastern end, and in Tremorfa on the western end.

21.4 Proposed assessment methodology

- 21.4.0.1 The following planning policies and guidance have been used to shape the methodology that will be used to assess the potential noise and vibration effects of the Project.

21.4.1 Policy Framework

- 21.4.1.1 Planning Policy Wales (2014) provides the policy framework of the Welsh Government with regards to management of environmental risks, aiming to minimise any adverse effects on present or future land uses. The document states the following:

“The objective of a policy for noise is to minimise emissions and reduce ambient noise levels to an acceptable standard. Noise Action Plans, drawn up by the Welsh Ministers in relation to Wales under the Environmental Noise Directive, and the Welsh Regulations, aim to prevent and reduce environmental noise where necessary and preserve environmental noise quality where it is good. They are a planning consideration in the use and development of land.

Policies should be designed to ensure, as far as possible, that potentially noisy developments are located in areas where noise will not be such an important consideration, or where its impact can be minimised. Local planning authorities should adopt policies to prevent potentially noisy developments in areas which have remained relatively undisturbed by noise. Development plan policies should have regard to any relevant Noise Action Plan, including the need to protect urban ‘quiet areas’ against an increase in noise.”

- 21.4.1.2 A case-specific combination of absolute, relative and change assessment is used, following standard practice, as outlined in section 8.5 of the Association of Noise Consultants Environmental Noise Measurement Guide.
- i. **Absolute** assessments are used when considering the onset of an effect, introduction of new receptors and in some situations, when an impact is relatively short-lived (e.g. construction).
 - ii. **Relative** comparisons are made when a new or different source of noise, generally a continuous or long term source, is introduced into an environment (e.g. plant noise).

- iii. **Change** comparisons are more appropriate for existing noise sources which vary in level or prevalence over time (e.g. traffic).

21.4.2 Relevant standards and guidance

Technical Advice Note (Wales) 11 (1997)

- 21.4.2.1 Technical Advice Note (TAN) 11 provides advice on *"how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business"*. In situations where noise from industrial or commercial premises are to be assessed, it cites *BS 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas*, as the recommended standard for guidance. In addition, it states that general guidance on acceptable noise levels within buildings can be found in *BS 8233: 1987*.
- 21.4.2.2 TAN11 states, in its explanation of the decibel (dB) in the Glossary, that *"a change of 3 dB(A) is the minimum perceptible under normal conditions"*.
- 21.4.2.3 TAN11 itself should not be used as a means of assessing the noise impact of a new noise source on existing residential dwellings. Its purpose is to assist in determining the suitability of land for residential development after considering the ambient noise climate. It contains helpful guidance and references.
- 21.4.2.4 TAN 11 advises in Annex B21 'Noise from recreational and sporting activities' that, *"For these activities the local planning authority will have to take account of how frequently the noise will be generated and how disturbing it will be, and balance the enjoyment of the participants against nuisance to other people"*.

BS 4142 Method for rating and assessing industrial and commercial sound (2014)

- 21.4.2.5 BS4142 includes a methodology for determining the likelihood of adverse impact on residents about industrial or fixed plant noise. This is based on a measurement of the difference between noise specifically due to industrial sources and the underlying background noise experienced at the residential premises.
- 21.4.2.6 BS4142 takes account of the different nature of noise impact on residential dwellings during the day and at night; a considerably shorter period of noise exposure is sufficient to produce an adverse reaction at night. Assessment of noise impact during daytime periods (07:00 - 23:00) covers a full hour, whereas a night-time (23:00 - 07:00) assessment is over a fifteen-minute period.
- 21.4.2.7 The BS4142 assessment method describes the difference between the measured background noise and the rating level. BS4142 derives a rating level by comparing the Specific L_{Aeq} Noise Level (arising from the new source of noise) against the current background L_{A90} noise level.

- 21.4.2.8 If the new noise source contains any tonal or impulsive noises, other sound characteristics or is intermittent, a penalty is added. This penalty can be agreed using a subjective method, which is appropriate where the source cannot be measured as it is only proposed at the time, but the characteristic of similar sources can be subjectively assessed. Alternatively, the penalty can be calculated using measured data, with the penalty for tonality ranging for 0 to +6dB, impulsivity 0 to +9dB, or up to +3dB for other sound characteristics or intermittency if the source is distinctive but neither tonal nor impulsive.
- 21.4.2.9 If the rating level exceeds the background noise level by around 10dB or more it is likely to be an indication of a significant adverse impact. A difference of around 5dB is likely to be an indication of an adverse impact. The lower the rating level is relative to the measured background sound level, the less likely it is there will be an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

Department of Transport: Calculation Of Road Traffic Noise (CRTN) (1998)

- 21.4.2.10 CRTN guidelines describe the procedures for calculating noise from road traffic. These procedures are primarily intended to enable entitlement under the Noise Insulation Regulations (1975-1996) to be determined, but they also provide guidance appropriate to the calculation of traffic noise for more general applications e.g. environmental appraisal of road schemes, highway design and land use planning.

BS 5228 Part 1: Noise and Vibration Control on Construction and Open Sites (2009)

- 21.4.2.11 Whilst this standard does not provide detailed guidance for determining whether or not noise from a site would constitute a problem in a particular location, it does reference a number of factors that are likely to affect considerations of the acceptability of site noise.
- 21.4.2.12 Although it is generally recognised that, for industrial noise, the likelihood of complaints is related to the difference between the industrial noise and the existing background noise level, this standard recognises that this relationship between response and noise level difference may well be different for construction noise activities and a greater difference may be tolerated when it is known that the operations are of relatively short duration.

World Health Organisation: Guidelines for Community Noise (1999)

- 21.4.2.13 The World Health Organisation (WHO) guidelines set community noise targets for the avoidance of noise levels which could result in annoyance or health effects during daytime and night-time periods.

- 21.4.2.14 The guidelines correspond to the guideline levels for of internal noise environment as recommended in BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings-Code of practice* with windows open.
- 21.4.2.15 It should be noted, however, that these absolute levels are accepted to represent aspirational targets. The current prevailing background noise conditions in the study area of the Project already exceed these levels such that comparative assessments are more appropriate.
- 21.4.2.16 The National Noise Incidence Study 2000/2001 found that 55±3% of the population of England and Wales live in dwellings exposed to day-time noise levels above the WHO level of 55 dB $L_{Aeq,day}$.
- 21.4.2.17 The National Noise Incidence Study 2000 has found that 68±3% of the population of England and Wales live in dwellings exposed to night-time noise levels above the WHO level of 45 dB $L_{Aeq,night}$.
- 21.4.2.18 Furthermore, in a review of health effects based noise assessment methods undertaken for the then Department of the Environment, Transport and the Regions (Porter *et al*, 1998) just before the issue of the 1999 WHO guidelines, it is noted that:

“Perhaps the main weakness of both WHO-inspired documents is that they fail to consider the practicality of actually being able to achieve any of the stated guideline values...The percentages exposed above the WHO guideline values could not be significantly reduced without drastic action to virtually eliminate road traffic noise and other forms of transportation noise (including public transport) from the vicinity of houses. The social and economic consequences of such action would be likely to be far greater than any environmental advantages of reducing the proportion of the population annoyed by noise. In addition, there is no evidence that anything other than a small minority of the population exposed at such noise levels find them to be particularly onerous in the context of their daily lives.”

National Policy Statements

- 21.4.2.19 The National Policy Statement for Renewable Energy Infrastructure EN-3 (DECCa, 2011) does not specifically refer to Tidal Lagoons within the documentation. However the Overarching National Policy Statement for Energy EN-1 (DECCb, 2011) does allow for generic noise and vibration assessments in relation to energy generation.
- 21.4.2.20 It states that:

Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:

- *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;*
- *identification of noise sensitive premises and noise sensitive areas that may be affected;*
- *the characteristics of the existing noise environment;*
- *a prediction of how the noise environment will change with the proposed development;*
- *in the shorter term such as during the construction period;*
- *in the longer term during the operating life of the infrastructure;*
- *at particular times of the day, evening and night as appropriate.*
- *an assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and*
- *measures to be employed in mitigating noise.*

The nature and extent of the noise assessment should be proportionate to the likely noise impact.

21.4.2.21 The methodologies already introduced will be used to assess noise and vibration on both land and underwater to satisfy the requirements of the National Policy Statements.

21.4.3 Consultation

21.4.3.1 City of Cardiff Council's and Newport City Council's Environmental Health departments were consulted on the potential noise and vibration impacts of the Project. As a result of this consultation, it was identified that best practice as per BS5228 would generally be appropriate mitigation of site preparation, construction and decommissioning noise. BS8233 and WHO guidance (1999) should be used in relation to the consideration of external amenity. Operation of the tidal lagoon would be assessed in accordance with BS4142.

21.5 References

- BS 4142 Method for rating and assessing industrial and commercial sound. (2014)
- BS 5228 Part 1: Noise and Vibration Control on Construction and Open Sites. (2009)
- BS 8233: Guidance on sound insulation and noise reduction for buildings-Code of practice with windows open. (2014)
- Department of Transport Welsh Office (1998) Calculation Of Road Traffic Noise
- DECCa (2011) National Policy Statement for Renewable Energy Infrastructure (EN-3)
- DECCb (2011) Overarching National Policy Statement for Energy EN-1
- Welsh Government (1997), Planning Policy Wales Technical Advice Note 11: Noise
- Welsh Government (2014), Planning Policy Wales
- Welsh Noise Map (<http://data.wales.gov.uk/apps/noise/>)
- World Health Organisation (1999) Guidelines for Community Noise