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Tees CCPP Project

The Tees Combined Cycle Power Plant Project
Land at the Wilton International Site, Teesside

Volume 1 - Chapter 8

Regulations – 6(1)(b) and 8(1)

Applicant: Sembcorp Utilities UK
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8 NOISE AND VIBRATION

8.1 INTRODUCTION

8.1.1 Terms of Reference for this Chapter

8.1 This chapter presents an assessment of the likely significant noise and vibration effects from construction, operation and decommissioning of the Project. The baseline noise levels at Noise Sensitive Receptors (NSRs) around the Project site are described, potential effects identified, proposed mitigation measures listed and an assessment of the significance of residual effects is made.

8.2 *Figure 8.1* shows the location of the NSRs in relation to the site as agreed with Redcar and Cleveland Borough Council (RCBC).

8.3 With regard to noise, potential effects of the Project as defined in *Chapter 2* include:

- the effects on NSRs of noise from construction equipment, and changes in noise from off-site construction traffic during the construction of the Project;
- effects of operational noise from on-site equipment on NSRs ; and
- effects of decommissioning.

8.4 Overall the Project proposes the construction and operation of 1,700 MWe of new CCGT electrical generation plant. Dependent on market conditions at the time of the final investment decision (after any approved DCO) the development of the Project could occur under two scenarios as follows.

- 'Scenario One' in which two CCGT 'trains' each of 850 MWe are constructed in a single phase to give a total aggregate capacity of 1700 MWe.

- 'Scenario Two' in which one CCGT train of 850 MWe is built and commissioned. Within five years of its commercial operation beginning the construction of a further 850 MWe commences.

8.5 Traffic during operation has been scoped out of the noise assessment. Since the site can be accessed via major roads which already serve the Wilton International Site (Wilton International) major changes in traffic noise are unlikely. This is supported by a review of traffic prediction data which suggests changes will be negligible.

8.6 Construction vibration has been scoped out since piling would be over 500 m from the nearest sensitive receptors, and empirical studies suggest that vibration at distances greater than approximately 100 m are unlikely to result

in significant effects. It is also likely that any piling would be completed using rotary techniques rather than driven, reducing the potential for vibration.

8.7 Vibration from operational equipment is not expected to result in noise impacts that are perceptible beyond the Project site boundary or at NSR locations.

8.1.2 Basis of Assessment including Realistic Worst Case Scenario

Construction Noise

8.8 As is usual in EIAs, the inventory of construction plant items has been based on experience of similar projects and since a full set of specified equipment will not be available until after the engineering, procurement and construction (EPC) contractor has been appointed. Additionally the locations of where construction plant assemblage will operate have not been fully defined. Therefore, the assessment is based on an even spread of construction sources around the Project site. This is thought to be a more realistic distribution than adopting a worst-case view assuming all the plant operates, for instance, at the site boundary. No mitigation has been assumed for construction plant in the predictions.

8.9 Given that the site is over 540 m from the nearest NSRs in Lazenby, the likelihood of noise levels from any construction plant exceeding daytime noise limits is considered unlikely. Therefore, noise levels have been estimated based on a worst-case plant assemblage with a sound power that reflects the likely noise levels based on the combination of equipment. At this stage it is not known if the construction phase/phases during Scenario 1 or 2 above will have different noise levels. However, by taking the worst-case likely noise levels a robust worst case is assessed. This can be assumed to occur during any construction period under either Scenario 1 or Scenario 2.

Operational Noise

8.10 The data used within this assessment are based on noise modelling supplied by potential EPC contractors for all of the significant operational noise sources. These data are based on their experience of what typically represent best available technique (BAT) in terms of equipment design and noise mitigation.

8.11 During detailed design, equipment vendor data will be available to ensure that appropriate noise mitigation is included so that the plant design meets the levels that have been assumed in this modelling. The modelling assumptions therefore provide a realistic representation of the likely noise emissions.

8.12 A worst case in terms of operational noise is that both trains are operating (effectively Scenario 1) and this has been adopted in this assessment.

8.13 The operational noise assessment is based on the following:

- the project layout presented in *Chapter 5 Project Description*, and the nearest NSRs (see *Figure 8.1*); and

- the results of the modelling of noise emissions based on typical noise levels supplied by potential suppliers and include the mitigation in *Table 8.14*.

8.1.3 Consultation

8.14 Sembcorp has carried out various formal and informal consultation activities as part of the DCO process. The formal Scoping Opinion is set out in *Annex B*. As part of the process, consultation relevant to noise was undertaken with RCBC and the scoping responses are detailed in *Table 8.1*. The Environment Agency (EA) has not raised any specific noise concerns in its scoping and PEIR responses (see *Annex B*).

Table 8.1 Consultation Responses

Source	Consultee Comment	Response
Secretary of State's scoping response	It is proposed that traffic noise during the operational phase is scoped out on the basis that as the site can be accessed via major roads which already serve the industrial estate noticeable changes in traffic noise are unlikely. The SoS agrees that this matter can be scoped out on the basis that the likely number of traffic movements generated during the operational phase of the Proposed Development is unlikely to be sufficient to generate significant effects.	Noted.
Secretary of State's scoping response	The SoS notes that the noise sensitive receptors (NSRs) identified in Table 6.4 and Figure 6.4 only reference human receptors and do not include ecological receptors. The SoS advises that the assessment should consider fauna on the site or in the area that could be impacted by noise and vibration, such as through disturbance caused by the Proposed Development. This should include the European sites and their features identified in the Scoping Report, as appropriate. The approximate distance of the NSRs considered in the assessment from the Proposed Development should be quantified in the ES.	Considered in Ecology *Chapter 9*.
Secretary of State's scoping response	The SoS welcomes that the methodology, scope of the noise survey, location of noise-sensitive receptors and overall assessment in relation to the operational phase will be agreed with RCBC, and recommends that the EA are also consulted.	Direct consultation undertaken with EA officer responsible for site.
Secretary of State's scoping response	The source of the noise criteria set out in Table 6.5, against which it is stated predicted noise levels will be compared, is not specified. It is assumed it is BS5228: 'Noise and vibration control on construction and open sites' (BSI) (1997), as this would seem to be appropriate. However, all guidance and standards on which the Applicant intends to rely for the purposes of the assessments should be clearly referenced in the ES.	Noted and addressed.
Secretary of State's scoping response	Section 6.5.5 (page 81) states that 'planning conditions for the operating plant require it to have no tonal content..'. It is unclear what is meant by this, however the SoS assumes that it is intended to refer to potential requirements in a DCO.	Noted and addressed.
Secretary of State's scoping response	Information should be provided in the ES on the types of vehicles and plant to be used during the construction phase, and the likely noise and vibration generated by them. The noise and vibration assessments should take account of the traffic movements along access routes, particularly during the construction phase.	Done as a matter of course, details are provided in the Traffic and Transport (*Chapter 10*).
Secretary of State's scoping response	Impacts on people from potential noise disturbance at night and other unsocial hours such as weekends and public holidays should be addressed in the assessment. Consideration should be given to monitoring noise complaints both during construction and when the Proposed Development is operational.	Noted and addressed.
Secretary of State's scoping response	The assessments undertaken for this topic should inform the ecological assessments. Cross-reference should be made in the ES between this topic chapter and the ecology and traffic and transport chapters.	Considered in Ecology Chapter 9.
Secretary of State's scoping response	National Planning Policy Framework. From 27th March 2013, local planning policies in existing plans (ie those adopted before the NPPF) should be given due weight according to their consistency with the NPPF (the closer the policies in the plan to the policies in the Framework, the greater the weight that may be given) (para 215).	Noted and addressed.

Source	Consultee Comment	Response
Email from Mick Gent EHO of RCBC to Sembcorp 28/3/2017.	Confirming requirements for baseline data to be referenced in the assessment. Lazenby noise measurement data post power station closure will be used in any assessment to demonstrate compliance with BS4142:2014; and to be used to establish baseline levels. Detailed discussions regarding procedure to establish noise levels at Grangetown given practical difficulties gaining site access. • Samples to be taken between 00:00 and 03:30 and measurements to be carried out over a minimum of 30 minutes (under suitable weather conditions) on 3 separate occasions to demonstrate this is appropriate to establish baseline required for BS4142:2014. • A continuous monitor will be placed on the proposed development site to act as a surrogate monitor and calculate likely levels at the nearest sensitive site in Grangetown. This monitor would also provide current site noise levels. • Monitoring of seven locations, as identified on the site's permit on 1 occasion (using a Class 1 sound level meter) to be used to establish baseline levels.	
Email from Mick Gent EHO of RCBC to Sembcorp 8/3/2017.	Mick Gent of Redcar and Cleveland Borough Council (RCBC). Initial correspondence with Mick Gent indicated that RCBC did not want the Project to lead to a creeping background. Although it was noted that the site background noise had reduced over recent years due to and historical plant closures, RCBC have indicated that anything above a 3 dB(A) increase above background would not be accepted.	Design has considered current national guidance (see *Section 8.2.3*).
Lazenby Environment Group (LEG) Consultation Jan 16th 2017	Concerns raised in regards to noise, steam, and odour.	Noted.
Eston Neighbourhood Action Partnership (NAP) Consultation Jan 18th 2017	Attendees raised the following: Noise, Steam, Odour, Safety, Specific benefits project might bring to Lazenby (via Sec 106)	Noted.
Redcar and Cleveland Borough Council Environmental Health Team's response to PEIR.	Noise and Vibration: The noise assessment has screened out traffic noise during construction and vibration during construction as both have been considered as negligible. The assessment has shown that daytime noise levels are predicted to be below the 65dB level for all noise sensitive receptors. The installation of an additional acoustic wall along the western boundary is welcomed.	Noted and no action required. DCO Requirement 20 details operational controls.

Source	Consultee Comment	Response
	The Team also welcomes the DCO insistence that the scheme will have no tonal content to the environment. Cooling towers are to be located away from noise receptors and will include the use of a turbine building with acoustic enclosure, cladding and silencers on steam vents. Working hours for the development are planned to be 07:00 to 19:00 with night time working minimised.	
	The developer plans to retain the use of the existing acoustic wall barrier along the southern edge of the site. It was noted during a site visit that this existing wall may require some maintenance to ensure that it is an effective barrier.	The noise model simulated the existing wall as a highly absorptive barrier (ie with reflection loss > 11 dB, and absorption coefficient α >0.91). Prior to the commencement of construction the EPC contractor will verify the efficacy of the wall to ensure it meets or exceeds this assumption.
Lazenby Environment Group (LEG) on behalf of the Residents of Lazenby Village.	This group and local residents (during the public consultation) also enquired whether the layout of the plant had been optimised to reduce noise (and other) impacts.	Noise impact was considered in the layout with the gas turbines being in buildings and cooling towers located furthest away from the village. An alternative layout at 90 degrees to the original was also considered.
A number of public Consultation Form Response.	Concerns raised about noise and 'noise pollution'.	This chapter addresses noise effects for all project phases at nearby community receptors and also addresses points raised in consultation with local communities over the layout of the main plant on the site from a noise perspective. A noise assessment was carried out on an alternative layout which was at 90 degrees to the original.

8.1.4 Policy and Legislation

General Considerations

8.15 Legislation and guidance of relevance to the noise and vibration impact assessment for the Project is set out below.

Policy

8.16 Policy relevant to the Project is set out in *Chapter 2* of this PEIR. *Table 8.2* below identifies those policies that are relevant to noise and vibration.

Table 8.2 Policies Relevant to Noise and Vibration

Topic	Noise and Vibration
Overarching National Policy Statement for Energy(EN-1)	Section 5.11 Noise and vibration
National Planning Policy Framework (NPPF)	
Planning Practice Guidance (PPG)	Planning Policy Guidance Note (PPG) 24: Planning and Noise
The Core Strategy Development Plan Document, adopted July 2007	Policy DP6 Pollution Control
Draft Publication Local Plan (November 2016)	Policy SD 4 General Development Principles

Overarching National Policy Statement for Energy (EN-1)

8.17 NPS EN-1 sets out the requirements for a noise assessment of an energy-related project, and also outlines the approach that applicants should adopt for the preparation of noise assessments. Paragraph 5.11.9 of NPS EN-1 requires that, when determining the application, the Secretary of State should not grant consent unless he is satisfied that the proposals will:

- *"Avoid significant adverse impacts on health and quality of life from noise;*
- *Mitigate and minimise other adverse impacts on health and quality of life from noise; and*
- *Where possible, contribute to improvements to health and quality of life through the effective management and control of noise."*

8.18 NPS EN-1 endorses the use of reference to BS4142 and BS8233 which have been used as part of the assessment of the Project. It is noted that NPS EN-1 does not suggest that there should be no change in the existing noise environment. The significance of the noise from the Project has been based on the standards which have been referenced (BS4142 and BS8233) and therefore follows the broad principles of the Overarching National Policy Statement for Energy.

Noise Policy Statement for England (NPSE)

8.19 The Noise Policy Statement for England (NPSE), 2010 sets out the highest level of national noise policy in England, as summarised in *Box 8.1*.

Box 8.1 ***The Noise Policy Statement for England (2010)***

Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- **avoid significant adverse impacts on health and quality of life;**
- **mitigate and minimise adverse impacts on health and quality of life; and**
- **where possible, contribute to the improvement of health and quality of life.**

8.20 Government's guiding principles of sustainable development include: ensuring a strong, healthy and just society; using sound science responsibly; living within environmental limits; achieving a sustainable economy; and promoting good governance.

8.21 The first two aims of the NPSE follow established concepts from toxicology that are applied to noise impacts, for example, by the World Health Organisation as follows.

- NOEL: No Observed Effect Level is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

- LOAEL: Lowest Observed Adverse Effect Level is the level above which adverse effects on health and quality of life can be detected.

- The NPSE extends these to the concept of a Significant Observed Adverse Effect Level: SOAEL, which is the level above which significant adverse effects on health and quality of life occur.

8.22 The NPSE notes:

> "*It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times*".

National Planning Policy Framework (NPPF)

8.23 The National Planning Policy Framework (NPPF) consolidates the previous raft of Planning Policy Statement (PPSs) and Planning Policy Guidance (PPGs) into one single guidance document for setting out the government's planning policies for England and how they are expected to be applied. The NPPF takes on board the aims of the NPSE and at paragraph 109 adds that the planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.

8.24 The LOAEL is described in PPG as the level above which:

> "*noise can be heard and causes small changes in behaviour and/or attitude, eg turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life*."

8.25 PPG identifies the SOAEL as the level above which:

> "*noise causes a material change in behaviour and/or attitude, eg avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area*."

8.26 The PPG advises that as noise exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary. If the exposure is above SOAEL the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Again, such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused. At the highest extreme, noise exposure causes extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this represents an unacceptable adverse effect and these situations should be prevented from occurring.

8.27 For those developments which are likely to generate significant noise, it recommends they be "*located in areas where noise will not be such an important consideration or where its impact can be minimised*". It advocates that local authorities should not place "*unjustifiable obstacles in the way of such*

development" but should "*ensure that development does not cause an unacceptable degree of disturbance*".

The Core Strategy Development Plan Document, adopted July 2007

8.28 The Redcar & Cleveland Planning Strategy (Local Plan) sets out the strategic policy framework for Redcar & Cleveland area and is used to make decisions on planning applications. The Core Strategy (1) (adopted 2007) highlights, within Policy DP6 Pollution Control, the importance of ensuring a development that may give rise to increased levels of noise or vibration is only permitted if it is acceptable in terms of human health and safety, environment; and general amenity. Policy DP6 highlights that where pollution is unavoidable, mitigation measures to reduce pollution levels will be required in order to meet acceptable limits.

8.1.5 Supporting Information for this Chapter

8.29 Information on the results of baseline surveys and other studies is provided in a series of Annexes as set out below.

- *Annex F.1* Noise Baseline Survey Details.
- *Annex F.2* Operational Noise Assumptions and Predictions.

8.2 ASSESSMENT METHODOLOGY

8.2.1 Desk Study Methodology

8.30 Mapping and imagery of the study area was reviewed in order to establish the location of NSRs around the site, and to focus the specification of noise surveys.

8.2.2 Baseline Survey Methodologies

8.31 A comprehensive survey was carried out by GT Acoustics and the Sembcorp Analytical Team to supplement extensive data already collected periodically for the Wilton International site. The survey data were used to establish baseline noise conditions following procedures agreed with RCBC. The extent of the surveys included noise logging over a two week period on the edge of the Wilton International Site facing Grangetown, and attended sample measurements at NSR locations (see *Section 8.3.4*). The data have been robustly analysed taking into account the effects of wind direction on noise levels at the NSRs.

(1) Redcar & Cleveland Borough Council.2007. Core Strategy DPD, Adopted - 2007

8.2.3 Impact Assessment Methodology and Significance Criteria

Construction Noise

8.32 Construction noise has been predicted based on an understanding of other similar projects of the types and numbers of construction plant that will be used. For the purpose of noise assessment, the three key phases of general construction comprise:

- civil engineering and platform preparation, including from the removal of the existing ground bearing slabs and foundations;
- construction site preparation; and
- construction and installation.

8.33 Sound power levels were found to be 116, 117 and 112 dB(A) respectively for each of the above phases. It has been assumed that the plant will be evenly distributed around the site which is realistic for this type of construction. It is not expected that sheet piling will be required except to support open excavations, but in order to simulate a worst-case situation piling has been modelled. For the purposes of this assessment the noise level from piling has been modelled assuming it occurs at the closest location to a receptor on site at which major construction is likely to take place.

8.34 The noise levels from piling vary depending on the piling type. Driven piles create more noise than a rotary piling rig. Sound power levels for driven piles can be as high as 122 dB(A). Typically piling is not a continuous activity; for example if it was carried out for 40% of the time the effective sound power would be 118 dB(A).

8.35 The construction noise levels have been predicted at noise sensitive properties around the site using the prediction methodology in BS 5228[(1)] using Soundplan 7.4. The predictions have included the effect of the existing noise barrier which will be retained as part of the Project. The standard also provides guidance on construction plant noise levels and on the threshold of significant noise effects on dwellings.

8.36 Where appropriate in consideration of planned times for construction activity, predicted noise levels have been compared with the noise criteria presented in *Table 8.3*).

(1)BS 5228: 2009 + A1 2014 'Noise and vibration control on construction and open sites', BSI, 2014

Table 8.3 Threshold of Significant Effects of Construction (and Decommissioning) Noise at Dwellings

Threshold of Significant Effect of Construction Noise at Dwellings	Threshold Value, dB		
	Category A [a]	Category B [b]	Category C [c]
Night-time (23.00 – 07.00)	45	50	55
Evenings and weekends [d]	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 - 13.00)	65	70	75
Note 1: All sound levels are defined at the façade of the receptor.			
Note 2: If the ambient noise level exceeds the Category C threshold values given in the table (ie the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.			
Note 3: (a) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. (b) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. (c) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than the category A values. (d) 19.00 – 23.00 weekdays, 13.00 – 23.00 Saturdays and 07.00 – 23.00 Sundays.			

8.37 The most stringent interpretation of the daytime criteria is for areas where existing noise levels are below the daytime 65 dB L_{Aeq} for week days and for Saturday morning construction works. Although the agreed baseline survey scope for this assessment was limited to collecting night-time noise levels, which are critical in terms of operational noise assessment, daytime noise levels were also available from the noise monitor which records continuously at the village of Lazenby (NML 3 in *Figure 8.1* in *Section 8.3.1*). This is the closest NSR to existing noise sources on the Wilton International site. Analysis of the Lazenby monitor suggests that noise levels are typically below 65 dB L_{Aeq}, and it is anticipated that other NSRs will experience noise levels that are lower than this given their distance from the site boundary, ie beyond Lazenby. Therefore, it is a reasonable and conservative approach to assume noise levels are below 65 dB L_{Aeq} at all receptors.

8.38 Construction hours have been established and it is assumed that works will take place primarily in the 'core hours' of 07:00 to 19:00 Monday to Friday and 08:00 to 18:00 on Saturdays. Piling works will be more restricted and will be limited to 0900 to 1800 Monday to Friday and 0900 to 1300 on Saturdays. With minor exceptions there will be no planned work outside of these days and hours or on Bank Holidays. The exceptions would include such matters as maintenance works, pumping to keep excavations clear of water and other minor activities all of inherently low noise characteristics. In the event of exceptional circumstances such as late running critical programme activities, procedures and controls would be agreed in advance with RCBC. In the event that workforce or community safety was an overriding concern then the need to address it would take priority.

8.39 As noted above, some works may require working outside of the core hours. It is too early in the Project development process to define these precisely and it should be noted that the core working hours do not necessarily apply to the following:

- construction and related works which do not exceed a noise limit of 50 dB (A) at the DCO Order limits; or
- the delivery or removal of materials, plant and machinery via designated routes on the local road network; or
- the delivery of abnormal indivisible loads; or
- where the prior agreement of RCBC has been obtained; or
- in the event of emergencies.

Off-site Construction Traffic

8.40 Changes in road traffic noise levels resulting from construction (and decommissioning) of the Project have been calculated using the Calculation of Road Traffic Noise (CRTN) methodology (1). Changes in noise greater than 3 dB(A) will be identified as a significant effect. This corresponds to the smallest noise change that is noticeable under normal environmental conditions.

8.41 In cases where the existing traffic noise is very low, the absolute levels of noise are also taken into account when establishing the significance of road noise. The significance of effect will also depend on the duration over which the change will take place.

Operational Noise - BS4142 Methods for Rating and Assessing Industrial and Commercial Sound

8.42 The guidance used for the assessment of sound of an industrial and/or commercial nature is BS 4142:2014 (2). The current version of the standard is applicable to investigating complaints; assessing sound from proposed, new, modified or additional sources of sound; and for assessing sound at proposed new dwellings or premises used for residential purposes.

8.43 The methods described in BS 4142 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling used for residential purposes.

8.44 BS 4142 is applicable for the determination of the following levels:

- 'rating levels' of an industrial and/or commercial sounds;
- 'ambient', 'background' and 'residual' sound levels, for the purposes of investigating complaints, assessing sound from proposed, new, modified

(1) Calculation of Road Traffic Noise (CRTN - ISBN 0 11 550847 3) Department of Transport, 1988.
(2) Methods for Rating and Assessing Industrial and Commercial Sound, BSI, 2014.

or additional source(s) of sound of an industrial and/or commercial nature and assessing sound at proposed new dwellings or premises used for residential purposes.

8.45 The principal terms used in BS 4142 are broadly defined as follows.

- **Ambient Sound** is the overall sound level from all sources.
- **Specific Sound Level**, Ls = $L_{Aeq,Tr}$ is the noise source under consideration.
- **Rating Level,** $L_{Ar,Tr}$ is the residual noise corrected to allow for certain distinctive acoustic features.
- **Residual Sound Level**, Lr = $L_{Aeq,T}$ is the noise remaining when the specific noise is sufficiently suppressed so as not to contribute to the ambient noise level.
- **Background Sound Level**, $L_{A90,T}$ is the measured L_{90} level of the residual noise.

8.46 The method described in BS 4142 requires the measurement or prediction of equipment or plant noise (Specific Sound Level) plus a correction for its acoustic character. A comparison is then made between the Rating Level and the Background Sound Level in consideration of the following overall guiding assessment values to provide an understanding of the potential for, and significance of effect(s).

- Typically, the greater this difference, the greater the magnitude of the impact.

- A difference of around +10 dB or more is likely to be an indication of significant adverse impact, depending on the context.

- A difference of around +5 dB is likely to be an indication of an adverse effect, depending on the context.

- The lower the rating level relative to the measured background sound level, the less likely that the specific sound source will have an adverse effect or a significant adverse effect.

- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a small impact, depending on the context.

8.47 The Rating Level of the source is the A-weighted Leq taking into consideration the following characteristics of the sound source:

- tonality;
- impulsiveness;
- intermittency;
- time of occurrence;
- duration of event; and

- any other characteristics of the sound source that are likely to be distinctive in the environment.

8.48 In this case the DCO requirements for the operating Project will require it to have no tonal content; therefore there are no corrections to be added to the Specific Sound levels to arrive at the Rating Level.

8.49 BS4142 2014 requires an initial estimate of the Specific Sound Level to be carried out which may later be modified by further consideration of the context. The standard differs from the previous (1997) version in several ways, and the consideration of context is of one of the most important factors. A series of examples are provided in which the initial numerical estimate is interpreted for a given context to arrive at the assessment of significance.

8.50 Where the initial estimate of the impact needs to be modified due to the context, the following factors need to be considered:

- the absolute level of sound where background sound levels and rating levels are low;
- where residual sound levels are very high and the residual sound might itself result in noise impacts;
- the character and level of the residual sound compared to the character and level of the specific sound;
- evidence on likely human response to sound, including references provided in BS 4142; and
- the sensitivity of the receptor including façade insulation, acoustic ventilation and/or screening which will secure good acoustic conditions and reduce receptor sensitivity.

8.51 As in the previous (1997) version, the current version of BS 4142 makes reference to BS 8233 (1) for the consideration of absolute (or benchmark) standards for noise.

8.52 The following assumptions have also been taken into consideration in undertaking the analysis for Operational Noise.

- In this analysis it has been assumed that the Project will not exhibit an acoustic tonal feature and therefore no correction in that regard has been applied in this analysis. The EPC contractor will be required to enter into guarantees in regard to tonal noise.

- The way that a number of different sources of noise combine resulting in the total noise emission of the plant is complex, and whilst equipment suppliers can estimate the likely overall noise, or the noise at well-defined octave frequency bands, it is not practical to model tonal noise. The well-

(1) Guidance on Sound Insulation and Noise Reduction for Buildings, BSI, 2014.

established procedures in ISO 9613-2 (1996) (1) have been used to predict noise propagation, and this method provides a method for calculating industrial noise propagation in octave bands or a simplified dB(A) value. It does not have a tonal prediction procedure.

- If any audible tonal noise is observed during testing and/or commissioning it will be analysed to identify the cause and corrective measures will be applied. For example it might be necessary to optimise 'delta pressure' on a valve, add or optimise an additional silencer, acoustic insulation, screening or acoustic enclosure on the source responsible. This approach is typical to the 'commissioning stage' of developments such as this, and would be secured by guarantees entered into by the EPC contractor.

Operational Noise - BS8233: 2014, Guidance on Sound Insulation and Noise Reduction for Buildings, 2014

8.53 Benchmark noise criteria for various building uses are provided in BS 8233 (2). The British Standard provides guidelines for avoiding disturbance at night which includes 30 dB L_{Aeq} at night between 2300 and 0700 inside residential buildings. The external noise levels that are equivalent to this value are typically 10 to 15 dB higher with windows open so that a reasonable benchmark would vary between 40 and 45 dB L_{Aeq} (free-field 2300-0700 hours). These noise targets, which apply outside a building, are based on preserving good standards for sleep within the building. The night-time criterion does not aim primarily to preserve residential amenity outside the buildings and is less stringent than the BS 4142 initial estimate criteria in areas where baseline noise levels are low. BS 8233 recommends the use of BS 4142 for the purposes of assessing noise changes, noting that noise changes should be considered in the context of the absolute levels of noise.

8.54 An external criterion of 50 to 55 dB LAeq (free-field 0700-2300 hours) has been proposed for more typical daytime activities. External areas such as gardens should also meet a desirable level of 50 dB LAeq where practicable.

8.55 The derived standards assume that buildings are not fitted with noise insulation, so higher external noise levels could be acceptable to residents if noise insulation and ventilation were provided which resulted in suitable internal noise levels.

Decommissioning

8.56 The same standards are expected to be applied during decommissioning as construction, and effects are expected to be similar in nature.

(1) Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation
(2) Guidance on Sound Insulation and Noise Reduction for Buildings, BSI, 2014.

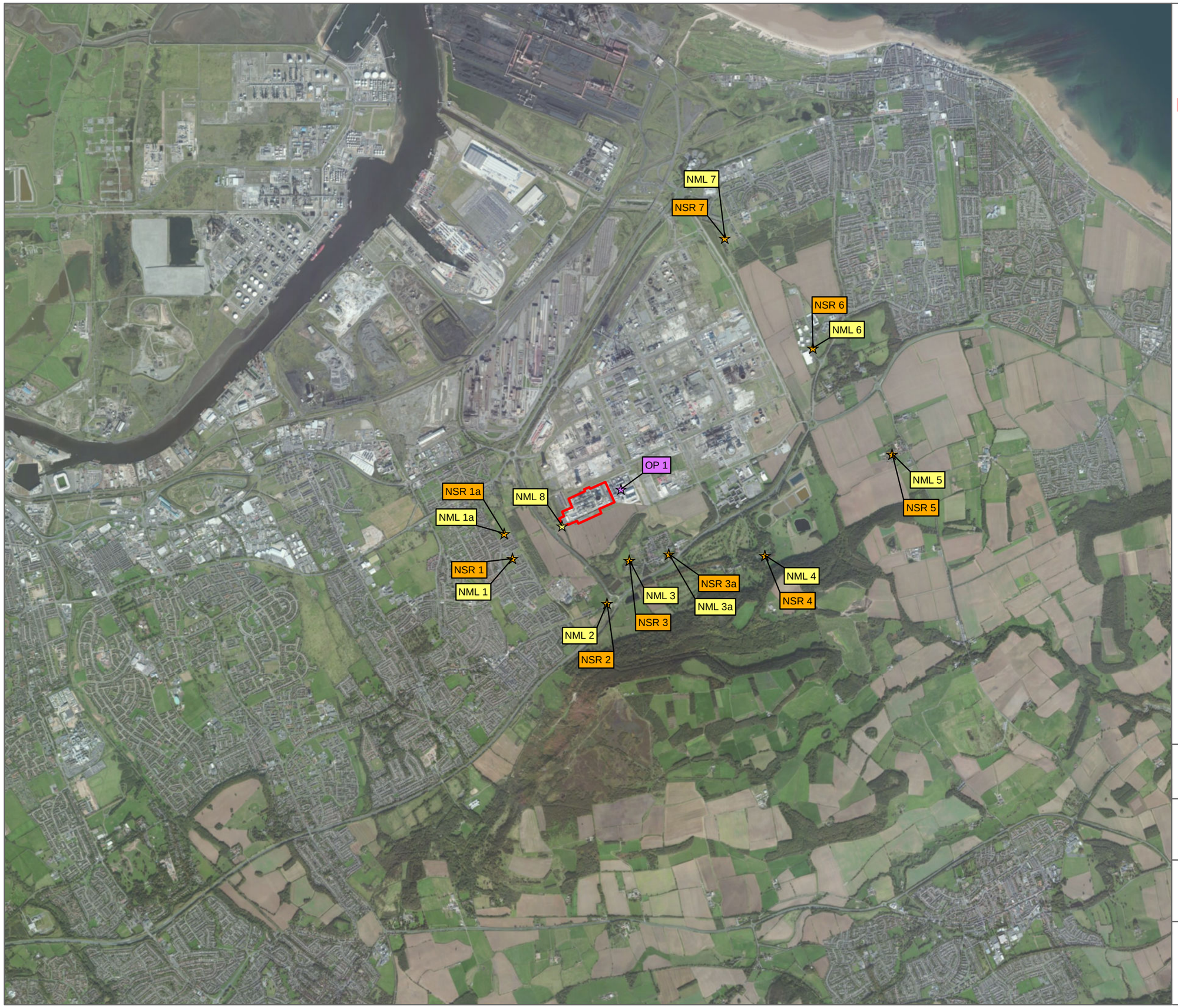
8.3 BASELINE CONDITIONS

8.3.1 Introduction

8.57 The residential communities and other potentially noise sensitive receptors to be included in the assessment are presented in *Figure 8.1* and listed in *Table 8.4*. These have been determined following consultation and agreement with RCBC and include the closest properties to the Project Site. These noise sensitive communities are already exposed to noise from the industrial facilities on the Wilton International site, as well as nearby road traffic and other sources.

Table 8.4 Noise Sensitive Receptors (NSRs)

NSR Number	NSR Description
1	Derwentwater Road, Grangetown
1a	Shakespeare Avenue, Grangetown
2	High Street, Lackenby
3	Closest properties to site, Lazenby
3a	High Street, Lazenby
4	Wilton Village
5	Yearby Village
6	Troisdorf Way, Kirkleatham Business Park
7	Hobson Avenue, Dormanstown



Operational Plant 1

Noise Monitoring Location and Noise Sensitive Receptor

Noise Monitoring Location

Indicative Site Boundary

0 250 500 750 1,000

Metres

N

SCALE: 1:40,000	VERSION: A01
SIZE: A3	DRAWN: WB
PROJECT: 0375193	CHECKED: MF
DATE: 22/05/2017	APPROVED: RE

Figure 8.1
Noise Sensitive Receptors and Monitoring Locations

ERM

sembcorp

PROJECTION: British National Grid

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukbrsdc02\Data\Bristol\Confidential Projects\0375193 TLP2 DCO Support.RE\2. Working Folders\2. GIS\MAPS\PEIR\Fig08.01_0375193_NoiseSensitiveReceptors_A01.mxd

8.3.2 Noise Context and Study Area

8.58 The site is appropriate for this type of development and the surrounding area could be assumed to be of low sensitivity to impact from industrial noise given that this type of noise is already present. However, this sensitivity is increased as a result of the known history of feedback regarding noise from residents in Lazenby and isolated properties such as Old Hall Farm, Lackenby.

8.59 The properties at Lazenby benefit from a 6 m high noise wall (on the southern edge of the Project site) which will be retained as part of the Project (noting that a section to be removed for construction access will be fully reinstated before operation commences). This is shown in *Figure 8.2*. During the PEIR consultation RCBC responded that it was "*noted during a site visit that this existing wall may require some maintenance to ensure that it is an effective barrier*". The noise model simulated the existing wall as a highly absorptive barrier (ie with reflection loss > 11 dB, and absorption coefficient α >0.91). Prior to the commencement of operation the EPC contractor will verify the efficacy of the wall to ensure it meets or exceeds this assumption.

Figure 8.2 Existing Noise Wall to be Retained

8.3.3 Desk Study Results

8.60 There has been a significant amount of noise survey work completed in the area around the Wilton site over a number of years either by Sembcorp or contractors working directly for the Wilton Site resident organisations. A

long-term noise monitor has been established at Lazenby (at NML 3 shown in *Figure 8.1*) which monitors the trend of noise in the area, and short sample measurements have been made at locations around the site on a regular basis (NML 1, 2, 3a, 4, 5, 6 and 7).

8.61 Historic information on baseline noise has been reviewed, which demonstrates a wide variation in noise at receptors around the site between spot measurements. The long-term measurements at Lazenby (NML 3) also indicate that wind direction has an important effect on noise levels at receptors by enhancing or reducing the propagation of noise from the industrial facilities on the Wilton site. This most likely explains the variation between short-term measurements.

8.62 Generally, background noise levels around Lazenby at night-time have reduced from approximately 46 to 41 dB L_{A90} due to the closure of various plants on the Wilton Site over the preceding 10 years. The most recent of which was the closure of the previous power station on the site of the Project.

8.63 Following discussions with RCBC it was agreed that more recent data would be required to reflect the current situation without the power station operating at the closest receptors. Measurements in 2016 and 1 January 2017 through to 4 May 2017 have therefore been included to illustrate these conclusions.

8.3.4 Field Survey Results

Scope of Survey

8.64 As discussed in *Section 8.3.3* it was agreed with RCBC that new survey data were required to supplement that already collected for the Wilton site. The scope of the survey is described below.

- Static continuous monitoring was required on the western most boundary of the Project site for two weeks (at NML 8) to infer/calculate the potential impact on Grangetown at NML 1 (Derwentwater Road) and NML 1a (Shakespeare Avenue) in *Figure 8.1*. This approach was required due to difficulties in setting up unattended equipment at Grangetown to measure directly.

- A minimum of three 30 minute attended readings were required in Grangetown around Shakespeare Avenue (NML 1a in *Figure 8.1*) between midnight and 3:30 am under calm weather conditions during the same period that the continuous monitor was in operation (1).

- 15 minute measurements at seven receptor locations as mentioned in the Environmental Permit (XP3839XV) for the Wilton International site (NML 1, 2, 3a, 4, 5, 6, and 7 in *Figure 8.1*) were required. Three rounds were

(1) Five measurements were made by GT Acoustics at this location to capture different wind directions.

conducted by the Sembcorp Analytical Team and are reported in *Annex F.1*.

8.65 It was also agreed that the long-term noise monitoring at Lazenby should be used to inform the assessment.

8.66 The following sections discuss the results and how they have been used to establish the representative baseline noise levels at each of the NSRs in the assessment.

Grangetown (NSR 1 and 1a)

8.67 As explained above the intended strategy adopted to determine a representative noise baseline at NMLs 1 and 1a equivalent to that from long-term unattended monitoring involved a combination of:

- setting up the unattended noise logger at NML 8; and
- undertaking attended measurements at NML 1a at intervals during the same time period that the unattended noise logger was running.

8.68 The outcomes are discussed below.

8.69 Unattended monitoring was carried out for approximately two weeks from March 28 to 10 April at location NML 8. Half hourly samples were recorded between 22.00 hours and 03.30 (ie the quietest time of night) as agreed with RCBC. The recorded background sound levels are summarised in *Table 8.5*.

Table 8.5 Background Noise Levels (LA90) dB Free-field at NML 8 (unattended monitoring)

Parameter	L_{A90}
Mode (all weather conditions)	43
Max (all weather)	49
Min (all weather)	38

8.70 Although these measurements were made over an extended period, it was not possible to accurately determine the noise levels at Grangetown from measurements recorded at NML 8. This was a result of a number of noise sources affecting the baseline noise in this area. The baseline noise was affected by changeable wind conditions. Ultimately the results of the monitoring have been used in this assessment only to confirm minimum levels of L_{A90}, which occur when the wind is blowing from Grangetown towards the site (ie from the south through to the west), and therefore provide a conservative (ie low) estimate of background noise in the area close to Grangetown.

8.71 The data have been summarised using all of the measurements without filtering out higher wind conditions or the relatively few periods when rain was recorded. The effect is likely to overestimate higher noise levels in

general compared to a night-time period under dry, calm conditions which would normally be required for a BS4142 assessment, but is not expected to materially affect the lowest noise samples.

8.72 Additionally, and as requested by RCBC, two attended surveys were completed.

8.73 The first of the attended noise surveys included attended readings taken over 30 minute periods in Grangetown, at Shakespeare Avenue (NML 1a), between midnight and 3:30 am under calm weather conditions. The measurements were taken by GT Acoustics during the same period that the continuous (attended) monitoring was in operation at NML 8. The results of the attended measurements are presented in *Table 8.6*.

Table 8.6 Background Noise Levels (LA90) dB Free-field at NML 1a (attended monitoring)

Date	Start Time	Wind Direction	Speed m/s	LA90
24/03/2017	00:17:00	ENE	1	44.6
25/03/2017	00:07:00	SSW	4	39.3
03/04/2017	00:07:00	SSW	3	33.7
06/04/2017	00:05:00	W	1	43.5
08/04/2017	00:06:00	S	3	37.3

8.74 The results of the attended readings indicate that industrial noise (which appeared to be mainly from the Wilton International Site) was evident on the 24 March and 6 April but inaudible at other times when the wind was in the prevailing wind direction; from the south and south-south-west. When industrial noise was not evident, traffic noise dominated.

8.75 As discussed above the values were intended to establish a difference to the logger measurements so that the period values at the logger (at NML 8) could be adjusted to provide an equivalent baseline level at Grangetown. However, due to the large number of sources contributing to baseline no single correction could be established that would apply under all wind conditions.

8.76 Despite the difficulties in establishing long term data at Grangetown, it was possible to consider the sample measurements and to draw conclusions from them. It was noted that the main industrial noise source at NML 1a during conditions when the wind was blowing towards Grangetown was the source which is labelled as Operational Plant 1 (OP1) (shown on *Figure 8.1*). The noise levels under downwind conditions (when the wind was blowing towards Grangetown from the OP1 plant ie from the ENE and the W) were approximately 44 to 45 dB L_{A90}, but when the wind was blowing towards OP1 (away from Grangetown ie from the S or SSW directions) the noise levels dropped, to below 40 dB.

8.77 However, since it is the representative background noise level that is required and not the minimum under any circumstances it has been considered

relevant to base the assessment on commonly occurring wind conditions. The prevailing wind direction (from the south) resulted in background noise levels of approximately 37 dB L_{A90}. This wind direction is maintained for 31% of the time based on historic met data that is representative of conditions at the site. For the next most commonly occurring direction (SSW which is experienced for 19% of the time) measurements of 34 to 39 dB L_{A90} were recorded. This results in an arithmetic average value of 37 dB L_{A90}. These indicate typical noise levels that could be expected under stable conditions at night under representative wind directions (ie 37dB L_{A90}). This value is obtained whether the values are averaged together for the two wind directions or for each one and then combined.

8.78 The second attended noise survey that was carried out involved noise measurements that were made by technicians from the Sembcorp Analytical Team (1). The full survey is shown in *Annex E*. The measurements were made over a minimum period of 15 minutes and those that are relevant to Grangetown (NML 1) are reported in *Table 8.7*.

Table 8.7 Background Noise Levels (LA90) dB Free-field at NML 1(attended monitoring)

NSR	Location	Date	Time	Wind Speed m/s	Wind Direction	L_{A90}
1	Derwentwater Road, Grangetown	31/3/2017	00:07:41	4	S	35.5
		07/04/2017	00:29:51	2	SW	39.1
		13/04/2017	00:04:16	2	SW	42.4

8.79 The measurements show varied noise levels. During all samples the wind was from the south or southwest.

8.80 Taking into account the variables of wind direction, speed and location the two attended surveys at Grangetown (NML 1 and NML 1a) show broad agreement. The lowest value in the most commonly occurring wind direction was recorded in the first survey ie 37 dB $L_{A90,}$ compared to 36 dB L_{A90} in the second.

8.81 There was a reduction in noise at NML 1 (and NMLs 2 to 5) (see *Annex E*) during the first round of the second survey which suggested that facilities operating at the Wilton site may have been unusually quiet during this round. Therefore, although the value of 36 dB at NML 1 was 1 dB lower than the 37 dB recorded by GT Acoustics at NML 1a, the value of 37 dB L_{A90} at Grangetown (NML 1a) based on the measurements by GT Acoustics has been adopted as a more representative value.

(1) Using equipment supplied by GT Acoustics

Lackenby (NSR 2) and Lazenby (NSRs 3 and 3a): Based on Unattended Noise Logging at NML3

8.82 The data at the long-term Lazenby noise monitor was used to establish baseline levels at *NSR 3* and *3a*. The equipment monitors the required L_{A90} background noise level in a slightly different way to that specified in the current version of BS 4142, therefore some additional measurements were made to confirm that the difference in methodology did not materially affect the value of $L_{A90.}$ This approach confirmed the validity of baseline data from the long–term noise monitor. Details of this validation are contained in *Annex F.1*.

8.83 The long-term monitoring in the area suggests that since the closure of the former power station, the background can be characterised as 41 dB L_{A90} and this has been agreed with RCBC. The measurements at Lazenby are conducted between midnight and 03.30 hours, during which time contiguous 15 minute measurements of L_{A90} are carried out. The figure of 41 dB that has been adopted in this assessment is equivalent to the 50% percentile of the L_{A90} sample measurements, and is therefore representative of a typical value in the quieter time of night. It is noted that this is likely to be lower than would be obtained by averaging over a longer period of time for instance over complete night-time periods and is therefore conservative. Correspondence with RCBC has suggested that a longer and less stringent baseline averaging period (eg 16 hour daytime and 8 hour night-time) would be accepted. However, the assessment has been based on the available data and focuses on the quietest time of night; this is likely to be a conservative approach as noted above.

8.84 For NSR 2 (Lackenby) the sample levels suggest similar or higher levels than at Lazenby, and a cautious approach has been adopted by using the same L_{A90} as at Lazenby.

Wilton Village (NSR 4) and Yearby Village (NSR 5)

8.85 A similar reduction in the first round of the survey was noted at *NSRs 2* to *5* as noted above (See *Annex E Table E2.1*). At *NSR 4* and *5* an average of the samples taken in the second and third round has been taken resulting in background noise levels of 42 and 45 dB L_{A90}. The lower sample recorded in the first round was not included in the average since it was likely to be unrepresentative of normal operation. This was completed on the same basis as for Grangetown.

Troisdorf Way, Kirkleatham Business Park (NSR 6) and Hobson Avenue, Dormanstown (NSR 7)

8.86 For *NSR 6* and *NSR 7* an average of the measurements at *NML 6* and *NML 7* respectively has been calculated resulting in background noise levels of 44 and 41 dB L_{A90}.

Summary of Representative Baseline Noise Levels

8.87 Based on the above consideration of background noise levels the following representative background levels in *Table 8.8* were adopted for the operational noise assessment.

Table 8.8 Summary of Representative Night-Time Background Sound Levels at NSRs

NSR	Monitoring Location	Representative Background Sound Level, $L_{A90,15mins}$ Night
1	Derwentwater Road, Grangetown	37
1a	Shakespeare Avenue, Grangetown	37
2	High street Lackenby	41
3	Closest properties to site, Lazenby	41
3a	High Street, Lazenby	41
4	Wilton Village	42
5	Yearby Village	45
6	Kirkleatham Business Park	44
7	Hobson Avenue Dormanstown	41

Survey Limitations

8.88 As noted above, it was not possible to monitor long term noise trends at Grangetown directly due to the lack of a secure location at which to locate the noise monitoring equipment. However, the approach taken (ie attended sampling) allowed direct observations to be made of the potential sources of noise and of the wind direction which assisted in the interpretation of the baseline data.

8.89 Although sample measurements form the basis of this assessment they have been taken under controlled conditions and form a robust basis for the assessment.

8.3.5 The Future Baseline

The future noise levels experienced at the noise sensitive receptors for the Project are likely to continue to be mainly influenced by road traffic on nearby main roads and industrial operations on the Wilton International site. There is no reason why these should vary materially from the baseline noise levels presented in this assessment. As local housing stock is replaced and improved it is likely that advances in acoustic insulation will lead to lower noise levels from external sources being experienced inside buildings.

8.4 ASSESSMENT OF IMPACTS AND EFFECTS

8.4.1 Potential Impacts

8.90 During the construction and decommissioning phases, the potential noise effects are from construction plant noise and off-site construction traffic. The effects of operation are expected to be limited to the noise from the operational equipment associated with the construction of the project.

8.4.2 Assessment of Effects during Construction

Construction (on-site Activities)

8.91 The predicted construction noise levels at one metre from the facades of the receptors around the site are presented in *Table 8.9* for the noisiest phase of general construction (construction site preparation) and assuming that driven piling (on the nearest boundary of site) may take place at the same time. This represents the worst case scenario.

Table 8.9 Predicted Construction (Façade) Noise Levels dB L_{Aeq}

Ref	Location	Predicted Noise Level
NSR 1	Derwentwater Road, Grangetown	53
NSR 1a	Shakespeare Avenue, Grangetown	53
NSR 2	High Street Lackenby	51
NSR 3	Lazenby: closest houses to the Project site	55
NSR 3a	High Street Lazenby	52
NSR 4	Wilton Village	46
NSR 5	Yearby Village	40
NSR 6	Troisdorf Way Kirkleatham Business Park	42
NSR 7	Hobson Avenue Dormanstown	41

8.92 The results indicate that the modelled noise levels are below the BS 5228 criterion of 65 dB L_{Aeq} and therefore no significant effects are expected as a result of on-site construction activities.

Off-site Construction Traffic

8.93 Based on the Transport Assessment (*Chapter 10*) an assessment of the traffic increase has been undertaken. Scenario 1 (ie the complete 1,700 MWe development built in a single phase of construction results in larger volumes of traffic than Scenario 2 and is therefore worst case for traffic noise.

8.94 The modelling predicts an increase in noise levels of less than 1 dB(A) on any road link which is used by construction traffic. Since this is below the criterion of 3 dB(A) no significant effect is predicted.

8.4.3 Assessment of Effects during Operation

Initial Estimates of Impacts

8.95 The criteria used to assess noise impacts are discussed in *Section 8.2.3*. First an *initial estimate* of the impact is calculated using the BS 4142 method. Then the context of that estimate is considered for each NSR in turn using the guidance in BS 4142 to determine the effect significance.

8.96 *Figure F2.1* in *Annex F2* shows the noise contours for predicted operational noise levels around the Project for the worst-case Scenario (with both trains on normal operation) and with the level of noise mitigation described in *Section 8.4.7*. The predicted noise levels are listed in *Table 8.10*.

Table 8.10 Predicted Operational Noise Levels from the Project dB LAeq,15 minutes (Free-field)

	Receiver	Normal Operation
NSR 1	Derwentwater Road Grangetown	40
NSR 1a	Shakespeare Avenue, Grangetown	40
NSR 2	High Street Lackenby	39
NSR 3	Lazenby: closest houses to the Project site	40
NSR 3a	High Street Lazenby	37
NSR 4	Wilton Village	32
NSR 5	Yearby Village	28
NSR 6	Troisdorf Way Kirkleatham Business Park	29
NSR 7	Hobson Avenue Dormanstown	28

8.97 Noise levels during start up require the additional operation of a small number of sources, and predictions indicate that overall noise levels are no higher during these phases than during normal operation.

8.98 *Table 8.11* indicates the initial assessment which is required in BS4142. The assessment has been presented for night-time impacts since it has been agreed with RCBC that night-time baseline data should determine the impact of the plant at the most sensitive time of operation. Daytime impacts are expected to be lower given the higher baseline noise levels from traffic and other sources.

Table 8.11 Initial Estimate of Noise Impacts at Night (Free-field, 1st Floor Level) Worst-case

NSR	Predicted Rating Level, $L_{Ar,Tr}$ (1)	Representative Background Sound Level, $L_{A90,15mins}$	Exceedance of Rating Level over Representative Background Sound Level, dB	Initial Estimate of Noise Impact (subject to context)
NSR 1. Derwentwater Road, Grangetown	40	37	+3	Below level indicating adverse impact

NSR	Predicted Rating Level, $L_{Ar,Tr}$ (1)	Representative Background Sound Level, $L_{A90,15mins}$	Exceedance of Rating Level over Representative Background Sound Level, dB	Initial Estimate of Noise Impact (subject to context)
NSR 1a Shakespeare Avenue, Grangetown	40	37	+3	Below level indicating adverse impact
NSR 2. High Street Lackenby	39	41	-2 (2)	Low impact depending on context
NSR 3 Lazenby: closest houses to the Project site	40	41	-1	Low impact depending on context
NSR 3a. High Street Lazenby	37	41	-4	Low impact depending on context
NSR 4. Wilton Village	32	42	-10	Low impact depending on context
NSR 5. Yearby Village	28	45	-17	Low impact depending on context
NSR 6. Troisdorf Way Kirkleatham Business Park	29	44	-15	Low impact depending on context
NSR 7. Hobson Avenue Dormanstown	28	41	-13	Low impact depending on context

1) An acoustic feature correction has not been applied in this assessment because it is most likely that the need for a correction can be avoided during the detailed design and commissioning phases of Project development.
2) The noise levels from the Project are compared to the existing background noise as required by BS 4142. Negative values indicate the plant level is lower than background, rather than a reduction in overall noise.

Consideration of Context

8.99 The representative background sound level occurs largely when receivers are upwind of the Wilton International site, due to the prevailing southerly wind direction. The predicted noise modelled for the Project, however, assumes receptors are downwind (using the ISO 9613-2 method). This results in an expected overly conservative estimation of the actual likely level of noise impact in this assessment, which should be considered as part of the context of the declared noise impact ratings.

8.100 BS 4142 notes that absolute noise levels are relevant, especially at night, since noise effects are likely to be experienced inside buildings during the night.

Impacts at Grangetown (NSR 1 and 1a)

8.101 A number of receptors are situated further from the Project and very low noise levels are predicted. BS 4142 refers to a 2004 paper commissioned by DEFRA (1) which reviews studies carried out relating industrial noise to annoyance. It includes a review of a 2002 report (2) which documents 11 surveys of annoyance from industrial noise, conducted in the Netherlands, involving approximately 2000 residents. Analysis of the data was used to generate a curve for Expected Annoyance (a measure of mean annoyance on the scale 0 – 100), against noise in DENL (3), dB(A). Since the Project will operate continuously (during the day and night), a predicted level of 39 dB(A), Leq, equates to a DENL of 45 dB(A). The dose response curve (Expected Annoyance vs DENL) does not extend to noise levels below DENL 45 dB(A), however, this level results in an Expected Annoyance value of 10 (out of 100). Therefore, annoyance from a level, DENL, of 45 dB(A) is expected to be minimal, and not significant.

8.102 A level of 39 dB(A) is considered to be a low level of noise and although it may be noticeable at times, particularly when background levels are low, this is not expected to result in any significant effects. The noise level is only at or above 39 dB(A) at NSR 1, NSR 1a, NSR 2 and NSR 3. At NSR 1 and 1a the initial assessment indicates that noise levels are below a level which is likely to result in an adverse impact, subject to context. It is also noted that BS4142 suggests that an impact of 10 dB is required for a 'significant' effect, and the predicted noise from the Project is clearly below this level. At NSR 2 and NSR 3 the initial assessment indicated a low potential impact dependent on context.

8.103 To put this into context, these initial assessment results are only expected to occur under the wind conditions when propagation from the OP1 plant is not favourable and background noise is low (ie S or SSW). The predicted noise levels from the Project for this assessment assume downwind propagation (ie from the east towards NSRs 1 and 1a), which means they are higher than under upwind conditions and are a worst case. Since there is only one wind direction at a particular moment, it is not possible that these two conditions can actually exist together. This is therefore a worst case scenario.

8.104 A more common baseline noise level at Grangetown with the wind in the same direction as used for predictions would be 40 to 45 dB L_{A90}, which would reduce the initial assessment of impacts to a 'low' potential for noise impacts.

8.105 The predicted noise level meets the lower end of the range of criteria employed to avoid sleep disturbance (ie 40 to 45 dB(A) from BS 8223). The

(1) Review and analysis of published research into the adverse effects of industrial noise, in support of the revision of planning guidance. B.Berry in association with N.Porter. March 2004.
(2) H M E Miedema, R G de Jong et al. 2002. TNO Inro rapport 2002-53 Relaties tussen geluidbelasting en hinder voor industrie- en rangeerterreinen.
(3) Day, Evening, Night Level

noise resulting from the Project is unlikely to result in sleep disturbance although some noise may be audible outside of the domestic properties. Since it is reasonable to assume that most people are inside their building at night, the impacts are not considered to be significant at any residential location.

Impacts at Other Receptors (NSR 3a, 4 to 7)

8.106 A number of receptors are situated further from the Project and very low noise levels are predicted. The BS 4142 initial assessment in *Table 8.11* shows that there is a 'low' potential for noise impacts. The predicted Project noise levels are also below 39 dB(A) which is likely to be minimal, and not significant as discussed above.

Daytime Impacts (All Receptors)

8.107 As stated above daytime baseline values have not been collected, as agreed with RCBC, however it is anticipated that daytime background noise will be higher as indicated by logging at the Lazenby monitoring station. One minute L_{Aeq} values that are recorded at Lazenby indicate that daytime noise levels are typically 15 to 20 dB higher than those in the middle of the night (see *Annex E*). This would result in the BS 4142 initial estimates of impacts likely to be low at all receptors and noise impacts leading to significant effects at sensitive receptors are not predicted.

Consideration of an Alternative Plant Configuration

8.108 After noise concerns were raised during public consultation, it was decided to model an alternative layout to see if it conferred any benefit in terms of predicted operational noise levels at NSRs. The alternative layout is shown below in *Figure 8.3.*

ALTERNATIVE LAYOUT

Power train runs west to east with stacks located almost in the centre of the plot.

ADOPTED LAYOUT

FUTURE CCR

EXCLUDED FOR ECOLOGY REASONS

MT CE CCR

PHYSIC INSTITUTE

TEMP CONSTRUCTION/LAYDOWN CAR PARKING ONLY

CAR PARK

ADMIN

Rotating the alternative layout 90 degrees anti-clockwise has power trains running south to north with stacks located towards the north west of the plot, the furthest possible point from Lazenby.

Indicative Site Boundary

0 50 100 150 200

Metres

N

SCALE: 1:15,000	VERSION: A01
SIZE: A3	DRAWN: WB
PROJECT: 0375193	CHECKED: RE
DATE: 11/10/2017	APPROVED: RE

Figure 8.3
Alternative and Adopted Site Layouts

ERM

sembcorp

PROJECTION: British National Grid

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukbrsdc02\data\Bristol\Confidential Projects\0375193 TLP2 DCO Support.RE\2. Working Folders\2. GIS\MAPS\PEIR\Fig08.02_0375193_AlternativeAndAdoptedLayouts_A01.mxd

8.109 The differences between the two plant configurations are shown below in *Table 8.12*. The noise differences are relatively small, and are generally 1 dB(A) louder for the alternative layout. There is a larger change (worsening) at NSR 6 (3 dB(A)). The most critical location which is closest to exceeding the adverse impact standard is NSR 1a Grangetown. Noise levels at this location have increased by 1 dB with the alternative layout. At NSR 6 the noise levels go up by 3 dB(A), but at this location the Project noise is clearly below the background noise and noise impacts are not predicted.

Table 8.12 Predicted Operational Noise Levels from the Project dB LAeq, 15 minutes (Free-field) – Normal Operation

Receiver		ES Orientation Noise Levels	Alternative layout noise levels
NSR 1	Derwentwater Road Grangetown	40	40
NSR 1a	Shakespeare Avenue, Grangetown	40	41
NSR 2	High Street Lackenby	39	39
NSR 3	Lazenby: closest houses to the Project site	40	41
NSR 3a	High Street Lazenby	37	38
NSR 4	Wilton Village	32	33
NSR 5	Yearby Village	28	29
NSR 6	Troisdorf Way Kirkleatham Business Park	29	32
NSR 7	Hobson Avenue Dormanstown	28	29

8.110 Since there was no improvement in noise levels for the alternative layout, it was decided to discount it from further consideration.

8.4.4 Assessment of Effects during Decommissioning

8.111 The noise levels during decommissioning are assumed to be similar to / less than those during construction.

8.4.5 Cumulative Effects

8.112 A number of other proposed developments with the potential for cumulative effects were identified during scoping (see *Annex A* Scoping Report) and several were identified for further consideration in regard to cumulative noise effects. These are presented in *Table 8.13*, together with the further assessment of cumulative effects undertaken for noise. The conclusion is that no significant cumulative effects are expected.

8.4.6 Uncertainty

8.113 The variation in background noise as a result of the various industrial uses on the Wilton site has been an important uncertainty in terms of establishing a representative background noise level as required by the operational assessment. This has been dealt with through conducting a comprehensive set

of surveys to better interpret the baseline situation and was completed to a scope of work agreed with RCBC.

8.114 Preliminary data for more than 90 items of plant and equipment (see *Annex F.2*) have been used to predict operational noise levels and it is expected that data will be refined during the detailed design process to allow for any DCO Requirements to be complied with. The types of mitigation that may be required will be developed at that stage, and this assessment is based on achievable noise levels for the key equipment on site based on the current design stage of the Project.

8.115 Construction noise has been predicted based on ERM's experience of construction activities that have occurred on similar major projects. In the absence of a detailed inventory of construction plant on site the assessment has been based on the likely size, nature and numbers of equipment. The noise levels predicted for construction are well within the assessment criterion and it is very unlikely that small variations in actual plant from those used for the prediction would change the conclusion of the assessment.

8.4.7 Summary of Mitigation Measures and Residual Significance of Effects

8.116 *Table 8.14* summarises the impacts where, either due to the significance of effects or requirements to comply with legislation, mitigation may be required. The mitigation is described and the significance of the residual effect after mitigation applied is assessed.

Table 8.13 Cumulative Noise Effects

Application	Location	Status	Description	Potential contribution to cumulative effects	Screened In?	Further assessment	Conclusion
Town and Country Planning Act Applications							
R/2015/0678/OOM	Land at Wilton International Redcar	Pending	Outline application (all matters reserved) for installation of two underground sections of high voltage electrical cables and fibre-optic cable associated with Dogger Bank Teesside A & B offshore wind farms.	0.54 km from Project site, within impact zone, construction noise from this development, could have cumulative effects with construction or operation of the Project.	**Y**	The ES for the onshore works for the wind farms demonstrated that no residential receptors would be affected by construction noise for the cable installation, sub-station construction and horizontal direction drilling works that would occur near the Project site. A supplementary report for re-routing a section made the same conclusion.	No potential for cumulative effects with the Project
R/2012/0757/OOM	Mannion Park Broadway Grangetown	Approved	Project consists of 250 dwellings and around 11,500 square metres of B1 office and light industrial uses. Vehicular access to the development will be taken from the A1085 Broadway; this will involve the provision of a new roundabout access into the site.	0.62 km from the Project site, within impact zone, construction noise from this development, could have cumulative effects with construction or operation of the Project. The nearest sensitive receptor to both sites is housing to the west-	**Y**	Consultation with the local planning officer has revealed that this planning permission has lapsed and this development therefore requires no further consideration.	

Application	Location	Status	Description	Potential contribution to cumulative effects	Screened In?	Further assessment	Conclusion
				southwest of the Project.			
R/2016/0418/FFM	Wilton Waste Treatment Wilton Site Lazenby	Approved	Retention as built of the CSG Wilton facility as a hazardous waste transfer and treatment site for processing a range of hazardous and non-hazardous waste including recovery of waste oils and oil contaminated wastes as well as a biological treatment facility for hazardous liquids.	0.49 km from Project site, within impact zone, construction noise from this development, could have cumulative effects with construction or operation of the Project. The nearest sensitive receptor to both sites is housing to the west-southwest of the Project.	**Y**	Not EIA development, construction noise not considered an issue in environmental documentation that accompanied the application	Unlikely to have potential cumulative effects with the Project
				0.49 km from Project site, within impact zone, operational noise from this development, could have cumulative effects with construction or operation of the Project. The nearest sensitive receptor to both sites is housing to the west-southwest of the Project.	**Y**	Not EIA development, operational noise not considered an issue in environmental documentation that accompanied the application	Unlikely to have potential cumulative effects with the Project
R/2015/0682/FFM	Wilton Waste Treatment ltd Wilton Site Lazenby	Approved	Provision of oil refinery at Wilton Waste Treatment Plant to enable the recovery of lubricating base oils, fuels and other hydrocarbon products from waste oils.	0.49 km from Project site, within impact zone, construction noise from this development, could have cumulative effects	**Y**	Not EIA development, construction noise not considered an issue in environmental	Unlikely to have potential cumulative effects with

Application	Location	Status	Description	Potential contribution to cumulative effects	Screened In?	Further assessment	Conclusion
				with construction or operation of the Project. The nearest sensitive receptor to both sites is housing to the west-southwest of the Project.		documentation that accompanied the application	the Project
				0.49 km from Project site, within impact zone, operational noise from this development, could have cumulative effects with construction or operation of the Project. The nearest sensitive receptor to both sites is housing to the west-southwest of the Project.	**Y**	Not EIA development, operational noise not considered an issue in environmental documentation that accompanied the application	Unlikely to have potential cumulative effects with the Project

Table 8.14 Mitigation and Residual Effects

Phase	Receptor and Impacts	Mitigation Measures	Residual Significance
Construction	NSRs nearest to the construction site, low potential for temporary construction impacts	There are various ways to reduce levels of noise emitted from construction sites that will be used if necessary to reduce construction noise; most of these are standard good practice that would be likely to be adopted anyway for the wellbeing of the workforce. They including the following: • use of models of compressors, generators and pumps fitted with properly lined and sealed acoustic covers or enclosures, which will be kept closed whenever the machines are in use; • fitting of mufflers or silencers of the type recommended by manufacturers;	Not Significant

Phase	Receptor and Impacts	Mitigation Measures	Residual Significance
		• shutting down of machines in intermittent periods between work, or throttling down to a minimum; • housing of stationary noise emitting equipment which is required to run continuously in suitable acoustic enclosures; • maintenance of plant in good working condition to minimise extraneous noises arising from mechanical vibration; and • siting noisy plant and equipment as far away as possible from noise sensitive receptors, and use of barriers (eg site huts, acoustic sheds or partitions) to reduce the level of construction noise at receptors wherever possible. The construction work will also be limited to certain days and times unless otherwise agreed with the Local Planning Authority on a case by case basis as follows: • 0700 and 1900 on weekdays; and • 0800 and 1800 hours on Saturday; save in relation to: • Works involving impact piling or other means of pile driving, which will be limited to 0900 to 1800 hours Monday to Friday and 0900 to 1300 hours on Saturday; and save in relation to: • Works where continuous periods of construction are required such as concrete pouring; • Works comprising non-intrusive and internal activities such as start-up and shut-down, electrical installation, building fit out and non-destructive testing; to which no restriction on hours is considered appropriate or necessary as such activities do not normally give rise to unacceptable levels of noise, or where an entire process has to be carried out in one go, such as concrete pouring and • Delivery of abnormal loads which may cause congestion on the local road network and which it may be more appropriate to carry out outside the hours referred to above; Adherence to such working hours will be secured by way of a requirement in the Development Consent Order which will require compliance with a	

Phase	Receptor and Impacts	Mitigation Measures	Residual Significance
		Construction Environment Management Plan ('CEMP'), a draft of which is contained at *Annex L.* The existing 6m high noise wall will also provide some screening to construction activities at Lazenby.	
Construction	Traffic noise changes at NSRs close to existing off-site roads to be used during construction	No mitigation measures required	Not significant
Operation	Effects of operational noise on NSRs	Layout was chosen to put cooling towers as far away from residents at Lazenby as possible. Gas turbines will be inside buildings and will be within enclosures (typically constructed with 100mm min thick insulation panels). The wall of the HRSG building has been assumed to be acoustically upgraded cladding material. Hybrid cooling towers were chosen because they are quieter than air coolers. Existing 6 m noise wall to be retained between the project and Lazenby. A noise wall (6 m high) has been included in the design along the western boundary of the site in addition to the abovementioned existing noise wall on the southern Project site boundary.	Not significant Potential adverse impacts are not predicted. Noise changers would be limited to external areas at night, and at such times the critical area will be inside of receptor buildings where conditions will be acceptable for sleep.
Operation	Potential for tonal noise	If any audible tonal noise is observed during testing and/or commissioning it will be analysed to identify the cause and corrective measures will be applied. For example it might be necessary to optimise 'delta pressure' on a valve, add or optimise an additional silencer, acoustic insulation, screening or acoustic enclosure on the source responsible. This approach is typical to the 'commissioning stage' of developments such as this and again would be secured by guarantees entered into by the EPC contractor.	Not significant

8.5 CONCLUSIONS

8.117 The Project has the potential to result in noise impacts at the closest residential receptors to the site. These include Grangetown, Lazenby and Lackenby.

8.118 The Project has gone through a process of optimisation initially in terms of site selection then in terms of the configuration of the plant. In response to concerns raised in consultation, an alternative layout was also considered to test whether the arrangement of the equipment on site was optimal one from the perspective of noise effects at the nearest sensitive receptor; it concluded the design proposed by the DCO, and the basis of this noise assessment, is acoustically preferable in terms of levels predicted at NSRs.

8.119 The most important potential impacts are from the operation of the power station which will result in noise from fixed equipment during the night when baseline noise levels are likely to be lowest. These have been mitigated by careful early layout of the site including placing key external sources such as cooling towers as far from receptors as possible, the retention of a noise barrier which provides noise reduction to residents in Lazenby and the provision of a noise barrier on the western site boundary to reduce noise at Grangetown. On-plant mitigation such as placing key items in buildings or enclosures has also been employed. As a result of these embedded mitigation measures the resulting noise levels are not expected to result in significant noise effects.