Environmental Permit Noise Assessment

Kemsley Paper Mill (K4) CHP Plant

For Kemsley CHP Ltd

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Quality Management

Prepared by	Peter Barling BSc(Hons) MIOA	Senior Consultant - Acoustics		04/04/2019
Reviewed & checked by	Stephen Scott MEng MIOA	Senior Acoustic Consultant		04/04/2019
Authorised by	Phil Evans MSc MIOA FGS	Senior Director - Acoustics		04/04/2019
Date of Issue	26/03/2019		**Report Number**	JAE10732_Report01_Rev0

Rev	Date	Status	Comments
0	29/03/2019	Issue	

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1 Introduction

1.1 The Acoustics Team at RPS Planning and Environment (RPS) has been appointed by Kemsley CHP Ltd to undertake a noise assessment of the Kemsley Paper Mill CHP Plant (K4) facility to form part of the application to the Environment Agency (EA) for an Environmental Permit.

1.2 RPS is a member of the Association of Noise Consultants (ANC), the representative body for acoustics consultancies, having demonstrated the necessary professional and technical competence. The assessment has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the Institute of Acoustics (IOA) and ethically, professionally and lawfully in accordance with the Code of Ethics of the ANC.

1.3 The technical content of this assessment has been provided by RPS personnel, all of whom are corporate (MIOA) members of the IOA (the UK's professional body for those working in acoustics, noise and vibration). Personnel and individual qualifications are provided within the Quality Management table at the start of this report and in Appendix A. This report has been peer reviewed within the RPS team to ensure that it is technically robust and meets the requirements of our Quality Management System.

2 Assessment Guidance & Methodology

Horizontal Guidance - H3 Part 2 Noise Assessment and Control

2.1 The purpose of horizontal guidance is to provide information relevant to all sectors regulated under the Environmental permit Regulations on specific environmental aspects. For example, noise, odour, energy efficiency, or protection of land.

2.2 Horizontal guidance has been produced by collaboration between EA, Environment Agency Wales (EAW), the Scottish Environment Protection Agency (SEPA) and the Northern Ireland Environment and Heritage Service (EHS). The purpose of Horizontal Guidance Note H3 for Noise Assessment and Control is to provide supplementary information; describe the principles of noise measurement and prediction; and the control of noise by design, by operational and management techniques and abatement technologies. It assists in determining BAT for a given installation and also covers the basic physics associated with noise and vibration.

2.3 H3 suggests that an initial assessment of the risk to sensitive receptors be undertaken and, if shown to be necessary by the level of risk, a more detailed assessment of the impact should be undertaken. It states that the amount of detail and the effort expended should be proportionate to the degree of risk involved.

2.4 H3 provides a list and brief descriptions of British and International Standards and guidance that it considers relevant to measurement, prediction and assessment of noise. With regards to prediction, it states:

"For industrial noise it is preferable to use those following the principles of ISO 9613-2 1996."

(N.B. ISO 9613-2 contains a method for the prediction of acoustic propagation outdoors.)

2.5 H3 acknowledges that community reaction to noise is complex to assess and affected by multiple factors both noise and non-noise related. It suggests that people are generally less tolerant of industrial and neighbour noise than transportation noise and that some of factors affecting community response are:

- hours of operation (day, night, 24hr, 7day)
- continuous or intermittent sources
- nature of the noise (tones, clatters, hums and the like)
- whether or not the noise is "avoidable" as perceived by the community
- community standing of the Operator (good/bad neighbour)

- response to complaints and other problems
- odour/litter/traffic or other adverse environmental effects
- good/bad employer
- nature of the area

British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound'

2.6 The foreword to BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' [1] provides the following introduction for the assessment of human response to sound:

> *"Response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood."*

2.7 The note to paragraph 8.5 of BS 4142:2014 is relevant to the assessment of the proposed development, and states:

> *"Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation."*

2.8 BS 4142:2014 primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the 'specific sound' from the proposed development) at residential NSRs. The specific sound level may then be corrected for the character of the sound (e.g. perceptibility of tones and/or impulses), if appropriate, and it is then termed the 'rating level', whether or not a rating penalty is applied. The 'residual sound' is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

2.9 The specific sound levels should be determined separately in terms of the $L_{Aeq,T}$ index over a period of 1-hour during the daytime and 15-minutes during the night-time. For the purposes of the Standard, daytime is typically between 07:00 and 23:00 hours and night-time is typically between 23:00 and 07:00 hours.

2.10 BS 4142:2014 states that measurement locations should be outdoors, where the microphone is at least 3.5 m from any reflecting surfaces other than the ground and, unless there is a specific reason

to use an alternative height, at a height of between 1.2 m and 1.5 m above ground level. However, where it is necessary to make measurements above ground floor level, the measurement position, height and distance from reflecting surfaces should be reported, and ideally measurements should be made at a position 1 m from the façade of the relevant floor if it is not practical to make the measurements at least 3.5 m from the facade.

2.11 With regards to the rating correction, paragraph 9.2 of BS 4142:2014 states:

"Consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention."

2.12 The commentary to paragraph 9.2 of BS 4142:2014 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds:

"Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a rating penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Other sound characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. … If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

2.13 BS 4142:2014 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound

level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period is because it can be subject to a wide variation in background sound level between the shoulder night periods. The accompanying note to paragraph 8.1.4 states that:

> *"A representative level ought to account for the range of background sounds levels and ought not automatically to be assumed to be either the minimum or modal value."*

2.14 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level of the specific sound. In the context of the Standard, adverse impacts include, but are not limited to, annoyance and sleep disturbance. Typically, the greater this difference, the greater is the magnitude of the impact:

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

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

2.15 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant 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, depending on the context.

3 Assessment

Baseline Conditions

3.1 The K4 facility is located at Kemsley Paper Mill, Sittingbourne, Kent. The site is bounded to the west by the paper mill, to the east by The Swale and to the north and south by Kemsley Marshes. The nearest residential receptors approximately 600 m to the west, within the residential area of Kemsley.

3.2 The A249 is located approximately 2 km to the north and west of the site and is accessed via Swale Way. The A249 connects with both the A2 west of Sittingbourne and the M2 at Junction 5 approximately 8 km south of the site. To the north, the A249 provides access to the Isle of Sheppey.

3.3 Baseline acoustic survey data was gathered in 2016 to inform the noise assessment as part of the original DCO planning process. Baseline sound measurements were carried out between Tuesday 7th June and Tuesday 14th June 2016 at 41 Reams Way and 97 Walsby Drive. It is considered that these locations are representative of the nearest neighbouring residential areas.

3.4 Table 3.1 below provides a summary of the representative baseline levels determined by survey and as used in the DCO noise assessment. The representative level has been determined by consideration of the survey data to provide a level indicative of the quieter times during the survey period. This is considered a robust approach.

Table 3.1 Summary of Baseline Data

NSR	Survey Location	Period	Representative Background Sound Level $L_{A90,T}$ (dB)	Background Sound Levels $L_{A90,T}$ (dB)	Residual Sound Level $L_{Aeq,T}$ (dB)
Reams Way	LT1	07:00 - 23:00	49	40 – 62	60 - 64
		23:00 - 07:00	43	38 – 56	54 - 59
Walsby Drive	LT2	07:00 - 23:00	39	32 – 49	47 - 51
		23:00 - 07:00	35	30 – 48	45 - 51

3.5 Within this assessment, the minimum representative day and night-time levels are used; i.e. 39 dB $L_{A90,day}$ and 35 dB $L_{A90,night}$. These are considered to provide the basis for a robust assessment and reflect the context of the proposal within the wider area.

Calculation of Specific Sound Levels

3.6 In order to determine the specific sound levels resulting from the operation of the K4 facility at NSRs, a 3-D noise model has been built using SoundPlan v7.4 noise modelling software. The model predicts noise levels at NSRs under light down-wind conditions based on hemispherical propagation, atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613:1996 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation' [2].

3.7 A summary of noise generating plant items and buildings/rooms included within the model are outlined below. Full details are provided in Appendix B. Note that specific acoustic data has been provided by the client for the majority of the significant plant that will be installed; where this has not been provided, data has been used based on professional judgement of assessing similar schemes.

- Generator & Gas Turbine Building (20 x 8 x 9 m);
- Heat Recovery Steam Generator (HRSG) building (28 x 15 x 32 m);
- HRSG Stack @ 70 m above ground level (AGL);
- Boiler Stack @ 35 m AGL;
- Gas Reduction Station;
- Gas Filter;
- Gas Heaters;
- Condensate Pumps;
- 28# Dump Condenser Fans;
- Boiler Water Feed Pumps;
- Start Transformer;
- Block Transformer;
- EB Transformer;
- Package Boiler House Building (8 x 4.5 x 5 m);
- Fin Fan Coolers; and
- Turbine Hall Building (16 x 23 x 15 m).

3.8 The following generic assumptions have been incorporated into the noise model:

- the topography of the site and the surrounding area has been obtained from site surveyed topographical data and Ordnance Survey (OS) Terrain 50 open data;
- the effect of screening from solid structures (buildings) has been incorporated into the modelling process by importing OS Open Data 'Settlement Area' shape file data into the model;
- the ground type in the model has been set to hard for the site (G=0), and soft for the wider area (G=1); and

- NSRs have been modelled at 1.5 m and 4 m above ground level, in free-field conditions.

Assessment

3.9 Specific sound levels associated with the operational K4 facility have been calculated at the nearest NSRs. As detailed in paragraph 2.14, character corrections can be applied to the specific sound level depending on the acoustic characteristics of the sound.

3.10 On the basis that noise emissions from plant and activities are not tonal or impulsive, would operate continuously and that predicted specific sound levels at NSRs are sufficiently low such that noise emissions would not be readily distinctive, a character correction is not considered to be applicable in this instance and the rating sound level is equal to the specific sound level.

3.11 Table 3.2 and Table 3.3 below provide the initial estimate of impact at the nearest identified NSRs due to the operation of the proposed development during daytime and night-time periods respectively, in accordance with BS 4142:2014. The predicted specific sound levels are taken at first floor level, representative of the free-field level in that location. Figure 2 at the end of the report provides a grid noise map of specific sound levels at 4 m AGL.

Table 3.2 Assessment (Daytime)

NSR	Specific Sound Level $L_{Aeq,Tr}$ (dB)	Rating Penalty (dB)	Rating Level $L_{Ar,T}$ (dB)	Background Level $L_{A90,T}$ (dB)	Rating / Background Level Difference (dB)
Marsh Rise	36	0	36	39	-3
Reams Way	34	0	34	39	-5
Reams Way N	35	0	35	39	-4
Reams Way S	35	0	35	39	-4
Recreation Way N	36	0	36	39	-3
Recreation Way S	35	0	35	39	-4
Walsby Drive N	36	0	36	39	-3
Walsby Drive S	38	0	38	39	-1

Table 3.3 Assessment (Night-time)

NSR	Specific Sound Level $L_{Aeq,Tr}$ (dB)	Rating Penalty (dB)	Rating Level $L_{Ar,T}$ (dB)	Background Level $L_{A90,T}$ (dB)	Rating / Background Level Difference (dB)
Marsh Rise	36	0	36	35	+1
Reams Way	34	0	34	35	-1
Reams Way N	35	0	35	35	0

NSR	Specific Sound Level $L_{Aeq,Tr}$ (dB)	Rating Penalty (dB)	Rating Level $L_{Ar,T}$ (dB)	Background Level $L_{A90,T}$ (dB)	Rating / Background Level Difference (dB)
Reams Way S	35	0	35	35	0
Recreation Way N	36	0	36	35	+1
Recreation Way S	35	0	35	35	0
Walsby Drive N	36	0	36	35	+1
Walsby Drive S	38	0	38	35	+3

3.12 With reference to Table 3.2 and Table 3.3 above, rating/background level differences are between -5 and -1 dB during the daytime and -1 and +3 dB during the night-time. With regards to the rating/background level difference and the likelihood for adverse impact BS 4142:2014 states the following:

> *"A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant 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, depending on the context."*

3.13 As rating levels do not exceed 5 dB above background it is considered that adverse impacts would be unlikely at any time. Furthermore, with reference to Table 3.1, maximum rating sound levels of 38 dB $L_{Ar,Tr}$ are at least 7 dB below the lowest night-time residual level at NSRs of 45 dB $L_{Aeq,T}$, and as such noise from the K4 facility would not result in a significant increase in the overall ambient noise level.

3.14 On the basis of the above, it is considered that there is a minimal risk of adverse impact at NSRs associated with the operation of the new K4 facility.

3.15 In addition to the new items of noise generating plant and buildings that will be introduced as part of the K4 facility there are two other existing buildings that form part of this permit application, specifically the auxiliary boiler room and 'water treatment plant' (WTP) building. These buildings fall under the existing permit (EPR/BJ7395IG) for the Kemsley Paper Mill CHP. Section 3.4 of the permit 'Noise and vibration' states that:

> *"Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration."*

3.16 The auxiliary boilers provide heat in the case when the CHP facility is offline and would only be in operation for around 500 hours/year.

3.17 As part of the overall K4 development the existing plant items will be replaced with newer equipment, and with regard to the boiler plant, the overall capacity will be reduced from over 100 MW to below 100 MW.

3.18 On the basis that the existing auxiliary boiler room plant and WTP are currently permitted, only run for limited periods, and will be modified such that noise emissions from will be reduced, these aspects of the permit application are considered to not increase the risk of adverse noise impact at NSRs.

4 Summary & Conclusions

4.1 The Acoustics Team at RPS Planning and Environment (RPS) has been appointed by Kemsley CHP Ltd to undertake a noise assessment of the Kemsley Paper Mill CHP Plant (K4) facility to form part of the application to the Environment Agency for an Environmental Permit.

4.2 An assessment has been undertaken in accordance with the methodology contained within British Standard (BS) 4142:2014 'Methods for rating and assessing industrial and commercial sound'. Baseline sound levels were determined from two surveys at locations representative of the nearest noise sensitive receptors (NSRs) to the proposed development. Specific sound levels from the proposed development operations have been predicted based on a 3D sound model and input acoustic data provided by Kemsley CHP Ltd.

4.3 The results of the assessment show that there is a minimal risk of adverse noise impact at NSRs.

Figures

Figure 1: Baseline Survey Locations

Project Number	JAE10732_Report01_Rev0	Project Title	KEMSLEY PAPER MILL (K4) CHP PLANT		
Client:	For Kemsley CHP Ltd	Rev : 0		Drawn By:	PB
		Date: 03/19		Checked By:	SS
File location:					

Notes
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MAKING COMPLEX EASY
6-7 Lovers Walk
Brighton East Sussex BN1 6AH
T 01273 546800 F 01273 546801
E rpsbn@rpsgroup.com W rpsgroup.com
rpsgroup.com/uk

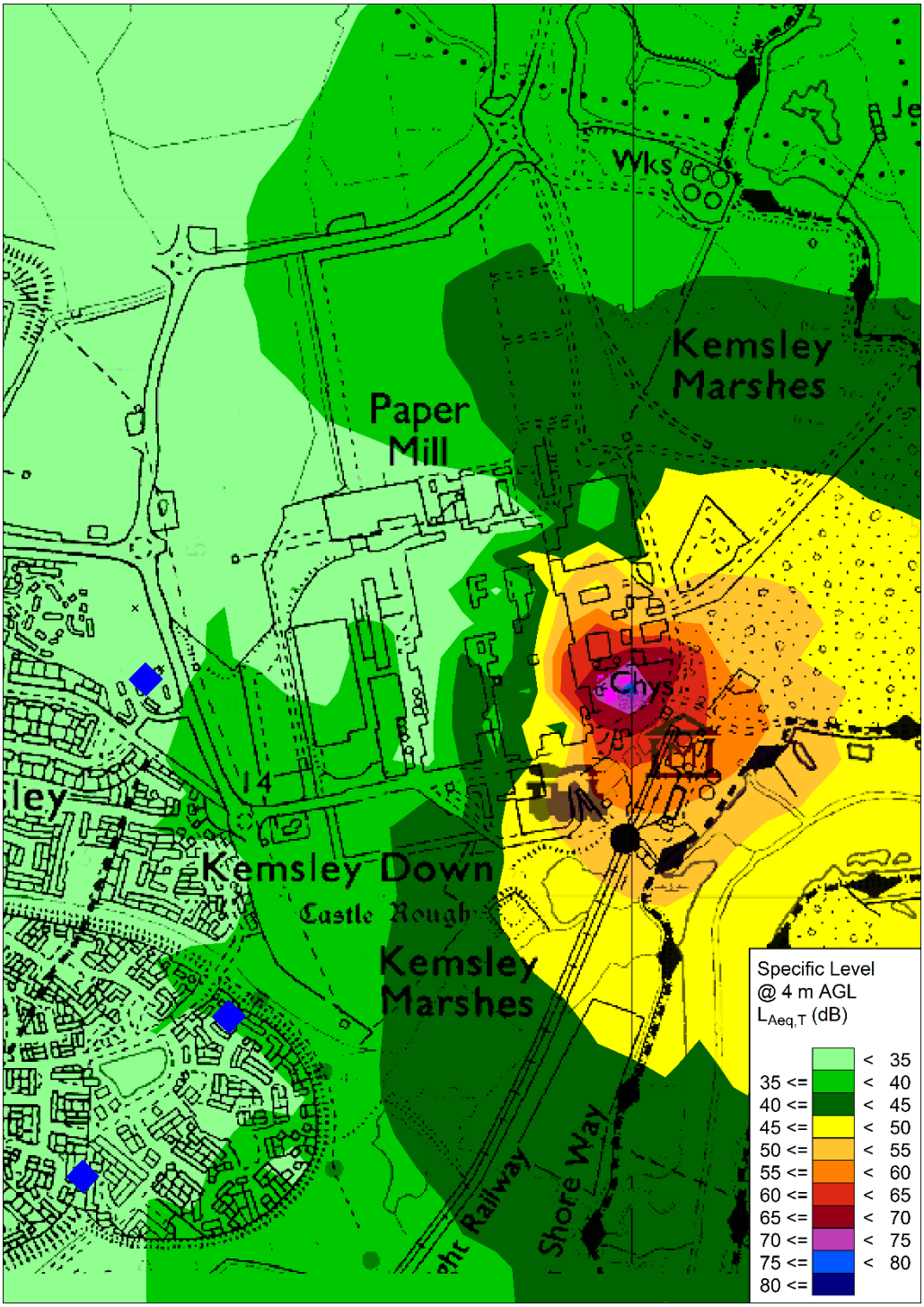

Figure 2: Predicted Specific Sound Levels

Project Number	JAE10732_Report01_Rev0	Project Title	KEMSLEY PAPER MILL (K4) CHP PLANT		
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MAKING COMPLEX EASY
6-7 Lovers Walk
Brighton East Sussex BN1 6AH
T 01273 546800 F 01273 546801
E rpsbn@rpsgroup.com W rpsgroup.com
rpsgroup.com/uk

Appendices

Appendix A: Personnel and Individual Qualifications

Phil Evans – Senior Director Acoustics

BSc (Hons) Geology; MSc Acoustics, Vibration and Noise Control; Fellow of the Geological Society; Member of the Institute of Acoustics; Associate Member Acoustical Society of America

A.1 Phil is a Senior Director and leads the RPS Acoustics Team in Brighton. He is a specialist in environmental acoustics and is active on a number of committees including the Association of Noise Consultants' Vibration Working Group; British Standards Institution (BSi) Committee GME/21/6/4 - BS 6472: Guide to Evaluation of Human Exposure to Vibration in Buildings; BSi Committee B/564/01 on BS 5228: Noise and Vibration Control on Construction and Open Sites which has now also revised and issued BS 8233:2014 Guidance on sound insulation and noise reduction in buildings. He has been a corporate Member of the Institute of Acoustics (MIOA) for over 20 years.

A.2 Phil has over 25 years' experience in the project management of, and technical input to, environmental noise and vibration impact assessments for major developments. He is an expert in the industrial/commercial, transportation and construction sectors including the measurement, calculation, evaluation and mitigation of environmental noise and vibration. Phil has significant experience in the preparation and presentation of technical evidence and reports for public inquiries and planning applications. He is experienced in consultation and liaison with government departments, local authorities and other statutory bodies. He is an experienced expert witness. He has a Continuous Professional Development Record to support this competency and experience.

A.3 Phil has been involved in many BS 4142 noise assessments for both the previous and current 2014 version of BS 4142. He has given evidence at public inquiries where BS 4142 has been the primary assessment methodology. He is very familiar with the Standard and attended the joint ANC/BSi launch of the 2014 version of the Standard. On the basis of Phil's overall experience in acoustics combined with particular focus on BS 4142, he is deemed competent for BS 4142 assessments.

A.4 For this project Phil has taken on the role of Project Director responsible for overseeing and delivering the project.

Peter Barling – Senior Acoustic Consultant

BSc (Hons) Physics; PGDip Environmental Assessment and Management; Member of the Institute of Acoustics

A.5 Peter is an Acoustic Consultant and environmental acoustics specialist with 5 years' experience. He has a Degree in Physics and also has a Post Graduate Diploma in Environmental Assessment and Management. He has been a member of the Institute of Acoustics since 2013.

A.6 Peter has project managed and undertaken noise assessments for a variety of developments, including: large scale mixed-use developments, incorporating commercial, retail, leisure and residential elements; on-shore substations for off-shore windfarms; energy from waste facilities; manufacturing facilities; distribution centres; retail units; minerals extraction and exploration; solar farms; and petrol service filling stations. He has provided input into Environmental Impact Assessments (EIAs) and undertaken noise assessments to support planning applications and discharge planning conditions. He has a Continuous Professional Development (CPD) Record to support this competency and experience.

A.7 Within the past two years Peter has been involved BS 4142 noise assessments for both the previous and current 2014 version of BS 4142. He is familiar with the Standard and has attended and participated in RPS CPD training seminars regarding the revised 2014 version of the Standard. On the basis of Peter's overall experience in acoustics, combined with particular focus on BS 4142 and with the assistance of more experienced colleagues, he is deemed competent for BS 4142 assessments.

A.8 For this project Peter has been responsible for preparing the report, figures and appendices; and reviewing the assessment and modelling.

Appendix B: Model Input Data

References

1 British Standards Institution. British Standard 4142:2014. Methods for rating and assessing industrial and commercial sound.

2 ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.