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INTRODUCTION

- 9.1 This chapter of the ES considers the potential for the construction and operation of the proposed Parc Adfer ERF to impact upon the noise environment in the vicinity of the application site (which has been described in Chapter 2 above). The chapter describes the scope, relevant legislation, assessment methodology and the baseline conditions existing around the application site.
- 9.2 The chapter assesses the potential environmental effects the proposals, which have been described in Chapter 3 of this Volume, would have on the baseline environment. It then considers the mitigation measures required to prevent, reduce or offset any significant adverse impacts (should they be identified) and the likely residual effects after these measures have been employed.
- 9.3 Technical terms or references are occasionally used in this section. To assist the reader, a glossary of terminology, including a table of example noise levels that may be found in general life, are included in Appendix 9/1.

Government advice, standards and good practice

British Standard 4142:1997

- 9.4 British Standard 4142:1997 “*Method for rating industrial noise affecting mixed residential and industrial areas*” is intended to be used to assess whether noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, is likely to give rise to complaints from people residing in nearby dwellings.
- 9.5 The procedure contained in BS4142:1997 for assessing the likelihood of complaints is to compare measured or predicted noise levels from the source in question immediately outside the dwelling, the ‘*specific noise level*’, with the background noise level.
- 9.6 The standard is not suitable for the assessment of complaint when the background and rating noise levels are both very low; very low background noise levels are defined as those below 30dB L_{A90} and very low rating noise levels are defined as those below 35dB $L_{Ar,T}$. The specific noise level is measured or predicted in terms of a $L_{Aeq,T}$ value and the background noise level is measured in terms of a L_{A90} value (refer to Appendix 9/1 for definitions).
- 9.7 Where the specific noise contains a ‘*distinguishable discrete continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks, clatters or thumps), or if the noise is irregular enough to attract attention*’ then a correction of +5dB is added to the specific noise level to obtain the ‘rating level’, or $L_{Ar,T}$.

- 9.8 The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS4142:1997 states:

“A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely.”

BS5228:2009

- 9.9 British Standard 5228:2009 “Code of practice for noise and vibration control on construction and open sites, Part 1: Noise” sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities.

- 9.10 Noise levels generated by construction operations and experienced at local receptors will depend on a number of variables, the most significant of which are:

- the sound power outputs of processes and plant;
- the periods of operation of processes and plant;
- the distance between the source and the receptor;
- the presence of screening by buildings or barriers;
- the potential reflection of sound; and
- soft ground attenuation.

- 9.11 BS5228-1:2009 gives several examples of acceptable limits for construction noise. The most simplistic being based upon the breach of fixed noise limits and BS5228-1:2009 states in paragraph E.2:

“Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut.”

- 9.12 Paragraph E.2 goes on to state:

“Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

- 70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;
- 75 decibels (dBA) in urban areas near main roads in heavy industrial areas.

These limits are for daytime working outside living rooms and offices.”

- 9.13 As Parc Adfer is located in an area which is primarily industrial in nature, it is considered the 70dB(A) limit would be most appropriate for use in this assessment.

- 9.14 BS5228-1:2009 also sets out a method for predicting noise levels generated by mobile plant using a well-defined haul route such as an access road. For

the purpose of this assessment, and due to low traffic flow numbers associated with the proposed development, noise levels for traffic movements have been calculated using this method.

- 9.15 The general expression for predicting the L_{Aeq} alongside a haul road used by single-engined vehicles is:

$$L_{Aeq} = L_{WA} - 33 + 10\text{Log}_{10}Q - 10\text{Log}_{10}V - 10\text{Log}_{10}d$$

Where:

- L_{WA} is the sound power level of the plant, in decibels (dB);
- Q is the number of vehicles per hour;
- V is the average vehicle speed in kilometres per hour (km/h);
- d is the distance or receiving position from the centre of the haul road, in metres (m).

- 9.16 An angle of view correction is also applied where appropriate by using the following expression:

$$A = 10\text{Log}_{10}(a_v/180)$$

- 9.17 The noise modelling software used for the predictions (CadnaA¹) for this assessment uses both of these expressions when calculating noise levels from haul roads.

- 9.18 BS5228:2009 Part 2 *Vibration* gives recommendations for basic methods of vibration control relating to construction sites where work activities/operations generate significant levels of vibration.

- 9.19 BS5228-2:2009 indicates that the majority of people are known to be very sensitive to vibration with the threshold of perception being typically in the peak particle velocity (PPV) range 0.14mms^{-1} to 0.30mms^{-1} . Vibration levels above these values can cause disturbance.

- 9.20 Table 9-1 outlines the guidance on the effects of vibration outlined in BS5228-2:2009

Table 9-1
Guidance on the Effects of Vibration Levels

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

¹ CadnaA Version 4.4.145, DataKustik GmbH

BS7385:1993

- 9.21 British Standard 7385:1993 “*Evaluation and measurement for vibration in buildings - Part 2: Guide to damage levels from groundborne vibration*” provides guidance on the transient vibration values for cosmetic damage in buildings which is shown in Table 9-2.

Table 9-2
Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4Hz to 15Hz	15Hz and above
Unreinforced or light framed structures, residential of light commercial buildings	15mms ⁻¹ at 4Hz increasing to 20mms ⁻¹ at 15Hz	20mms ⁻¹ at 15Hz Increasing to 50mms ⁻¹ at 40Hz and above

- 9.22 BS7385-2:1993 states that:

“A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive”.

Calculation of Railway Noise - 1995

- 9.23 The technical memorandum “*Calculation of Railway Noise*” (CRN) (1995), published by the Department of Transport, sets out the current method for calculating the noise levels generated by railways at nearby residential properties. The guidance only considers noise generated by moving railway vehicles.
- 9.24 For the purpose of this assessment, all calculations relating to noise generated by railway movements have been made using CadnaA.

Design Manual for Roads and Bridges

- 9.25 The “*Classification of Magnitude of Noise Impacts in the Long Term*” guidance values contained in Table 3.2 of the “*Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7*” have been referenced in this assessment in relation to the potential changes in road traffic noise levels as a result of the operational use of the proposed Parc Adfer.
- 9.26 Although not strictly applicable to other noise sources, i.e. those of an industrial nature, the guidance has also been referenced for the cumulative impact of all operations.
- 9.27 The impact scale adopted in this assessment is shown in Table 9-3 below.

Table 9-3
Classification of Magnitude of Noise Impacts

Noise Level Change dB(A)	Subjective Response	Magnitude of Impact
0	No change	No Change
0.1 – 2.9	Barely perceptible	Negligible
3.0 – 4.9	Noticeable	Minor
5.0 – 9.9	Up to a doubling or halving of loudness	Moderate
10.0 or more	More than a doubling or halving of loudness	Major

9.28 The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB(A) change in noise represents a doubling or halving of the noise level. It is considered that the criteria specified in the above table provide a good indication as to the likely significance of changes on noise levels in this case and have also been used to assess the impact of the operational noise.

ISO9613

9.29 The noise levels generated by the operation of fixed plant at the proposed Parc Adfer ERF have been predicted in accordance with the noise prediction framework set out in ISO 9613-2 *Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation*.

9.30 The model takes into account the distance between the sources and the receptors and the amount of attenuation due to atmospheric absorption.

9.31 The model also assumes downwind propagation, i.e. a wind direction that assists the propagation of noise from the source to all receptors.

AQTAG09

9.32 AQTAG09 provides guidance to assist planning officers involved with applications for installations with relevant noise emissions and relate these to the requirements of the habitat regulations.

9.33 The habitat regulations specify that where specific noise from industry, measured at the habitat/nest site is below the levels indicated in Table 9-4 it is considered unlikely that it will have an adverse impact on designated species. Where levels are exceeded further, more detailed assessment will be required.

Table 9-4
Specific Noise Levels at Habitat/Nesting Site

Parameter	Noise Level, dB
$L_{Amax,F}$	80.0
$L_{Aeq,1hr}$	55.0

APPROACH TO THE ASSESSMENT

Sources of Information

- 9.34 Information regarding the proposed Parc Adfer ERF, including the fixed and mobile plant to be employed, operational hours and proposed vehicle movements to and from the site has been provided by the applicant and/or their sub-consultants or has been assumed based on SLR's experience with similar sites in the UK.

Methodology

- 9.35 The noise assessment has been carried out in accordance with national guidance and the relevant British Standards and considers the likely noise levels that would be generated by the proposed development at the identified nearby noise-sensitive receptors.
- 9.36 The proposed Parc Adfer ERF would be operational 24 hours per day, 7 days per week. Vehicle movements associated with the facility would not be limited to a particular time of day however there are no heavy goods vehicle or waste delivery movements are envisaged on Bank/Public Holidays.
- 9.37 It should be noted that the application site is located in an already heavily industrialised area with several factories (such as UPM Shotton Paper Mill and TATA Steel) and industrial estates within Deeside Industrial Park; such industrial premises are located close to the application site and, in some cases, closer to nearby noise-sensitive receptors than Parc Adfer. There are also major transport routes in the vicinity of the application site including the A494 and A548 roads, together with a railway line crossing the River Dee at Hawarden Bridge and passing adjacent to the application site. It is therefore considered that the area around the application site is not particularly noise-sensitive.
- 9.38 An assessment has been made of the baseline situation and the potential impact of the proposals. Environmental impacts have been identified and where appropriate, mitigation measures and/or scheme changes to offset potentially adverse environmental impacts have been identified.
- 9.39 Noise levels during the operation of the proposed Parc Adfer ERF have been calculated and assessed using the procedures of BS4142:1997 for the fixed plant. The heavy goods vehicle noise has been calculated using the procedures of BS5228-1:2009 and has been assessed against the existing ambient noise levels.

BASELINE CONDITIONS

- 9.40 Environmental noise surveys were undertaken in November 2012 and June 2014 to capture the prevailing noise climate at accessible noise-sensitive locations nearest to the application site. The measurement locations chosen were considered representative of the most sensitive locations, i.e. those located away from the main sources of noise in area.

- 9.41 The surveys were undertaken on Thursday 15th and Friday 16th November 2012 covering both the daytime and night-time periods and on 8th June 2014 to cover Sunday daytime. The survey methodology and results are set out below.
- 9.42 The noise monitoring locations are considered as being representative of the nearest noise-sensitive locations to the application site, i.e. those located away from the existing noise generating sources. These are shown on Drawing PA 9/1 (contained in Appendix 9/2).
- Location 1: Burton Point Farm, approximately 2,150m to the north;
 - Location 2: Barn Farm, approximately 1,875m to the northeast; and
 - Location 3: Sealand Avenue, approximately 2,300m to the southeast.
- 9.43 At the measurement positions the following noise level indices were recorded:
- LAeq,T – The A-weighted equivalent continuous noise level over the measurement period.
 - LA90 – The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise.
 - LA10 – The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise.
 - LMax – The maximum A-weighted noise level during the measurement period.
- 9.44 The noise monitoring equipment used during the surveys is detailed in Table 9-5. All noise monitoring equipment was calibrated before and after the measurements and no calibration drifts were found to have occurred. The equipment had been calibrated to a traceable standard by UKAS-accredited laboratories within the 24 months preceding the surveys.

Table 9-5
Noise Monitoring Equipment

Location	Equipment	Serial Numbers
All Locations	Norsonic Nor-140 Type 1 sound level meter	1403009
	Norsonic Type 1251 acoustic calibrator	31821

- 9.45 The weather conditions during the survey periods were acceptable for noise monitoring, being dry with very little wind. The microphone was placed 1.5m above the ground in free-field conditions, i.e. at least 3.5m from the nearest vertical, reflecting surface.
- 9.46 The results of the noise surveys are presented in full in Appendix 9/3 and are summarised in Table 9-6.

Table 9-6
Summary of Measured Noise Levels, free-field, dB

Location	Period	L _{Aeq,T}	L _{A90}	L _{A10}	L _{Amax}
Burton Point Farm	Sunday	43.8	36.0	45.7	68.2
	Daytime	45.6	38.7	45.8	62.6
	Night-time	39.8	36.7	39.9	63.8
Barn Farm	Sunday	43.2	37.9	45.0	66.7
	Daytime	47.7	44.8	48.5	69.2
	Night-time	39.3	37.4	40.9	47.5
Sealand Avenue	Sunday	52.2	49.3	53.7	69.4
	Daytime	52.7	47.5	53.6	73.9
	Night-time	43.2	40.1	45.4	54.5

Noise Climate

Location 1: Burton Point Farm

- 9.47 The weekday daytime noise climate at Burton Point Farm comprised distant and local road traffic, distant industry (considered to be the nearby paper mill operated by UPM), occasional air and rail traffic and local activities at the nearby farm. Natural sounds such as birdsong and livestock could also be heard occasionally. Industrial noise was not audible during the Sunday surveys.
- 9.48 The night-time noise climate comprised distant and, very occasional, local road traffic and distant industry (considered to be UPM). Natural sounds from the nearby farm could also be heard occasionally.

Location 2: Barn Farm

- 9.49 The daytime noise climate at Barn Farm comprised distant and local road traffic, distant industry (considered to be UPM), occasional air and rail traffic and local activities at the nearby farm. Natural sounds such as birdsong, dogs barking and livestock could also be heard occasionally. Industrial noise was not audible during the Sunday surveys.
- 9.50 The night-time noise climate comprised distant and, very occasional, local road traffic and distant industry (considered to be from UPM). Natural sounds from the nearby farm could also be heard occasionally.

Location 3: Sealand Avenue

- 9.51 The daytime noise climate at Sealand Avenue comprised road traffic, industrial noise from Garden City Industrial Estate (on the weekday) and occasional air traffic. Natural sounds such as birdsong and dogs barking could also be heard occasionally. Industrial noise was not audible during the Sunday surveys.

- 9.52 The night-time noise climate comprised distant road traffic and distant industry (considered to be from UPM).

ENVIRONMENTAL DESIGN MEASURES

- 9.53 The layout of Parc Adfer has been designed in such a way that external activities are screened from the majority of nearby noise-sensitive receptors by either the intervening landforms, existing screening mounds/bunds or by existing buildings and buildings within the development.

POTENTIAL IMPACT

Receptor Locations

- 9.54 In addition to the noise monitoring locations, two other locations have been identified for consideration in the assessment; in particular the proposed development known as 'The Airfields', Deeside. This development has been designated as a strategically important employment site with industrial, commercial and residential elements. The current masterplan shows residential development directly to the north and west of Sealand Avenue extending approximately 300m nearer to the application site. A notional receptor "The Airfields" has been used as the approximate location of the nearest proposed residential receptor for the purpose of this assessment with the baseline measurements taken at Sealand Avenue considered representative of this location.
- 9.55 To the north of the application site there are three potentially noise-sensitive receptors, Barn Farm, Burton Point Farm and Burton Mere House. Burton Mere House was not accessible at the time of the surveys therefore measurements made at Barn Farm have been used as being representative of this location.
- 9.56 The village of Burton is considered less noise-sensitive than the properties above due the road running through the village and due to the greater distance from the application site than Barn Farm for example.
- 9.57 It is considered that properties at Shotwick, to the east of the application site are not noise-sensitive to Parc Adfer due to their proximity to the M56/A550/A494 interchange and Deeside Industrial Park. It is also considered that properties at Connah's Quay are less noise-sensitive than those at Sealand Avenue, Garden City, due to the local road network and intervening industrial premises between the village and the site.
- 9.58 Whilst industrial premises are located closer to the application site than the residential receptors identified above, they are not considered to be noise sensitive.
- 9.59 The assessment will therefore consider the noise impacts at the following locations:
- Location 1 - Burton Point Farm;
 - Location 2 - Burton Mere House;

- Location 3 - Barn Farm;
- Location 4 - Sealand Avenue; and
- Location 5 - The Airfields.

Construction Noise

- 9.60 Noise levels generated by construction works have been predicted and assessed in accordance with the guidance contained in BS5228-1:2009 as stated above. Although the nearby receptors are bounded by busy roads and industrial uses, it is considered that to provide the best level of protection from noise generated by construction works the lower limit of 70dB $L_{Aeq,1hr}$ would be appropriate for use in the assessment.
- 9.61 It is inevitable with developments of this nature that construction works will cause some disturbance to those living nearby; this would also apply for most other forms of development. However, disruption due to construction works is a localised phenomenon and is temporary in nature. In general, only people living within 100 to 200m of the site boundary are likely to be seriously impacted by construction noise. As such, in the case of Parc Adfer, there are no sensitive receptors within this distance.
- 9.62 An estimate of the likely effects of noise from construction activities has been made for those properties described in paragraph 9.58 above. The predicted noise levels are based on the methodology contained in BS5228-1:2009 over the core working day and reflect the currently available information for the proposed development.
- 9.63 The assumed plant to be used in each construction activity is shown in Table 9-7.
- 9.64 It is acknowledged that there may be other sub-phases of the construction works. However, in the absence of detailed information pertaining to how these sub-phases are likely to be carried out, the three main phases assessed are considered to give a good indication of the likely impact during the construction works.
- 9.65 Construction operations would be undertaken during the daytime only, therefore predictions of the likely levels of noise generated at ground floor level for each phase of work have been made to the façade that faces the site. The predictions are based on downwind propagation and 100% hard ground between the noise sources and the receptor locations and 100% on-time for all the plant to provide for a worst case assessment. The attenuation provided by existing off-site buildings has also been considered. The predicted noise levels are set out in Table 9-8.

Table 9-7
Assumed Construction Plant

Operation	Plant	No. Of Plant	Sound Power Level, L_{WA} dB
Site Preparation	Tracked Excavator	2	108
	Grader	2	104
	Articulated Dumper	4	108
	Dozer	2	109
Piling Operations	Piling Rig	2	115
	Concrete Truck Pouring	3	108
	Concrete Pump	3	107
Building Foundations & Erection	Mobile Crane	3	110
	Tracked Excavator	2	108
	Compressor	4	92
	JCB 520-40 Tele-handler	2	99
	Generator	4	93

Table 9-8
Predicted Construction Noise Levels, free-field, dB

Location	Site Preparation	Piling	Building Erection	Total
1. Burton Point Farm	34.7	32.6	33.6	38.5
2. Burton Mere House	38.1	35.4	36.4	41.6
3. Barn Farm	35.1	33.0	33.9	38.9
4. Sealand Avenue	33.3	33.2	34.3	38.4
5. The Airfields	35.2	35.1	36.1	40.3

- 9.66 Table 9-8 shows that the predicted noise levels generated by construction operations within the application site would be well within the 70dB $L_{Aeq,1hr}$ criterion adopted for the construction noise assessment.
- 9.67 Based on the above, it is considered that mitigation measures to reduce construction noise levels are not necessary.

Construction Vibration

- 9.68 BS5228:2009 Part 2: *Vibration* gives recommendations for controlling vibration on construction and open sites. It is considered that the main source of vibration during construction works would relate to piling operations.
- 9.69 A prediction has been made assuming that percussive piling techniques are employed with nominal hammer energy of 3kJ per blow and the vibration level calculated at refusal as the worst-case situation.

- 9.70 The nearest receptor to any area that may require piling operations would be approximately 2km away with vibration levels at that distance predicted to be below 0.01mms^{-1} . At this level, vibration is unlikely to be perceptible.
- 9.71 Based on the guidance contained in BS7385:1993, the likelihood of structural damage due to construction vibration is not expected.
- 9.72 Based on the above, mitigation measures to reduce the likelihood of complaints due to vibration from construction piling are considered unnecessary.

Construction Traffic Noise

- 9.73 The predicted noise levels produced by construction traffic movements have been calculated using the methodology contained in BS5228-1:2009. Calculations have been undertaken using the proprietary noise modelling software, CadnaA.
- 9.74 It is assumed that there would be a maximum of ten delivery vehicles per hour delivering construction materials to the proposed development area (20 movements) as a worst-case.
- 9.75 For the purpose of this assessment it is assumed that all vehicles be routed in the same way as operational vehicles (refer to Chapter 8 of this volume).
- 9.76 Table 9-9 shows the predicted noise levels produced by delivery vehicle movements for the worst affected façade of each property assessed, i.e. the façade that faces the access road.

Table 9-9
Predicted Construction Traffic Noise Levels, free-field, dB

Location	Total $L_{Aeq, 1hr}$
1. Burton Point Farm	11.9
2. Burton Mere House	17.2
3. Barn Farm	17.3
4. Sealand Avenue	22.0
5. The Airfields	20.7

- 9.77 The future ambient noise levels at the nearest noise-sensitive receptor locations have been calculated by logarithmically adding the above predicted noise levels for delivery movements to the existing measured ambient noise levels shown in Table 9-6 to determine the potential impact.
- 9.78 Table 9-10 compares the predicted future ambient noise levels with the impact scale adopted for this assessment.

Table 9-10
Predicted Ambient Noise Levels from Construction Traffic Movements
free-field, dB

Location	Ambient Noise Levels		Change	Magnitude of Impact
	Existing	Predicted Future		
1. Burton Point Farm	45.6	45.6	0	No Change
2. Burton Mere House	47.7	47.7	0	No Change
3. Barn Farm	47.7	47.7	0	No Change
4. Sealand Avenue	52.7	52.7	0	No Change
5. The Airfields	52.7	52.7	0	No Change

9.79 Table 9-10 shows that noise generated by construction traffic accessing the application site facility would generate no change in ambient noise levels at the receptors assessed.

9.80 Based on the above, mitigation measures to reduce the potential impact of construction traffic noise are considered un-necessary.

Operational Assessment

9.81 The operational noise effects associated with the proposed Parc Adfer ERF are anticipated to include the following:

- Fixed plant associated with the Parc Adfer ERF;
- railhead operations; and
- Site-related train and heavy goods vehicle movements.

9.82 It should be noted that initially, waste would be delivered to Parc Adfer via the road network; the railhead would not be constructed until a time when the transportation of waste became more viable economically. However, to provide for a robust (and worst-case) assessment the rail operations have been included in the assessment.

9.83 There are no assessment methods that apply to all aspects of the operations at the site. BS4142:1997 is applicable to the assessment of fixed plant associated with Parc Adfer and, as there are no specific guidelines for the assessment of on-site vehicle movements, this has been included in the BS4142 assessment.

9.84 Noise generated by site-related heavy vehicle movements off-site have been predicted using the haul route methodology outlined in BS5228-1:2009 and have been assessed against the existing ambient noise levels at the nearby noise-sensitive receptor locations.

9.85 All predictions have been undertaken using the proprietary noise modelling software, CadnaA, which implements the full range of UK calculation methodologies.

Energy Recovery Facility

- 9.86 The development proposals include the main building, IBA handling and processing areas, railhead (sidings) and other ancillary equipment. The estimated noise levels generated by the main fixed plant are detailed in Table 9-11.

Table 9-11
Energy Recovery Facility, Noise Levels, dB

Plant Area/Item	Derived Sound Levels, L_{WA} or L_i
Flue Gas Treatment	100
Air Cooled Condenser	100
Stack Outlet	88
ID Fan (enclosed)	88
Boiler Hall*	87
Turbine Hall*	94
Waste Bunker*	87
Tipping Hall*	87
Raw IBA Area*	85
IBA Processing Area*	85

* internal reverberant noise level, L_i

- 9.87 There will also be a number of mobile plant items operating within the application site which are detailed in Table 9-12. Noise emission data for this plant is taken from either the manufactures data or from the tables contained in BS5228-1:2009.

Table 9-12
Mobile Plant Items and derived Sound Power Levels

Operational Area	Plant Item	No. of Plant	Derived L_{WA} , dB
IBA Processing Area	CAT966H Loading Shovel	1	107
Railhead	CAT TH514C 5T Tele-handler	1	106
Waste Delivery	Heavy Goods Vehicles (per hour)	10	104
Staff Vehicles	Car	37	73

- 9.88 Details of the building construction materials have been supplied by the applicant and are detailed in Table 9-13 below along with their relevant sound reduction index, R_w , values.
- 9.89 The site is enclosed within a Palisade fence. However, due to the open nature of Palisade fencing it is considered to be acoustically transparent and is therefore not included in the noise models.

Table 9-13
Sound Reduction Index, R_w , of Building Materials, dB

Material	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Double skinned insulated trapezoidal sheet steel panels	-	15	20	28	37	43	40	-
Single skin trapezoidal sheet steel	-	14	16	20	25	29	23	-
Hormann SPU40 F42 sectional roller shutter doors	4	6	13.5	19	22	23	23	21
Glass - IGU 4/20/4	-	21	17	25	35	37	31	-
Louvre System	4	6	8	11	17	15	13	12

BS4142 Assessment

- 9.90 An assessment has been carried out in accordance with the guidance contained in BS4142:1997 to determine whether noise emissions from the fixed plant associated with the proposed Parc Adfer ERF are likely to give rise to complaints from occupants of the nearby noise-sensitive receptors.
- 9.91 Noise predictions at the nearby noise-sensitive receptors have been undertaken using the proprietary software-based noise model, CadnaA, which implements the full range of UK calculation methods. In this instance, the calculation algorithms set out in ISO9613-2:1996 have been used. For the purposes of the assessment, 100% on-time has been assumed for all plant items.
- 9.92 Predictions have been made to a height of 1.5m for the daytime and 4.0m for the night to represent a living room and bedroom window height respectively.
- 9.93 The predictions include on-site vehicle movements associated with the delivery of feed stock, i.e. ten HGV movements in the worst-case hour.
- 9.94 It is assumed that the plant would have some intermittent noise sources or noise sources that will be variable in nature, therefore an acoustic feature correction of +5dB has been added to the noise level to give a noise rating level, $L_{Ar,T}$.
- 9.95 The BS4142:1997 assessment is shown in Table 9-14 below. The background noise levels and predicted rating levels have been rounded to the nearest whole decibel.

Table 9-14
BS4142:1997 Assessment, free-field, dB

Location	Period	Measured Background Noise Level L_{A90}	Predicted Rating Level $L_{Ar,T}$	Difference
Burton Point Farm	Sunday	36	25	-11
	Daytime	39		-14
	Night-time	37		-17
Burton Mere House	Sunday	38	31	-7
	Daytime	45		-14
	Night-time	37		-10
Barn Farm	Sunday	38	30	-8
	Daytime	45		-15
	Night-time	37		-10
Sealand Avenue	Sunday	49	28	-21
	Daytime	48		-20
	Night-time	40		-11
The Airfields	Sunday	49	29	-20
	Daytime	48		-19
	Night-time	40		-10

9.96 BS4142:1997 states:

“A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely”.

9.97 Table 9-16 shows that the predicted noise rating levels generated by the Parc Adfer would be below the prevailing background noise level at all locations assessed and at all times.

9.98 With reference to BS4142:1997, the predicted noise rating levels would lead to the following situations:

- Burton Point Farm, a positive indication that complaints would be unlikely;
- Burton Mere House, between marginal significance and a positive indication that complaints would be unlikely on Sunday and a positive indication that complaints would be unlikely during the day and at night;
- Barn Farm, between marginal significance and a positive indication that complaints would be unlikely on Sundays and a positive indication that complaints would be unlikely during weekdays and at night;
- Sealand Avenue, a positive indication that complaints would be unlikely; and
- The Airfields, a positive indication that complaints would be unlikely.

- 9.99 Based on the predicted noise rating level, i.e. the predicted noise level including the addition of a 5dB penalty for possible tonal content of the noise sources, being below the prevailing background noise levels measured at the nearest noise-sensitive properties, mitigation measures to reduce possible impacts are considered un-necessary.

Site-related Vehicle Movements

- 9.100 The predicted noise level produced by site-related vehicle movements on the wider road network has been calculated using the methodology contained in BS5228-1:2009. Again, calculations have been undertaken using the proprietary noise modelling software CadnaA.
- 9.101 The transport assessment (refer to Chapter 8 of this Volume) has advised that during the AM and PM peak periods, 08:00 to 09:00 hours and 17:00 to 18:00 hours respectively, there would be a total of 37 light vehicle and 10 heavy goods vehicle movements relating to site operations.
- 9.102 The former Department of Transport document *Calculation of Road Traffic Noise* (CRTN, 1988) states that calculations of noise level for traffic flows below 50 vehicles per hour or 1000 vehicles per 18 hour day are unreliable and measurements should be taken when evaluating such cases. However, as Parc Adfer is not operational, the noise generated by HGV movements has been predicted using the haul route method outlined in BS5228-1:2009. The impact of noise from heavy goods vehicles has been assessed against the existing ambient noise levels.
- 9.103 Table 9-15 shows the predicted noise level produced by vehicle movements at the site.

Table 9-15
Predicted Noise Levels from Traffic Movements, free-field, dB

Location	Period	Predicted $L_{Aeq,1hr}$	
		HGV & Cars	Cars Only
1. Burton Point Farm	Day	7.3	0
	Night	11.9	2.5
2. Burton Mere House	Day	12.6	3.4
	Night	13.5	4.0
3. Barn Farm	Day	12.9	3.4
	Night	13.0	3.4
4. Sealand Avenue	Day	18.4	8.5
	Night	18.7	8.8
5. The Airfields	Day	17.0	7.3
	Night	17.5	7.7

- 9.104 The future ambient noise levels at the closest noise-sensitive receptors have been calculated by logarithmically adding the above total predicted noise levels to the existing ambient noise levels.
- 9.105 Table 9-16 compares the predicted future ambient noise levels with the impact scale adopted for this assessment.

Table 9-16
Predicted Ambient Noise Levels from Site-related Vehicle Movements, free-field, dB

Location	Period	Ambient Noise Level		Change	Magnitude of Impact
		Existing	Predicted Future		
1. Burton Point Farm	Sunday	43.8	43.8	0	No Impact
	Midweek day	45.6	45.6	0	No Impact
	Night-time	39.8	39.8	0	No Impact
2. Burton Mere House	Sunday	43.2	43.2	0	No Impact
	Midweek day	47.7	47.7	0	No Impact
	Night-time	39.3	39.3	0	No Impact
3. Barn Farm	Sunday	43.2	43.2	0	No Impact
	Midweek day	47.7	47.7	0	No Impact
	Night-time	39.3	39.3	0	No Impact
4. Sealand Avenue	Sunday	52.2	52.2	0	No Impact
	Midweek day	52.7	52.7	0	No Impact
	Night-time	43.2	43.2	0	No Impact
5. The Airfields	Sunday	52.2	52.2	0	No Impact
	Midweek day	52.7	52.7	0	No Impact
	Night-time	43.2	43.2	0	No Impact

- 9.106 Table 9-16 shows that noise generated by site-related HGV and cars movements would not increase the ambient noise levels at the receptors and would therefore have a no impact.

Site-related Railway Movements

- 9.107 Due to the separation distances between the railway line and the nearest receptors assessed, vibration from low speed railway movements associated with the proposed Parc Adfer ERF have not been considered.
- 9.108 The predicted noise level produced by site-related railway movements has been calculated using the methodology contained in CRN. Again, calculations have been undertaken using the proprietary noise modelling software CadnaA.
- 9.109 The assessment has been based on a single 'Class 60' diesel locomotive pulling a maximum of 20 4-axle wagons at a maximum speed of 35kph. It is assumed that all trains would arrive from the south.

- 9.110 In accordance with the guidance contained in CRN, the assessment only considers noise levels generated by moving railway vehicles. Table 9-17 shows the predicted noise level produced by vehicle movements at the site.

Table 9-17
Predicted Noise Levels from Site-related Railway Movements, free-field, dB

Location	Period	Predicted $L_{Aeq,1hr}$
1. Burton Point Farm	Day	0
	Night	0
2. Burton Mere House	Day	0
	Night	0.1
3. Barn Farm	Day	0
	Night	0.9
4. Sealand Avenue	Day	10.7
	Night	11.6
5. The Airfields	Day	13.0
	Night	19.9

- 9.111 The future ambient noise levels at the closest noise-sensitive receptors have been calculated by logarithmically adding the above total predicted noise levels to the existing ambient noise levels.
- 9.112 Table 9-18 compares the predicted future ambient noise levels with the impact scale adopted for this assessment.

Table 9-18
Predicted Ambient Noise Levels from Site-related Railway Movements, free-field, $L_{Aeq,T}$ dB

Location	Period	Ambient Noise Level		Change	Magnitude of Impact
		Existing	Predicted Future		
1. Burton Point Farm	Sunday	43.8	43.8	0	No Impact
	Midweek day	45.6	45.6	0	No Impact
	Night-time	39.8	39.8	0	No Impact
2. Burton Mere House	Sunday	43.2	43.8	0	No Impact
	Midweek day	47.7	45.6	0	No Impact
	Night-time	39.3	39.8	0	No Impact
3. Barn Farm	Sunday	43.2	43.2	0	No Impact
	Midweek day	47.7	47.7	0	No Impact
	Night-time	39.3	39.3	0	No Impact
4. Sealand Avenue	Sunday	52.2	52.2	0	No Impact
	Midweek day	52.7	52.7	0	No Impact
	Night-time	43.2	43.2	0	No Impact

Location	Period	Ambient Noise Level		Change	Magnitude of Impact
		Existing	Predicted Future		
5. The Airfields	Sunday	52.2	52.2	0	No Impact
	Midweek day	52.7	52.7	0	No Impact
	Night-time	43.2	43.2	0	No Impact

9.113 Table 9-18 shows that noise levels generated by railway movements would not increase the ambient noise levels at the nearby assessment locations and there would therefore be a no impact.

Cumulative impacts of all operations

9.114 The noise levels generated by the operational processes have been assessed against standards appropriate for each type of source considered; BS4142:1997 for the operation of the fixed plant associated with Parc Adfer and the existing ambient noise levels for the assessment of site-related railway and road traffic movements. The scope of BS4142:1997 specifically excludes the assessment of mobile noise sources and is not appropriate for the assessment of cumulative impacts.

9.115 Table 9-19 summarises the cumulative impact at each receptor during the daytime and night-time period. The cumulative noise levels have been assessed against the existing ambient noise levels and the potential change has been compared to the impact scale adopted for this assessment (refer to Table 9-3 above).

9.116 As the assessment considers the change in ambient $L_{Aeq,T}$ noise levels it is not appropriate to add a tonal penalty to the operational noise levels.

Table 9-19
Cumulative Impact Assessment, Free-field $L_{Aeq,T}$ dB

Location	Period	Ambient Noise Level		Change	Magnitude of Impact
		Existing	Predicted Future		
1. Burton Point Farm	Sunday	43.8	43.9	0	No Impact
	Midweek day	45.6	45.6	0	No Impact
	Night-time	39.8	39.9	0	No Impact
2. Burton Mere House	Sunday	43.2	43.9	+0.1	Negligible
	Midweek day	47.7	47.7	0	No Impact
	Night-time	39.3	40.2	+0.1	Negligible
3. Barn Farm	Sunday	43.2	43.3	+0.1	Negligible
	Midweek day	47.7	47.7	0	No Impact
	Night-time	39.3	39.7	+0.1	Negligible
4. Sealand Avenue	Sunday	52.2	52.2	0	No Impact
	Midweek day	52.7	52.7	0	No Impact

Location	Period	Ambient Noise Level		Change	Magnitude of Impact
		Existing	Predicted Future		
5. The Airfields	Night-time	43.2	43.3	+0.1	Negligible
	Sunday	52.2	52.2	0	No Impact
	Midweek day	52.7	52.7	0	No Impact
	Night-time	43.2	43.3	+0.1	Negligible

9.117 It can be seen from the results in Table 9-19 that the cumulative impact of the operation of the Parc Adfer ERF and the movement of road and rail vehicles to and from the application site could lead to a negligible impact at worst.

9.118 The assessment shows that, at worst, there could be a 0.1dB increase in the prevailing ambient noise levels at times; this is an increase which would not be noticeable above everyday fluctuations in the ambient noise levels in the area and therefore mitigation measures are considered un-necessary.

Cumulative Impacts on Surrounding SPA Sites

9.119 Table 9-20 summarises the predicted cumulative impact within the nearby SPA sites during the daytime and night-time periods. The cumulative noise levels have been assessed against the guidance noise levels outlined in AQTAG09. The predictions have been undertaken at the nearest point within each of the SPA sites assessed.

Table 9-20
Cumulative Impact Assessment on SPA Sites, free-field, $L_{Aeq,T}$ dB

Location	Period	Predicted Noise Level	AQTAG09 Noise Limit	Difference
Inner Marsh Farm SPA	Daytime	21.6	55.0	-33.4
	Night-time	20.2		-34.8
Shotton Lagoons & Reedbeds SPA	Daytime	28.4		-26.6
	Night-time	28.4		-26.6
Shotton Local Wildlife Site	Daytime	37.5		-17.5
	Night-time	37.5		-17.5

9.120 Table 9-20 shows that cumulative noise levels generated by the operation of the Parc Adfer would be well within the guidance noise levels outlined in AQTAG09 at all SPA sites assessed. No impacts are therefore predicted upon these designated sites.

MITIGATION MEASURES

Construction Noise

- 9.121 The assessment of construction noise has shown that the criterion adopted in accordance with the guidance contained in BS5228-1:2009 will be met at all receptor locations assessed without specific mitigation measures being adopted. However, it is recommended that best practice methods are followed on-site.
- 9.122 There are several safeguards which exist to minimise the effects of construction noise including:
- The various EC Directives and UK Statutory Instruments that limit noise emissions of construction plant;
 - The guidance outlined in BS5228-1:2009; and
 - The powers that exist for local authorities, under sections 60 and 61 of the Control of Pollution Act 1974, to control environmental noise and pollution on construction sites.
- 9.123 The following generic measures are given to illustrate the range of best practice techniques available. The adoption of Best Practicable Means, as defined in COPA is usually the most effective means of controlling noise from construction sites. In addition, the following measures should be considered where appropriate:
- Phasing of construction works to maximise the benefit from perimeter structures;
 - Compressor, generator and engine compartment doors will be kept closed and plant turned off when not in use;
 - All pneumatic tools should be fitted with silencers/mufflers where practicable;
 - Delivery vehicles should be routed to minimise disturbance to local residents and deliveries should be programmed to arrive during the least sensitive times of the day only;
 - Delivery vehicles should be prohibited from waiting within the site with their engines running;
 - Care should be taken when unloading vehicles to avoid un-necessary noise; and
 - All plant items should be properly maintained and operated according to the manufacturers' recommendations.
- 9.124 Potential problems concerning construction noise can sometimes be avoided by taking a considerate and neighbourly approach to relations with local residents.
- 9.125 Construction works should not be undertaken outside of the hours agreed with the local authority.

Construction Vibration

- 9.126 The nearest receptor to any area that may generate significant levels of vibration is over 2km from the application site. At this distance vibration levels are likely to be below 0.01mms^{-1} and would be unlikely to be perceptible therefore mitigation measures are not considered necessary.

Operational Noise

- 9.127 The cumulative assessment has shown that noise levels generated by the proposed Parc Adfer ERF could lead to a negligible increase of 0.1dB in the ambient noise levels at the nearest noise-sensitive properties to the application site. Such an increase would not be noticeable above the normal fluctuations in ambient noise levels in the area.
- 9.128 Based on the results of the assessment, mitigation measures to reduce any potential noise impacts at the nearby noise-sensitive receptors are considered un-necessary.

CONCLUSIONS

- 9.129 The assessment has considered the potential of the proposed Parc Adfer ERF to give rise to noise impacts at the nearest noise-sensitive receptors to the application site.
- 9.130 Noise levels during construction operations would remain within the 70dB $L_{Aeq,1hr}$ criterion adopted for this assessment at all locations assessed.
- 9.131 Vibration levels during construction operations are unlikely to be perceptible at any of the locations assessed due to the distance between piling operation locations and the nearest receptors. Vibration level would not cause structural damage to any of the properties assessed.
- 9.132 With reference to BS4142:1997, the predicted noise rating levels would lead to the following situations:
- Burton Point Farm, a positive indication that complaints would be unlikely;
 - Burton Mere House, between marginal significance and a positive indication that complaints would be unlikely on Sunday and a positive indication that complaints would be unlikely during the day and at night;
 - Barn Farm, between marginal significance and a positive indication that complaints would be unlikely on Sundays and a positive indication that complaints would be unlikely during weekdays and at night;
 - Sealand Avenue, a positive indication that complaints would be unlikely; and
 - The Airfields, a positive indication that complaints would be unlikely.
- 9.133 At all locations assessed the predicted noise rating level is below the prevailing background noise level.

- 9.134 The cumulative assessment shows that, at worst, there could be a 0.1dB increase in the prevailing ambient noise levels at times; this is an increase which would not be noticeable above everyday fluctuations in the ambient noise levels in the area.
- 9.135 The cumulative assessment on nearby SPA sites has shown that noise levels are well within the guidance noise levels specified in AQTAG09.
- 9.136 The increase in ambient noise levels due to operations at the proposed Parc Adfer ERF would have a negligible impact at worst.
- 9.137 Based on the results of the assessment, noise should not pose a material constraint for the proposed Parc Adfer.