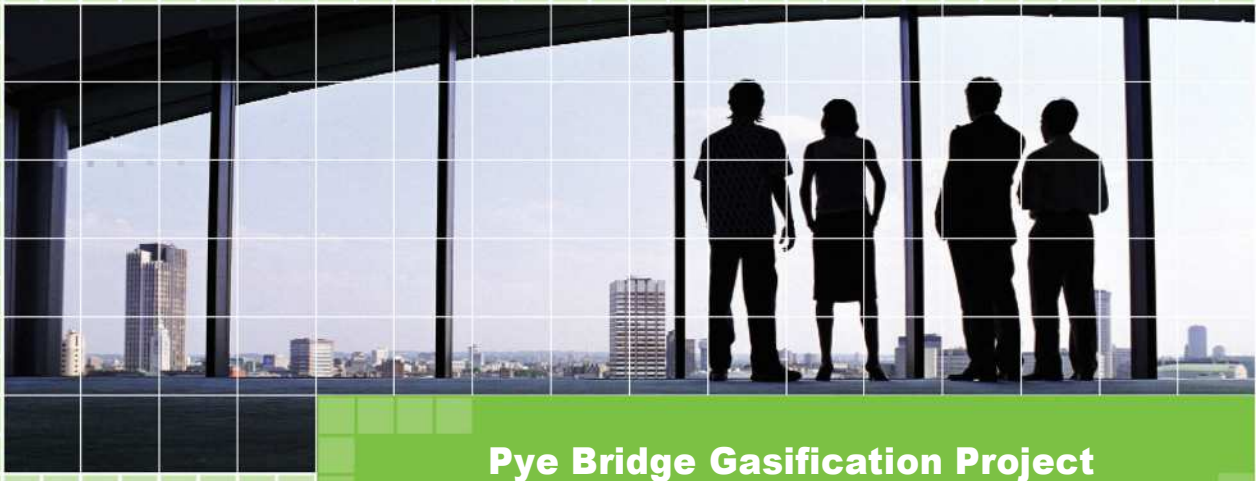

Pye Bridge Gasification Project
Environmental Permitting Regulations
Noise Assessment Report

Warwick Energy Limited

5 February 2010

WARWICK ENERGY

WSP

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Contents

1 Introduction

1.1 This report forms part of the Environmental Permitting Regulations (EPR) application, submitted to The Environment Agency by Warwick Energy Limited in respect of the gasification plant proposed at a Site in Pye Bridge, Derbyshire.

1.2 Guidance on the arrangements for dealing with noise 'emissions' under the EPR is given in the Environment Agency Horizontal Guidance for Noise Part 1 – *Regulation and Permitting*. This Report has been prepared with due regard to this guidance.

1.3 In respect of noise, the EPR authorisation process requires the following information:

- details of significant noise sources, their proposed location, operating duration and any specific characteristics. In addition, the anticipated contribution to the overall noise emission from each source is to be categorised as Low, Medium or High;
- details of the nearest noise-sensitive receptors, the prevailing local noise environment, and details of the distance and direction from the site/installation;
- specific details of the noise levels relating to the operation of the proposed installation and the surrounding environment; and
- identification of any mitigation measures where necessary, that could be implemented to improve the situation with respect to noise.

1.4 In addition to the above, the EPR authorisation process also requires an opinion as to whether Best Available Techniques (BAT) are being applied. To identify whether this is the case, the EPR application guidelines state that justification should be given where the rating level of noise from an installation exceeds the numerical value of the background noise level (L_{A90}) or 50 dB L_{Aeq} by day (free-field) or 45 dB L_{Aeq} by night (façade), when assessed at nearby noise-sensitive receptors.

1.5 As this is a proposed development, and not one which can be accessed and measured currently, detailed noise calculations for the proposed development have been undertaken. These noise calculations have been prepared based on the existing on-site and local area topography and the detailed scheme proposals including fabrication, operational details and plant specifications as provided by ITI Energy.

1.6 The noise calculations have been used to predicted operational noise levels at a sample of local noise sensitive receptors, and allow comparison with the EPR BAT justification criteria.

1.7 This Report is necessarily technical in nature, so to assist the reader a glossary of acoustic terminology is contained in Appendix A.

2 Installation Description

2.1 Warwick Energy (Pye Bridge) Limited are proposing to install a new plant developed and procured by ITI Energy Limited to gasify Briquetted Fibre Fuel (BFF). BFF is derived from treated refuse (i.e. recyclables removed), to produce electricity.

2.2 The installation will consist of 2 gasifiers and 2 engines (3MWe engines that have been de-rated to 1.9MWe to operate with syngas). Each gasifier is designed to process 1.5 tonnes of BFF per hour to produce approximately 3,000Nm^3 of gas with a calorific value in the order of 6-7MJ/Nm3. This in turn allows each gas engine/generator to generate power in the region of 1.9MWe

2.3 The EPR application boundary is shown in Figure B2 of Appendix B. The site does not include the site access road leading west from the site. The EPR Horizontal Guidance for noise is explicit in that roads external to the application boundary should not be included in the noise assessment.

2.4 It is proposed that the engine building and gasifier building will be of single layer breezeblock construction with the engine building having open louvred sections to allow free flow of air through the building. The gas engines will sit within acoustic cells made from an additional layer of breezeblock. The roof of both buildings will comprise a 150mm concrete slab covered with 0.6mm steel sheeting.

2.5 It is proposed that the site will operate 24 hours a day, seven days a week although deliveries, removals and maintenance visits would take place during normal office hours Monday to Friday, assumed to be between 09:00 and 17:00 hours. Other vehicular movements include staff arrivals and departures which would occur over the course of 24 hours.

2.6 The topography of the site is broadly flat with a slope down to a residential receptor known as The Hideaway to the south of the Site.

SUMMARY OF SOURCE NOISE LEVELS

2.7 Plant noise emission data has been provided by ITI Energy Ltd which has been used at similar sites. The relevant source data are presented in Table 1 for fixed plant items.

Table 1 Proposed Fixed Plant Items Source Noise Level Data, Free-Field, dB(A)

Ref.	Plant / Source Noise Item	Typical Operating Hours	$L_{Aeq,T}$, dB	Measurement Distance (m)	Location
1	Flare Stack[1]	30mins daytime	65.0	2	External
2	Conveyors	24 hours	80.0	1	External
3	Common Stack	24 hours	75.0	1	External
4	Engine Radiator Fans	24 hours	54.0	10	External
5	Conveyor[2]	As required during normal working hours	80.0	1	Internal
6	Conveyor[2]	24 hours	80.0	1	Internal
7	Conveyor	24 hours	80.0	1	Internal
8	Compressed Air System[2]	24 hours	85.0	1	Internal
9	Ash Augers[2]	24 hours	70.0	1	Internal
10	Fuel Conveyors[2]	24 hours	70.0	1	Internal
11	Water Circulation Pumps[2]	24 hours	80.0	1	Internal
12	Blowers[2]	24 hours	84.0	1	Internal
13	Ash Conveyor	24 hours	80.0	1	Internal
15	Cooling Tower	24 hours	63.6	5	External
16	Gas Engines	24 hours	106.0	1	Internal
17	Engine Cell Outlet x4	24 hours	75.0	1	External
18	Engine Cell Inlets x2	24 hours	75.0	1	External

1 See paragraph 2.8
2. This plant item is located within the Gasifier Building. Further assessment will group all items located within the Gasifier Building together and this building will be treated as the noise source
3 Noise produced by the gas engines will be fully contained within the engine cells, the only noise associated with their operation is from plant items 3,4,17 and 18 which have been assessed separately and so this item will be omitted from further assessment.
NOTE: No.14 is the Engine Building, however its individual plant items contained within this building have been assessed separately and so No.14 is not included within the above list

2.8 It is understood that the Flare Stack will only operate for up to 1 hour per week and so it is therefore not considered to form part of the typical daily operation at the site. Furthermore, it can be seen from the Table above that this source would generate a noise level which is significantly below other proposed items of plant.

2.9 Nevertheless, consideration has been given to the use of the flare stack in Section 6 of this report.

3 Noise Survey

NOISE SENSITIVE RECEPTORS

3.1 The closest noise-sensitive receptors to the site were identified during the environmental noise survey (as detailed below). These comprised residential dwellings to the northwest and south of the site. These receptors are described below and their locations are shown in Figure B1 of Appendix B.

- Receptor A: Known as The Lodge and located approximately 48m to the north west of the Site boundary; and
- Receptor B: Known as The Hideaway and located approximately 58m to the south of the Site boundary.

3.2 The above receptors have been used in the assessment of potential impacts section below and were considered when selecting measurement positions during the baseline noise survey.

BASELINE ENVIRONMENTAL NOISE SURVEY

3.3 An environmental noise survey was undertaken on the Site, commencing at approximately 10:30 hours on Thursday 2nd July 2009 and concluding at 10:30 hours on Monday 6th July 2009.

3.4 This survey was performed to identify the existing noise climate at two locations considered representative of the identified noise sensitive receptors during both daytime and night-time periods.

3.5 The noise survey was carried out using the following type 1 instrumentation:

Table 2 Noise Measurement Equipment

Equipment	Serial Number
01dB-Stell Solo Master Data logging integrating sound level meter	10966
01dB-stell PRE21S ½" n Pre-amplifier	13599
MCE212 ½" Microphone	94014
01dB-Stell SIP 95 Data logging integrating sound level meter	10565
01dB-stell PRE21S 1/2" n Pre-amplifier	002557
MCE212 ½" Microphone	92308
01dB Type CAL 21 acoustic calibrator	51031216

3.6 All sound level meters had been calibrated to traceable standards within the preceding two years and the calibrator within the preceding 12 months.

3.7 During the survey, the weather was generally conducive towards the measurement of environmental noise, remaining dry with average winds speeds measured between 0m/s and 2.5m/s.

3.8 Two permanent noise measurement positions were selected, each being subject to continuous measurement throughout the noise survey. These measurement locations are shown in Figure B1 of Appendix B and are described below:

- Measurement Position 1: Located on the southern Site boundary fence, close to the main entrance gates, in free-field conditions and approximately 2.5m above ground level;

- Measurement Position 2: Located on the western Site boundary fence, in free-field conditions and approximately 2.5m above ground level.

3.9 Measurement Position 1 is considered to be representative of the dwelling known as The Hideaway. The noise climate at this position consisted of vehicle activity at neighbouring installations close to the Site during the weekday period. During the weekend period the noise climate consisted of bird song and tree wind movement.

3.10 Measurement Position 2 is considered representative of the dwelling known as The Lodge. The noise climate at this position consisted of distant vehicle activity at neighbouring installations close to the Site during the weekday period. During the weekend period the noise climate consisted of bird song and tree wind movement.

3.11 A summary of the measured background noise levels is presented in Table 3 below with the full tabulated data presented in Appendix D.

Table 3 Summary of Measured Background Noise Levels, Free-field (dB)

Measurement Position	Day	Daytime / Night-time	Time	Measured Sound Pressure Level dB L_{A90}
1	Thursday	Daytime	12 hours[1]	42.4
		Night-time	8 hours	33.5
	Friday	Daytime	16 hours	42.6
		Night-time	8 hours	32.6
	Saturday	Daytime	16 hours	36.2
		Night-time	8 hours	28.4
	Sunday	Daytime	16 hours	34.5
		Night-time	8 hours	28.9
2	Thursday	Daytime	12 hour[1]	40.5
		Night-time	8 hours	32.3
	Friday	Daytime	16 hours	42.5
		Night-time	8 hours	34.4
	Saturday	Daytime	16 hours	36.8
		Night-time	8 hours	29.4
	Sunday	Daytime	16 hours	35.6
		Night-time	8 hours	30.0

1. 11:00 – 23:00

VIBRATION SURVEY

3.12 No plant considered likely to give rise to perceptible levels of vibration at local receptors is proposed at site. Therefore, no further consideration is given to vibration in this report.

4 Noise Assessment Criteria

BS 4142: 1997 'METHOD FOR RATING INDUSTRIAL NOISE AFFECTING MIXED RESIDENTIAL AND INDUSTRIAL AREAS'

4.1 The EPR horizontal guidance for noise indicates that the methodology contained in British Standard 4142: 1997 *Method for rating industrial noise affecting mixed residential and industrial areas* should be used as the basis of the noise assessment.

4.2 BS 4142: 1997 sets out a method to determine background noise levels in comparison with noise levels from factories, industrial premises, fixed installations, or sources of an industrial nature in commercial premises. The Standard describes a method for assessing whether the noise from the industrial premises is likely to give rise to complaints from people residing in nearby noise-sensitive buildings.

4.3 The BS 4142 assessment methodology involves a comparison of the existing background noise level with the noise level measured and/or predicted from the industrial premises, known as the 'rating level'. Where applicable, a correction for any acoustic features, such as distinguishable tones or distinct impulses, should be applied.

4.4 The difference between this rating level and the background noise level is quantified by BS4142 according to the likelihood of complaints arising, as shown in Table 4 below.

Table 4 BS4142 Guidance on Noise Assessment

Difference between Rating Level (LAr) and Background Noise Level (L_{A90})	BS4142 Guidance
+ 10 dB	Complaints are likely
+ 5 dB	Marginal significance
- 10 dB	Positive indication that complaints are unlikely

4.5 However, in the introduction, BS4142 states that the above assessment method is 'not suitable' where background noise levels and rating noise levels are 'very low', going on to state that 'very low' is considered to be background levels below about 30dB and rating levels below about 35dB.

4.6 Under the heading Indicative BAT Requirements, the EPR guidelines for noise indicate that justification should be given where the rating level exceeds the numerical value of the background noise level (L_{A90}) or 50 dB L_{Aeq} by day (free-field) or 45 dB L_{Aeq} by night (façade) when assessed at local noise-sensitive receptors.

BRITISH STANDARD 8233: 1999: SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS - CODE OF PRACTICE

4.7 BS 8233: 1999 "Sound Insulation and Noise Reduction for buildings – Code of Practice" provides recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

4.8 The Standard suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests that an internal noise level of 30 dB $L_{Aeq,T}$ within bedrooms is a 'good' standard, whilst 35 dB $L_{Aeq,T}$ is a 'reasonable' standard. For living areas in the daytime, the standard recommends 30 dB $L_{Aeq,T}$ as a 'good' standard and 40 dB $L_{Aeq,T}$ as being a 'reasonable' standard. BS 8233 also states that individual noise events should not normally exceed 45 dB $L_{Amax,fast}$ in bedrooms at night.

4.9 With regards to external living areas, BS 8233 states that:

"In gardens and balconies etc, it is desirable that the steady state noise level does not exceed 50dB $L_{Aeq,T}$ and 55dB $L_{Aeq,T}$ should be regarded as the upper limit".

5 Noise Assessment

NOISE LEVEL PREDICTIONS

5.1 A series of detailed internal reverberant noise level and noise breakout calculations have been undertaken for the Gasifier Building. These calculations are based on the noise levels provided for the proposed internal plant items, the building dimensions, finishes, and composite façade constructions. Noise breakout through each façade and roof area have been calculated and the resulting predicted noise level at the closest residential receptors has been derived.

5.2 For external plant items, standard distance attenuation calculations have been performed to determine the specific noise level from each item at the closest residential receptors based on standard acoustic principles of 6dB per doubling of distance for point sources.

5.3 Table 5 below details the predicted specific noise levels at Receptors A and B.

Table 5 Summary of Predicted Specific Noise Levels, Free-field

Receptor	Description	Period	Predicted Specific Noise Level ($L_{Aeq,T}$) dB
A	The Lodge, 48m to the west of the Site boundary	Daytime	46.5
		Night-time	46.5
B	The Hideaway, 58m to the south of the Site boundary.	Daytime	51.8
		Night-time	51.8

ASSESSMENT OF PREDICTED RATING NOISE LEVELS

5.4 In accordance with the EPR Horizontal Guidance for Noise, the predicted installation noise levels have been compared with the absolute guidance criteria contained therein, and also assessed in accordance with BS4142.

5.5 An acoustic correction factor of +5dB has been applied to the specific noise levels presented in Table 5 above to determine the rating noise levels to allow for any tonal or intermittent characteristics in accordance with BS4142.

5.6 Table 6 compares the rating noise levels with the absolute criteria presented in the EPR Horizontal Guidance for Noise.

Table 6 Comparison of Rating Noise Levels with EPR Absolute Criteria

Receptor Location	Period	Predicted Specific Noise Level ($L_{Aeq,T}$) dB	Acoustic Correction Factor (dB)	Rating Noise Level (Lr) (X)	Criteria (Y)	Difference (X)-(Y)
A	Daytime	46.5	+ 5	51.5	50	+1.5
	Night-time	46.5	+ 5	54.5[1]	45	+9.5
B	Daytime	51.8	+ 5	56.8	50	+6.8
	Night-time	51.8	+ 5	59.8[1]	45	+14.8
1. Façade level, for comparison with night-time criteria level						

5.7 It can be seen from Table 6 that for unmitigated noise levels, the absolute daytime and night-time assessment criteria presented in the EPR Horizontal Guidance for noise is exceeded at both Receptor A and Receptor B.

5.8 Table 7 compares the rating noise levels with the measured background noise levels in accordance with BS4142. For the purposes of this assessment, the average arithmetic background noise level for the daytime and night-time period, for both weekday and weekend period, have been used.

Table 7 Assessment of Rating Noise Levels in Accordance with BS4142 (as referenced in EPR Horizontal Guidance), dBA

Receptor Location	Weekday / Weekend	Period	Rating Noise Level (Lr) (A)	Background Noise Level $L_{A90,T}$ (dB) (B)	Difference (A)-(B)
A	Weekday	Daytime	51.5	41.5	+10.0
	Weekday	Night-time	51.5	33.4	+18.1
	Weekend	Daytime	51.5	36.2	+15.3
	Weekend	Night-time	51.5	29.7	+21.8
B	Weekday	Daytime	56.8	42.5	+14.3
	Weekday	Night-time	56.8	33.1	+23.7
	Weekend	Daytime	56.8	35.4	+21.4
	Weekend	Night-time	56.8	28.7	+28.1

5.9 Considering Table 7, it is identified that the rating noise levels exceed the measured background noise levels for both Receptor A and Receptor B. Table 7 indicates that the minimum exceedence is +10.0dB and the maximum exceedence is +28.1dB. As such the guidance contained within BS4142 suggests that ‘a difference of around 10dB or more indicates that complaints are likely and the greater the difference the greater the likelihood of complaints’.

5.10 Accordingly consideration to appropriate noise mitigation is presented in Section 6. This section demonstrates the good practice measures that are to be put in place and the additional measures that will be required to ensure compliance with BAT for noise.

6 Mitigation

6.1 The assessment in the previous Section has identified that at Receptor A and Receptor B, there are significant exceedences of the EPR noise assessment criteria. As such, it is necessary to demonstrate the noise attenuation benefits to be achieved by noise mitigation measures that have been incorporated into the scheme in accordance with Best Available Techniques for noise mitigation.

6.2 Table 8 details the plant items in order of unmitigated noise impact at the residential receptors:

Table 8 Proposed Fixed Plant Items – Calculated Unmitigated Sound Pressure Level For Each Receptor, Free-Field, dB(A)

Ref.	Plant / Source Noise Item	Location	Calculated Sound Pressure Level at Receptor, dB(A)		Significance
			Receptor A	Receptor B	
18	Engine Cell Inlets x2	External	30.4	50.4	High
13	Ash Conveyor	Internal	39.3	40.9	High
2	Conveyors	External	39.3	40.9	High
7	Conveyor	Internal	39.3	40.9	High
17	Engine Cell Outlet x4	External	40.0	34.0	High
3	Common Stack	External	37.6	33.7	High
4	Engine Radiator Fans	External	31.2	31.2	High
15	Cooling Tower	External	27.4	27.1	Medium
-	Gasifier Building[1]	External	19.2	23.3	Low

1 Contains plant items 5,6,8,9,10,11 and 12

6.3 The above table details all plant items and their level of contribution prior to mitigation.

6.4 Appropriate noise mitigation measures for each of the dominant noise generating items as detailed above have been agreed with ITI Energy in order to reduce the noise impact at Receptors A and B and these are discussed as follows:

- Engine Cell Inlets - Acoustic silencer will be fitted to the inlet points on the façade of the building which will be lined with an acoustically absorptive material which will reduce the noise level of these inlets by 17dB. Metal cladding to be installed onto side of building which will lower air-intake point to ground level. An acoustic fence of 3m height is to be installed along southern boundary of the Site in order to remove line of sight to Receptor B. Calculations have been

undertaken for barrier attenuation which has indicated that a reduction of 10.7dB can be achieved;

- Ash Conveyor - An appropriate housing will be fitted to reduce the noise level to 58dB(A) at 1m;
- Conveyor (Item 2) - An appropriate housing will be fitted to reduce the noise level to 58dB(A) at 1m;
- Conveyor (Item 7) - An appropriate housing will be fitted to reduce the noise level to 58dB(A) at 1m;
- Engine Cell Outlet - Acoustic silencer will be fitted to the outlet points on the roof of the Engine Building which will be lined with an acoustically absorptive material which will reduce the noise level of these outlets to 60dB(A) at 1m;
- Common Stack - Acoustic silencer to be fitted to the top of the stack to reduce noise levels to 61dB(A) at 1m;
- Engine Radiator Fans - Radiator size to be increades in conjunction with a lowrered fan speed in order to achieve 37.1dB(A) at 10m
- Cooling Tower - Acoustic silencer to be fitted to the top of the cooling tower which will produce a noise level of 44dB(A) at 5m.
- Gasifier Building - Façade construction to be made from Kingspan Insulated Wall Panel Type 3W - KS1000 AWP(60), or similar, which has a sound reduction index of 41dB R_w.

Table 9 Proposed Fixed Plant Items – Calculated Mitigated Sound Pressure Level For Each Receptor, Free-Field, dB(A)

Ref.	Plant / Source Noise Item	Location	Calculated Sound Pressure Level at Receptor, dB(A)		Contribution at Receptors
			Receptor A	Receptor B	
18	Engine Cell Inlets x2	External	13.4	22.7	Low
13	Ash Conveyor	Internal	17.3	18.9	Low
2	Conveyors	External	17.3	18.9	Low
7	Conveyor	Internal	17.3	18.9	Low
17	Engine Cell Outlet x4	External	24.0	19.0	Low
3	Common Stack	External	22.6	18.7	Low
4	Engine Radiator Fans	External	24.0	24.0	Low
15	Cooling Tower	External	20.4	20.1	Low
-	Gasifier Building[1]	External	11.5	15.4	Low

1 Contains plant items 5,6,8,9,10,11 and 12

6.5 It is understood that the Flare Stack will only operate for up to 1 hour per week and its use will be limited to daytime only operation which is considered to be a less noise sensitive period than during the night-time period. Notwithstanding this, consideration has been given to the noise levels that will also be generated by this source.

6.6 With installation of the proposed 3m high boundary acoustic fence, the rating noise levels generated by this source at the closest residential receptors are calculated to be as follows, including a +5dB acoustic character correction::

- Receptor A 21 dB(A)
- Receptor B 25 dB(A)

6.7 These rating noise levels are 10dB or more below the overall rating noise levels presented in Tables 10 and 11 below. The contribution of noise from the flare stack can therefore be considered insignificant.

6.8 Table 10 below compares the overall rating noise levels with the absolute criteria presented in the EPR Horizontal Guidance, following the implementation of noise mitigation to the selected items of plant.

Table 10 Comparison of Rating Noise Levels with EPR Absolute Criteria

Receptor Location	Period	Predicted Specific Noise Level ($L_{Aeq,T}$)	Acoustic Correction Factor (dB)	Rating Noise Level (Lr) (X)	Criteria (Y)	Difference (X)-(Y)
A	Daytime	30.0	+5	35.0	50	-15.0
	Night-time	30.0	+5	38.0[1]	45	-7
B	Daytime	29.8	+5	34.8	50	-15.2
	Night-time	29.8	+5	37.8[1]	45	-7.2

1. Façade level, for comparison with night-time criteria level

6.9 It can be seen from Table 10 that the absolute daytime assessment criteria and night-time assessment criteria for both Receptors A and B is not exceeded.

6.10 Considering Table 10 above, it can be seen that the mitigation measures have been design to ensure rating noise levels of no greater than 35dB. The corresponding guidance from BS4142 is that the rating noise levels are classed as being ‘very low’. In this situation BS4142 states that an assessment comparing against the prevailing background noise level is ‘not suitable’. Notwithstanding this, and for completeness, the rating noise levels have been compared against the prevailing background levels in Table 11 below.

Table 11 Assessment of Rating Noise Levels in Accordance with BS4142 (as referenced in EPR Horizontal Guidance), dBA

Receptor Location	Weekday / Weekend	Period	Rating Noise Level (Lr) (A)	Background Noise Level $L_{A90,T}$ (dB) (B)	Difference (A)-(B)
A	Weekday	Daytime	35.0	41.5	-6.5
	Weekday	Night-time	35.0	33.4	+1.6
	Weekend	Daytime	35.0	36.2	-1.2
	Weekend	Night-time	35.0	29.7	+5.3

B	Weekday	Daytime	34.8	42.5	-7.7
	Weekday	Night-time	34.8	33.1	+1.7
	Weekend	Daytime	34.8	35.4	-0.6
	Weekend	Night-time	34.8	28.7	+6.1

6.11 Considering Table 11, it can be seen that at worst, the difference between the rating and background noise level is +6.1 which best corresponds to the situation described in BS4142 as being of only 'marginal significance', but overriding this result is the fact that the rating noise levels are 35dB or lower, which BS4142 classifies as being 'very low'.

6.12 In addition to the above, it is deemed prudent to compare the calculated specific noise levels with the criteria contained within BS8233: 1999.

ASSESSMENT OF PREDICTED SPECIFIC NOISE LEVELS WITH BS8233

6.13 Table 12 compares the mitigated predicted specific noise levels at Receptors A and B with the indoor ambient noise levels contained in BS8233. For this assessment, a façade level has been derived by increasing the predicted free-field noise levels incident at the Receptors by 3dB.

6.14 This assessment has assumed a partially open window which would afford a reduction of the outdoor to indoor noise level of 12dB, in accordance with the guidance detailed in PPG24.

Table 12 Assessment of Mitigated Predicted Internal Ambient Noise Levels with BS8233 Internal Target Noise Levels (as referenced in EPR Horizontal Guidance)

Receptor	Room Type	BS8233 Design Criteria, $L_{Aeq,T}$ (dB)		Predicted Specific Façade Noise Level (dB)	Predicted Internal Noise Level (dB)[1]
		Good	Reasonable		
A	Bedroom	30	35	33.0	21.0
	Living Room	30	40	33.0	21.0
B	Bedroom	30	35	32.8	20.8
	Living Room	30	40	32.8	20.8

1 It has been assumed that an open window will attenuate an outdoor to indoor noise level by 12dB

6.15 Table 12 indicates that the predicted internal noise levels for Receptors A and B will meet the 'good' design criteria for both bedrooms and living rooms with windows partially open.

6.16 Table 13 below compares the predicted specific daytime noise levels for Receptors A and B with the guidance contained in BS8233 for outdoor living areas.

Table 13 Assessment of Mitigated Predicted Specific Noise Levels with WHO Outdoor Living Area Criteria (as referenced in EPR Horizontal Guidance)

Receptor	BS8233 Outdoor Living Area Criteria (dB)	Predicted Specific Daytime Noise Level, free-field (dB)	Difference (dB)
A	50	30.0	-20.0
B	50	29.8	-20.2

6.17 Table 13 indicates that the predicted specific daytime noise levels, for Receptors A and B, are comfortably below the BS8233 outdoor criteria level of 50dB $L_{Aeq,T,}$,this being the criteria level at which the majority of people will be marginally annoyed.

6.18 To ensure compliance with the principles of Best Available Techniques for noise mitigation, it is recommended that the agreed noise mitigation measures for all plant / source noise items are strictly adhered to in order to minimise any noise impact at both Receptors.

7 Conclusion

7.1 WSP Acoustics has carried out a noise assessment for the proposed gasification plant proposed at the Pye Bridge Industrial Estate in Derbyshire. This report is referenced under Environment Agency Form EPR Part B, section B 2.9.

7.2 The assessment has determined that:

- Noise-sensitive receptors are located beyond the western and southern site boundaries. The closest dwelling, known as the The Lodge (Receptor A), lies 48m to the west and The Hideaway (Receptor B) lies 58m to the south.
- The mitigated predicted noise levels have been assessed in accordance with BS4142 and it has been shown that the predicted rating noise levels at both Receptors is concurrent with the guidance contained within this document.
- The mitigated predicted noise levels associated with the proposed plant operation at both Receptors A and B do compare favourably with the EPR absolute guideline criteria.
- The BS8233 internal criterion are not expected to be exceeded as a result of the mitigated specific noise levels and the BS8233 outdoor living area criterion of 50dB $L_{Aeq,T.}$ is not expected to be exceeded for both Receptors.
- With the incorporation of the agreed noise mitigation measures, the contribution of noise from each on-site source is categorised as Low when assessed at the closest receptors.

7.3 Following implementation of the proposed mitigation measures, it is therefore proposed that the installation will use BAT for the management of noise impacts.

WSP ACOUSTICS

Appendix A Glossary Of Acoustic Terminology

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc, according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 4 0dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of Pain

ACOUSTIC TERMINOLOGY

dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq\ T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} & L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.
Ambient Noise Level	The all encompassing noise level measured in $L_{Aeq,T}$. The Ambient Noise Level incorporates background sounds as well as the industrial source noise under consideration.
Residual Noise Level	The Ambient Noise Level in the absence of the industrial source noise under consideration, measured in $L_{Aeq,T}$.
Specific Noise Level	The noise level measured in $L_{Aeq,T}$ attributed to the industrial noise source under consideration alone.
Background Noise Level	The noise level in the absence of the industrial source noise under consideration, measured in L_{A90}.

Appendix B Existing Site Layout & EPR Application Boundary and Receptor Locations

FIGURE B1 EPR APPLICATION BOUNDARY AND SITE LAYOUT

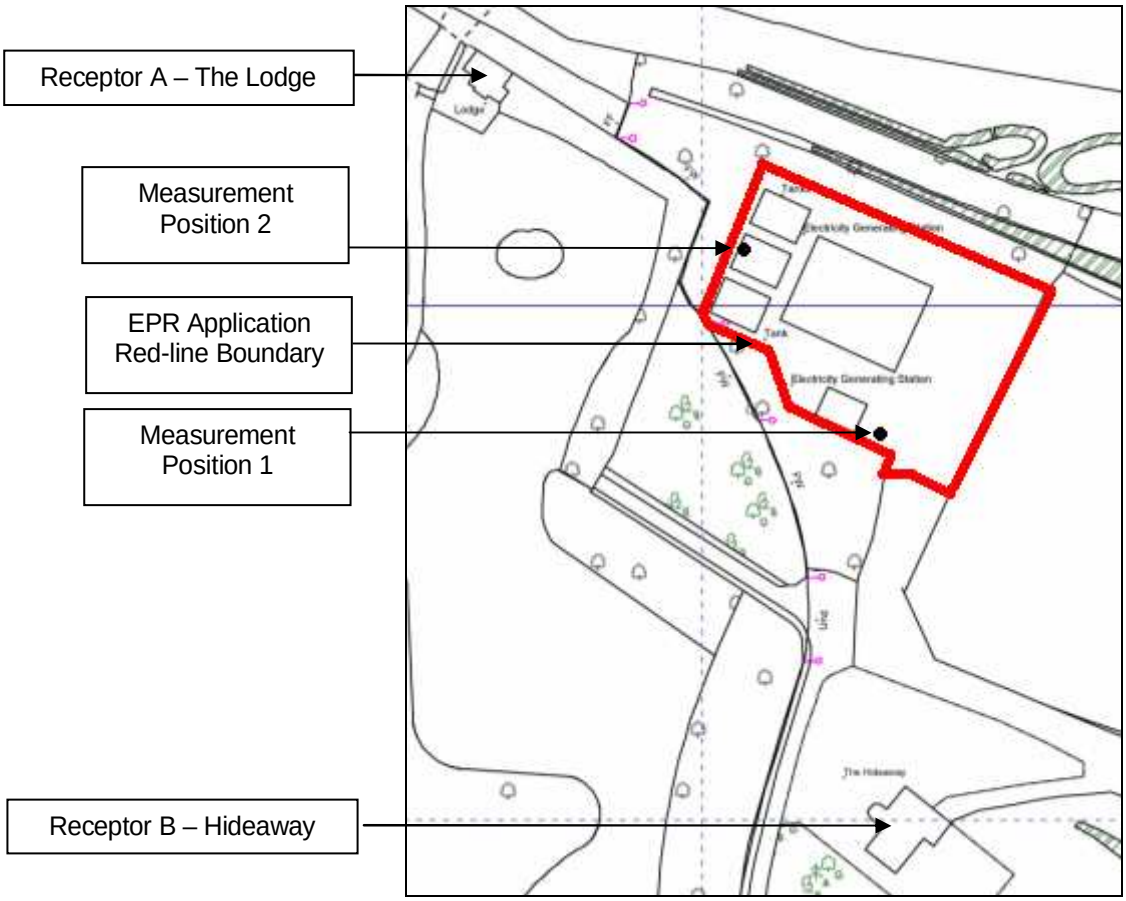
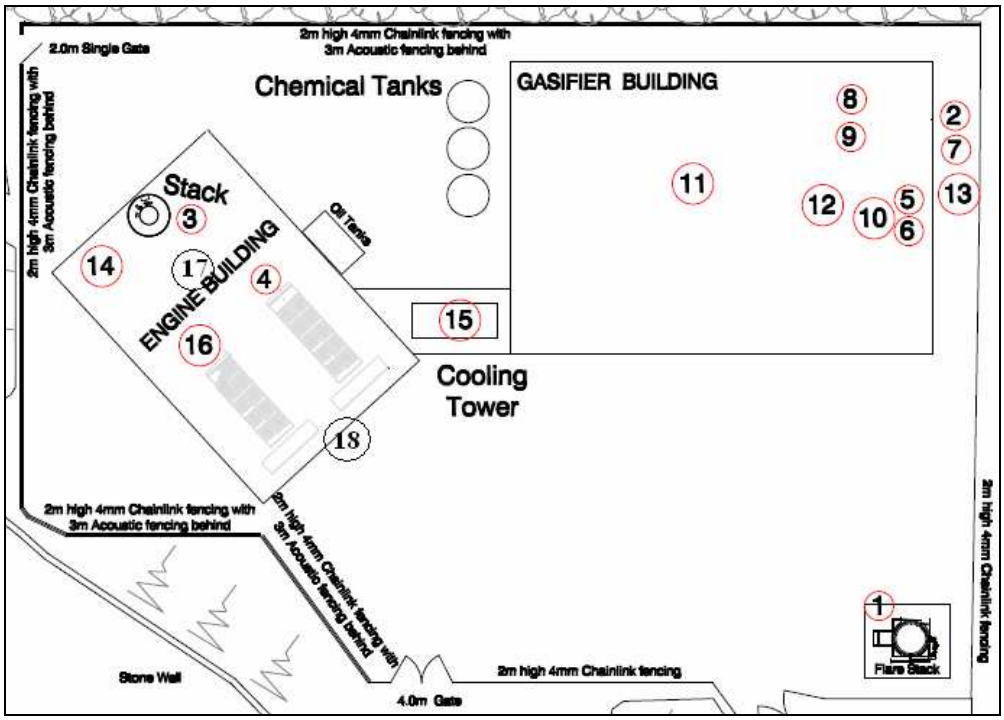


FIGURE B2 PROPOSED SITE LAYOUT & PROPOSED PLANT LOCATIONS



KEY:

1. Flare Stack
2. Conveyors
3. Common Stack
4. Engine Radiator Fans
5. Conveyor
6. Conveyor
7. Conveyor
8. Compressed Air System
9. Ash Augers
10. Fuel Conveyors
11. Water Circulation Pumps
12. Blowers
13. Ash Conveyor
15. Cooling Tower
16. Gas Engines
17. Engine Cell Outlet x4
18 Engine Cell Inlets x2

NOTE: No.14 is detailed as the Engine Building, for which its component parts have been assessed separately.

Appendix C Full Tabulated Noise Measurement Data

TABLE C1 FREE-FIELD NOISE MEASUREMENT DATA FOR MP1

Period Start		Measured Sound Pressure Level, dB			
Date	Time	$L_{Aeq,T}$	$L_{AFmax,T}$	$L_{A90,T}$	$L_{A10,T}$
02 July 2009	11:00	54.3	69.6	48.9	56.7
02 July 2009	12:00	53.0	73.0	45.2	55.2
02 July 2009	13:00	54.1	74.9	46.9	56.4
02 July 2009	14:00	55.6	75.5	48.8	58.9
02 July 2009	15:00	52.0	68.4	46.5	53.3
02 July 2009	16:00	51.2	68.0	44.7	53.1
02 July 2009	17:00	46.0	59.4	40.4	48.7
02 July 2009	18:00	44.5	59.3	39.1	47.2
02 July 2009	19:00	45.3	56.0	39.7	48.4
02 July 2009	20:00	42.9	55.5	36.7	45.8
02 July 2009	21:00	41.2	53.5	36.8	43.5
02 July 2009	22:00	39.1	53.8	34.5	40.7
02 July 2009	23:00	37.3	55.4	32.5	38.0
03 July 2009	00:00	36.1	50.4	30.8	37.4
03 July 2009	01:00	37.1	54.3	29.7	37.2
03 July 2009	02:00	34.7	48.6	29.5	35.6
03 July 2009	03:00	47.2	67.5	30.5	47.2
03 July 2009	04:00	51.2	67.8	36.9	54.6
03 July 2009	05:00	44.4	60.4	38.2	46.7
03 July 2009	06:00	48.2	69.9	40.0	47.7
03 July 2009	07:00	50.6	69.6	42.6	53.0
03 July 2009	08:00	54.8	68.0	46.6	57.9
03 July 2009	09:00	53.8	69.6	46.3	56.3
03 July 2009	10:00	58.1	70.7	53.5	61.2
03 July 2009	11:00	57.0	71.2	49.4	59.9
03 July 2009	12:00	53.4	71.6	46.6	54.5
03 July 2009	13:00	53.8	70.2	43.8	57.5
03 July 2009	14:00	56.3	72.4	46.3	58.5
03 July 2009	15:00	56.6	77.9	48.0	59.7
03 July 2009	16:00	51.7	69.5	42.2	53.3
03 July 2009	17:00	46.1	66.9	37.6	47.5
03 July 2009	18:00	44.6	68.0	37.0	42.9
03 July 2009	19:00	42.9	63.3	37.1	44.4
03 July 2009	20:00	44.1	60.3	35.8	46.2
03 July 2009	21:00	48.6	64.2	36.0	53.1
03 July 2009	22:00	42.6	58.9	32.5	42.3
03 July 2009	23:00	39.4	55.9	33.3	38.7
04 July 2009	00:00	37.5	52.8	31.3	37.9
04 July 2009	01:00	32.7	42.0	29.8	34.7
04 July 2009	02:00	34.6	54.7	28.9	34.4
04 July 2009	03:00	49.5	61.0	30.7	54.9
04 July 2009	04:00	52.6	68.2	35.5	57.2
04 July 2009	05:00	42.3	60.5	35.9	44.4
04 July 2009	06:00	42.3	57.8	35.7	44.2
04 July 2009	07:00	46.7	64.9	36.7	48.8
04 July 2009	08:00	49.3	69.1	37.8	51.4
04 July 2009	09:00	49.2	66.0	39.9	50.2
04 July 2009	10:00	47.7	66.5	39.9	49.7
04 July 2009	11:00	46.9	66.6	37.9	48.8
04 July 2009	12:00	45.9	65.4	38.1	47.0
04 July 2009	13:00	41.7	61.4	36.1	43.3
04 July 2009	14:00	43.9	60.6	36.1	46.7
04 July 2009	15:00	43.4	61.9	36.6	46.0
04 July 2009	16:00	43.9	58.8	37.9	46.4
04 July 2009	17:00	42.5	57.6	36.3	45.3

04 July 2009	18:00	44.5	63.5	36.1	46.9
04 July 2009	19:00	40.4	60.1	34.6	42.5
04 July 2009	20:00	45.1	63.9	33.0	47.4
04 July 2009	21:00	47.9	59.8	32.6	52.6
04 July 2009	22:00	34.6	51.3	29.1	35.7
04 July 2009	23:00	35.3	48.4	29.1	37.4
05 July 2009	00:00	31.1	46.1	26.7	33.3
05 July 2009	01:00	34.9	53.8	26.5	35.6
05 July 2009	02:00	28.3	40.7	23.9	30.2
05 July 2009	03:00	45.3	62.2	24.0	50.0
05 July 2009	04:00	52.3	72.5	33.7	56.0
05 July 2009	05:00	42.1	67.6	32.0	44.9
05 July 2009	06:00	38.3	57.6	31.4	41.3
05 July 2009	07:00	43.3	57.0	34.0	46.3
05 July 2009	08:00	42.7	61.1	32.7	45.0
05 July 2009	09:00	41.5	59.6	34.0	43.4
05 July 2009	10:00	40.6	60.8	34.5	43.5
05 July 2009	11:00	42.2	60.6	34.3	45.1
05 July 2009	12:00	40.6	58.2	34.1	42.8
05 July 2009	13:00	41.2	54.3	35.5	44.3
05 July 2009	14:00	45.1	62.3	37.0	48.2
05 July 2009	15:00	44.7	62.6	36.0	46.9
05 July 2009	16:00	42.7	57.5	35.2	45.8
05 July 2009	17:00	41.2	57.1	36.2	43.6
05 July 2009	18:00	41.8	59.4	35.7	43.7
05 July 2009	19:00	41.3	59.1	35.2	42.6
05 July 2009	20:00	45.7	72.5	34.9	46.7
05 July 2009	21:00	41.2	62.0	33.4	43.3
05 July 2009	22:00	40.4	62.7	29.2	38.7
05 July 2009	23:00	30.9	42.8	26.3	33.6
06 July 2009	00:00	28.6	39.7	24.7	31.0
06 July 2009	01:00	39.3	61.9	24.2	35.9
06 July 2009	02:00	28.2	42.5	23.1	29.2
06 July 2009	03:00	35.3	51.6	24.3	40.1
06 July 2009	04:00	50.1	64.8	34.8	54.9
06 July 2009	05:00	43.6	60.6	35.7	45.9
06 July 2009	06:00	47.1	73.6	38.4	47.9
06 July 2009	07:00	49.1	68.0	42.3	49.9
06 July 2009	08:00	49.2	64.5	44.6	51.2
06 July 2009	09:00	51.0	70.1	45.2	52.5

TABLE C2 FREE-FIELD NOISE MEASUREMENT DATA FOR MP2

Period Start		Measured Sound Pressure Level, dB			
Date	Time	$L_{Aeq,T}$	$L_{AFmax,T}$	$L_{A90,T}$	$L_{A10,T}$
02 July 2009	11:00	50.2	59.6	46.8	52.3
02 July 2009	12:00	48.1	63.4	42.1	50.7
02 July 2009	13:00	48.4	59.8	43.9	50.6
02 July 2009	14:00	49.2	61.0	46.1	51.2
02 July 2009	15:00	47.7	58.2	44.0	49.7
02 July 2009	16:00	46.4	59.8	42.7	48.8
02 July 2009	17:00	44.8	58.2	39.7	47.4
02 July 2009	18:00	43.6	57.8	38.1	45.7
02 July 2009	19:00	44.2	58.8	38.4	46.6
02 July 2009	20:00	44.6	59.1	35.9	48.3
02 July 2009	21:00	41.7	58.5	35.6	43.8
02 July 2009	22:00	38.9	51.8	32.9	41.5
02 July 2009	23:00	36.6	50.2	30.8	39.5
03 July 2009	00:00	34.8	52.5	28.7	37.8
03 July 2009	01:00	35.7	51.1	28.1	38.2
03 July 2009	02:00	33.4	47.6	27.8	36.9
03 July 2009	03:00	47.3	66.9	29.9	51.1
03 July 2009	04:00	50.4	66.3	36.1	55.0
03 July 2009	05:00	44.4	65.1	37.3	46.1
03 July 2009	06:00	45.7	59.5	39.7	48.0
03 July 2009	07:00	46.4	65.0	40.6	48.1
03 July 2009	08:00	49.6	59.8	45.0	52.5
03 July 2009	09:00	51.4	59.1	43.3	55.6
03 July 2009	10:00	58.1	65.6	52.7	61.3
03 July 2009	11:00	53.1	67.1	49.3	55.0
03 July 2009	12:00	48.9	58.4	43.8	51.6
03 July 2009	13:00	53.7	61.8	41.9	58.2
03 July 2009	14:00	48.4	62.6	44.8	50.3
03 July 2009	15:00	48.7	61.6	45.4	50.5
03 July 2009	16:00	45.8	54.1	42.3	48.1
03 July 2009	17:00	44.8	62.1	40.3	45.8
03 July 2009	18:00	46.7	70.6	39.7	46.3
03 July 2009	19:00	44.2	58.7	39.3	46.1
03 July 2009	20:00	51.0	71.9	39.7	53.3
03 July 2009	21:00	43.7	61.1	37.3	44.5
03 July 2009	22:00	41.1	61.9	34.6	42.1
03 July 2009	23:00	39.9	52.2	35.6	42.0
04 July 2009	00:00	37.5	51.5	33.0	40.1
04 July 2009	01:00	35.2	46.1	31.1	37.7
04 July 2009	02:00	35.5	52.7	30.2	37.6
04 July 2009	03:00	48.3	65.7	32.7	52.8
04 July 2009	04:00	52.9	74.2	38.7	56.2
04 July 2009	05:00	49.3	71.7	36.8	45.8
04 July 2009	06:00	42.3	60.1	37.3	44.1
04 July 2009	07:00	45.4	65.4	37.7	48.0
04 July 2009	08:00	47.2	59.3	38.6	51.5
04 July 2009	09:00	43.8	58.5	39.4	45.5
04 July 2009	10:00	44.3	60.7	38.9	46.1
04 July 2009	11:00	44.1	59.2	38.4	47.2
04 July 2009	12:00	47.0	63.0	38.3	50.7
04 July 2009	13:00	43.7	59.5	36.7	44.7
04 July 2009	14:00	45.8	60.9	37.1	49.3
04 July 2009	15:00	43.0	56.7	37.0	45.8
04 July 2009	16:00	45.2	62.6	37.8	47.3
04 July 2009	17:00	42.0	59.7	36.8	44.6
04 July 2009	18:00	44.7	61.8	37.0	47.6
04 July 2009	19:00	46.3	71.3	36.5	47.9
04 July 2009	20:00	55.2	79.7	35.0	55.9
04 July 2009	21:00	44.4	61.8	34.0	48.1
04 July 2009	22:00	37.5	58.0	29.8	38.9
04 July 2009	23:00	35.7	48.4	30.0	38.6

05 July 2009	00:00	33.6	56.1	27.7	35.7
05 July 2009	01:00	34.7	50.4	27.9	37.4
05 July 2009	02:00	30.6	44.7	25.2	33.1
05 July 2009	03:00	45.3	60.4	24.1	50.0
05 July 2009	04:00	56.4	78.8	35.8	57.3
05 July 2009	05:00	43.9	65.2	31.9	46.5
05 July 2009	06:00	47.2	66.8	32.2	50.5
05 July 2009	07:00	50.9	68.8	33.7	54.7
05 July 2009	08:00	44.1	63.4	34.4	43.8
05 July 2009	09:00	41.1	59.2	35.0	43.7
05 July 2009	10:00	42.4	57.9	35.6	44.6
05 July 2009	11:00	48.8	71.1	36.8	49.4
05 July 2009	12:00	42.3	64.5	35.7	43.7
05 July 2009	13:00	46.6	64.7	36.3	48.2
05 July 2009	14:00	44.9	65.5	37.7	47.0
05 July 2009	15:00	47.0	66.1	36.8	47.4
05 July 2009	16:00	45.3	72.5	36.2	46.1
05 July 2009	17:00	41.8	57.9	37.2	43.7
05 July 2009	18:00	42.9	60.6	37.2	44.6
05 July 2009	19:00	42.8	60.2	36.7	44.4
05 July 2009	20:00	50.0	64.0	36.2	54.8
05 July 2009	21:00	51.4	68.0	34.3	55.2
05 July 2009	22:00	41.7	62.8	30.1	39.3
05 July 2009	23:00	32.7	44.5	26.9	35.8
06 July 2009	00:00	31.9	48.9	24.9	34.0
06 July 2009	01:00	41.0	62.4	24.9	37.7
06 July 2009	02:00	30.5	51.6	23.9	33.2
06 July 2009	03:00	46.9	60.4	25.2	52.1
06 July 2009	04:00	54.3	74.6	38.1	56.6
06 July 2009	05:00	51.7	82.5	36.5	49.5
06 July 2009	06:00	57.8	85.3	39.2	54.2
06 July 2009	07:00	50.4	71.8	41.1	51.6
06 July 2009	08:00	48.2	62.0	43.1	51.0
06 July 2009	09:00	48.2	67.4	42.8	49.7

Appendix D Limitations To This Report

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of WSP Environmental Limited. WSP Environmental Limited accept no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/or WSP Environmental Limited and agree to indemnify WSP Environmental Limited for any and all loss or damage resulting therefrom. WSP Environmental Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

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