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Project:

CNG Hinckley

Title:

Noise Impact Assessment



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CONTENTS:

1	INTRODUCTION	1
2	SITE	2
3	GUIDANCE	4
4	MEASUREMENTS	6
5	EQUIPMENT	6
6	RESULTS	7
7	NOISE MODELLING	8
8	NOISE IMPACT ASSESSMENT	13
9	CONCLUSIONS	16

APPENDIX A:	Glossary of Technical Terms
APPENDIX B:	Proposed Site Plan
APPENDIX C:	Planning Policy & Guidance
APPENDIX D:	Survey Results (Tabular)
APPENDIX E:	Survey Results (Graphical)

1 INTRODUCTION

- 1.01 Environmental Equipment Corporation Limited has been commissioned by CNG Fuels Ltd to undertake an impact assessment of new noise sources proposed as part of development of a new CNG Fuels Service Station on land of A5 Watling Street and west of the petrol filling station, Hinckley, LE10 3ED. The proposals include the installation of 12 No. fuelling pumps on a new, developed forecourt and the associated installation of plant for the production and storage infrastructure required for a Bio-Compressed Natural Gas (Bio-CNG) facility.
- 1.02 This noise assessment has been conducted in accordance with current British Standards and is based on a noise survey carried out at the site including a weekend period.
- 1.03 This assessment includes:
- the setting of plant noise limits in accordance with the requirements of national planning policy, standards and guidance; and
 - the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location.
- 1.04 This report is prepared solely for CNG Fuels Ltd. Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party. Note that the contents contained herein are produced for the purposes of review by relevant Planning Authority departments and do not constitute a detailed design or specification document to be used for the purposes of construction.
- 1.05 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

- 2.01 The proposed CNG Fuels service station will be located on a vacant plot of land within the vicinity of large industrial estate to the south west of Hinckley town centre and immediately adjacent to an existing BP filling station. The facility will include a forecourt with refuelling stations capable of serving up to 12 lorries at any one time.
- 2.02 The CNG site is located adjacent to the A5, a busy link road between the M1 and M6 and in an area that is a mix of commercial and residential properties along with farmland.
- 2.03 To the east of the site is a BP service station that operates 24 hours a day and includes a car wash and jet wash bay.
- 2.04 To the north of the site is an area designated as a 'Travellers Site' that has static caravans distributed across it. Adjacent to this is a single storey dwelling named 'The Bungalow' and beyond this is the railway line on a raised embankment that serves Hinckley.
- 2.05 To the north east are dwellings and a small nursery and school along Nutts Lane.
- 2.06 The area to the south and west is currently farmland.
- 2.07 The Google Maps image in Figure 1 below has been annotated to show the proposed site and the immediate surroundings and dwellings.



Figure 1: Site layout and nearest dwellings

- 2.08 This application is for the installation of 12No. Bio-CNG Fuelling pumps and the associated plant infrastructure required for the operation of the site. The site operates by drawing natural gas from the main gas distribution grid which is then compressed and can be stored locally. This gas is then used to refuel Bio-CNG fuelled lorries locally on site. Compared to their diesel counterparts, Bio-

- CNG vehicles run on 100% renewable biomethane and are considerably quieter, with more than a 90% reduction in CO₂ emissions.
- 2.09 The site will be powered by an onsite engine generator set that will run on the gas supplied directly to the fuelling station site. The generator will run 24 hours a day.
 - 2.10 The fuelling plant on site consists of three sets of compressors that are housed in separate acoustically treated containers, each having their own remote dry air coolers sited on top of the containers. The metal containers are acoustically lined and include ventilation for the cooling of the plant within. Whilst there is on-site storage for the Bio-CNG fuel, this storage is limited, and the operation of the fuelling station is typically 'on demand' such that the storage tanks are refilled on-site as the existing stored fuel is dispensed. This means that the operation of the plant is not fixed but is driven by the demand and delivery at the pumps. The plant operation is based on run and standby so only one of the three sets of compressor and dry air cooler systems will ever run. The site is also served by a local LV transformer and a second back up generator, to be used in the event of a failure. The service station is expected to offer refuelling services both day and night.
 - 2.11 A large scale plan layout of the site is presented in Appendix B. Figure 2 below overlays this plan onto a Google Maps image to put the layout in context.



Figure 2: Proposed new site layout and existing surroundings.

3 GUIDANCE

3.01 As part of the Pre-application process an officer of the Environmental Health department of Hinckley & Bosworth Borough Council advised that:

'Noise impact will need to be considered in the application bearing in mind the 24 hour use and nearby residential/traveller site use.'

3.02 The following assessment adopts current relevant British Standards BS4142/BS8233 criteria and methodology and considers the current National Planning Policy Framework.

3.03 The assessment methodology of 'BS4142:2014: 'Methods for rating and assessing industrial and commercial sound'' is the principle standard against which to assess potential impact in this context and that standard in turn requires that the assessment outcomes be judged and considered taking into account context and relevant guidance metrics.

3.04 Additional guidance has been taken from current British Standards BS8233:2014. This document provides useful reference for assessing acceptability against established absolute noise limits.

3.05 A summary of the design guidance is provided below.

BS4142:2014 'Methods for rating and assessing industrial and commercial sound' + A1:2019

3.06 To assess the acceptability of the resultant noise levels we have consulted the relevant standards. BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'. The scope of BS4142 includes that assessment of the following sources:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which compromise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating

3.07 BS4142 gives guidance on assessing the likelihood of adverse impacts by calculating a 'rating level' of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the 'rating level' to assess the likelihood of complaints:

- The greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
- A difference of +5dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background noise level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low sound impact, depending on the context.

3.08 This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. For the purposes of the standard it states that daytime and night-time are typically 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

- 3.09 The 'rating level' of the noise source is obtained taking the following factors into consideration:
- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq} .
 - An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.

- 3.10 The background sound level should be established in terms of the L_{A90} noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. The standard states that *'a representative level ought to account for the range of background sound levels and ought not to automatically to be assumed to be either the minimum or modal value.'*

- 3.11 BS 4142 goes on to state that:

'The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.'

- 3.12 BS4142 requires uncertainties in the assessment to be considered and, where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

BS8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

- 3.13 BS8233:2014, 'Guidance on sound insulation and noise reduction for buildings', section 7 gives guidance on acoustic criteria and noise levels appropriate for various internal spaces that have different functions. Section 7.7 relates specifically to buildings having a residential purpose and offers guidance on appropriate internal ambient noise levels for dwellings (when unoccupied) with specific consideration:

- for bedrooms, the acoustic effect on sleep; and
- for other rooms, the acoustic effect on resting, listening and communicating.

- 3.14 The guidance applies to external noise as it affects the internal acoustic environment from sources without a specific character.

- 3.15 Table 4 of section 7.7.2 recommends the following internal noise limits based on the presence of steady, external noise sources:

Table 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 3.16 The guidance criteria are based upon research and existing guidelines provided by the World Health Organisation.
- 3.17 It is generally considered that the sound insulation provided by a partially open window will be 15dB, dependent on window type, extent of opening and source frequency content.
- 3.18 It can be seen that in the worst case, with a partially open window reduction of 15dB, indoor ambient noise targets for bedrooms will be met where the external ambient noise level is below 45dB(A). This is based upon steady noise of an anonymous nature and is consistent with the World Health Organisations LOAEL.
- 3.19 The Local Authority have also requested that an assessment to establish if vehicle refuelling activities could result $L_{Amax,F}$ of over 45dB would occur over 10 times a night (2300-0700hrs) as well

4 MEASUREMENTS

- 4.01 Environmental noise measurements were carried out over a weekend period, between 1315 hours on Friday 17th February 2023 and concluded 1200 hours Monday 20th February, 2023, to establish the existing noise levels at the site. The survey methodology and results are set out below.
- 4.02 Noise measurements have been carried out at the following position, as shown in Figure 1 and described as:
- Position 1: located at a height of approximately 2 metres above ground level. The measurement was not located within 3.5 metres of any reflecting surfaces, other than the mounting surface.
- 4.03 This position is considered to be representative of the background noise at the facades of the Travellers site closest to the A5.

5 EQUIPMENT

- 5.01 The equipment used for the survey was as follows:-
- 01dB Metravib Black Solo Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
 - 01dB Metravib MCE 212 Condenser Microphone, PRE 21 S Pre-amp and Connecting Leads;
 - 01dB Outdoor Microphone Kit and a
 - Tripod.
- 5.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter 01dB Black Solo	Serial No.	61719
	Calibration Date	22 nd August 2022
	Cal Certificate No.	U41741
½" MCE 212 Condenser Mic.	Serial No.	166397
	Calibration Date	22 nd August 2022
	Cal Certificate No.	U41741
Calibrator CAL 21	Serial No.	34634297
	Calibration Date	21 st October, 2021
	Cal. Certificate No.	U37247

N.B. Copies of calibration certificates are available upon request.

5.03 The equipment was calibrated both before and after the survey with no difference noted in the levels.

6 RESULTS

6.01 The weather during the survey was suitable for noise measurement, it being dry with little wind for the duration of the survey.

6.02 Noise sources at the noise sensitive receiver locations include local and distant road traffic as well as the occasional noise from train passbys.

6.03 A list of the levels measured is included in Appendix D and represented graphically in Appendix E.

6.04 A summary of the time averaged ambient levels and lowest measured background levels over the measurement periods are shown in Table 6.1. The minimum L_{A90} is the lowest fifteen minute measurement in the specified period.

Day	Period	Average $L_{Aeq,T}$ – dB	Minimum L_{A90} – dB	Max. L_{A90} – dB	Modal L_{A90} – dB	Mean L_{A90} – dB
Friday 17 th February 2023	Day time (1315-1900 hrs)	67.3	52	64	61	59
	Evening (1900-2300 hrs)	63.8	43	51	47	47
	Night-time (2300-0700 hrs)	62.1	37	51	49	45
Saturday 18 th February 2023	Day time (0700-1900 hrs)	67.2	53	62	58	58
	Evening (1900-2300 hrs)	63.8	42	51	50	48
	Night-time (2300-0700 hrs)	61.2	35	46	39	40
Sunday 19 th February 2023	Day time (0700-1900 hrs)	66.7	47	60	58	56
	Evening (1900-2300 hrs)	62.9	41	52	43	45
	Night-time (2300-0700 hrs)	63.6	33	63	35	42
Monday 20 th February 2023	Day time (0700-1200 hrs)	67.5	58	62	59	60

Table 6.1: Free-Field Measured Ambient and Background Noise Levels

7 NOISE MODELLING

7.01 The noise impact assessment has considered the following operations based on typical activity at similar sites and assumes operations both day and night, powered by the 24 hour operation of the primary site generator:

- **Gas Storage refill process**

Operation of a single compressor plant container and the dry air cooler (DAC) at any time – The sets of compressor plant and DAC's operate individually as run and standby and will never run simultaneously. The engine generator set that powers the site will be operating at its maximum load under these conditions.

- **Worst Case Refuelling activity**

The refuelling of up to 20 lorries which represents a peak activity that is expected to be able to occur in any one hour based on the refuelling time for each lorry. As the facility will be open 24 hours we have assumed a worst case that the site could be equally busy at night as during the daytime although in reality it is expected that during the night the activity will be less than assessed. We have assumed that the plant could also operate at the same time as the refuelling activity. Whilst powering the site the generator set would operate at a reduced load however the noise levels we have presented in this assessment represent a worst case scenario of the gas engine generator plant operating at its maximum load.

- **Emergency Operation**

The operation of the standby emergency generator in the event of a power failure to the refuelling station.

7.02 The propagation of the activity and plant noise has been modelled using CadnaA software by Datakustik. Calculations are undertaken using the General Method of Calculation from ISO9613-2:1996. Within the noise model, buildings and the immediate local topography have been accounted for.

7.03 The source data used in the model is taken from measurements of sound pressure levels of specific refuelling activities and plant operation taken at existing CNG sites in Newark and Erdington. The following notes have been taken from the operation of the plant and the refuelling activities.

- **Compressor Housings**

The compressor housing consists of three solid sides with access doors that control noise breakout. The fourth long side has ventilation louvres in that has higher levels of noise breakout. The CadnaA model for this plant item takes into account the different noise levels from the facades of the compressor housing. The compressors and fans within the housing run at a fixed speed. At the end of a charging cycle for the storage tanks there is a short noise from a pressure relief valve. This is included in the overall sound power levels and is also assessed separately as an L_{Amax} level for the night time noise impact.

- **Dry Air Cooler**

The dry air cooler will only operate when the compressor plant is operating. Whilst its operating speed can be influenced by the ambient air temperature we have assessed against a typical warm day condition in all instances as a worst case.

- **Vehicle Refuelling**

The refuelling activity is a relatively quiet operation. There is short term noise associated with the lorry arrival and departure, the layout is such that the lorry can pull straight into a refuelling station and straight out of the other side without unnecessary manoeuvring. The refuelling station equipment does not generate any significant levels of noise for the majority of the dispensing period, with exception of a short term noise from a local pressure relief valve at the end of a refuelling operation. The typical refuelling operation takes around 5-7 minutes.

7.04 The following noise data has been used based on spot readings taken on site of the plant operating under typical conditions. The plant effectively runs at fixed speed so it is not expected that there will be any significant variation in the noise output over the course of its operation.

Item under consideration	Sound Power Level – dB re 10 ⁻¹² W								
	63	125	250	500	1k	2k	4k	8k	A
Dry Air Cooler	75	77	76	74	72	72	66	60	78
Compressor Housing Louvred side	84	89	85	85	83	79	75	70	88
Compressor Housing Solid Side	81	74	70	71	70	63	61	55	74
Compressor Pressure Relief Vent	84	82	78	80	77	81	80	69	86
Fan on LV Room	70	65	56	58	60	57	56	52	64
¼ hour refuelling operation	80	73	70	70	71	65	61	60	74

**Table 7.2: Source Sound Power Data Used within CadnaA Noise Model
based on EEC measured sound pressure levels at similar sites**

7.05 Source noise levels for the proposed standby emergency generator are not available and thus the model adopts typical manufacturers published noise data for housed units, producing a maximum of 75dBA at 1m.

7.06 Figures 3 – 6 present the images of each CadnaA noise model that has been developed for each of the worst case operating scenarios detailed in section 7.01 – a summary being:

- Worst case peak operating condition of 20 No refuelling operations and Compressor and DAC plant operating in a single hour.
- Worst case peak operating condition of 20 No refuelling operations in a single hour but the plant not operating.
- Operation of the standby emergency generator in isolation

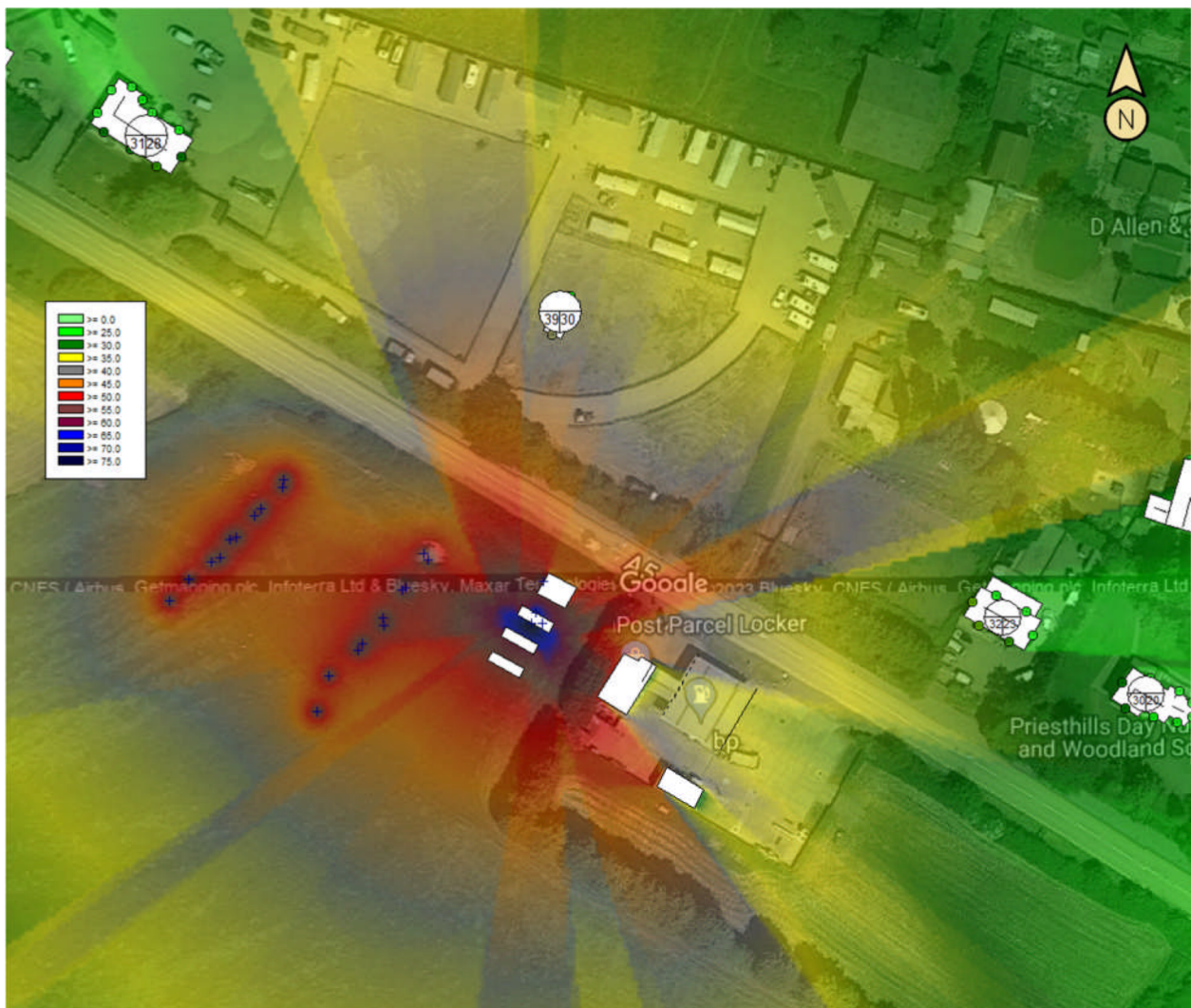
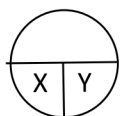


Figure 3: Peak Daytime Condition of 20 No. refuelling operations and Compressor and DAC plant operating – Large Scale View showing noise propagation



X - Total hourly noise level L_{Aeq} for 20 No. vehicle refuelling and all plant operating
Y - 20 No. Vehicle Refuelling noise only

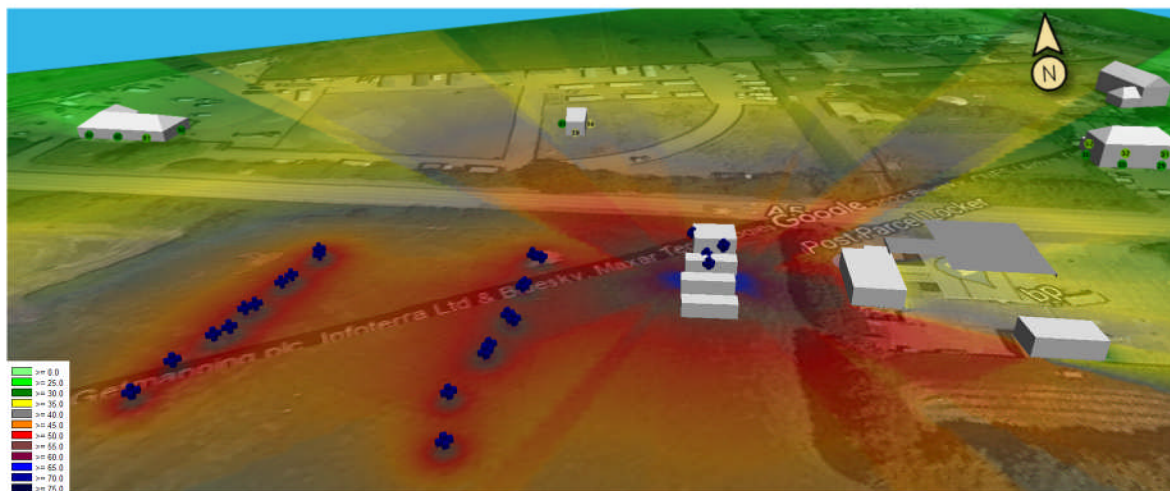


Figure 4: Peak Daytime Condition of 20 No. refuelling operations and Compressor and DAC plant operating – Isometric Large Scale View showing noise propagation toward properties on opposite side of A5

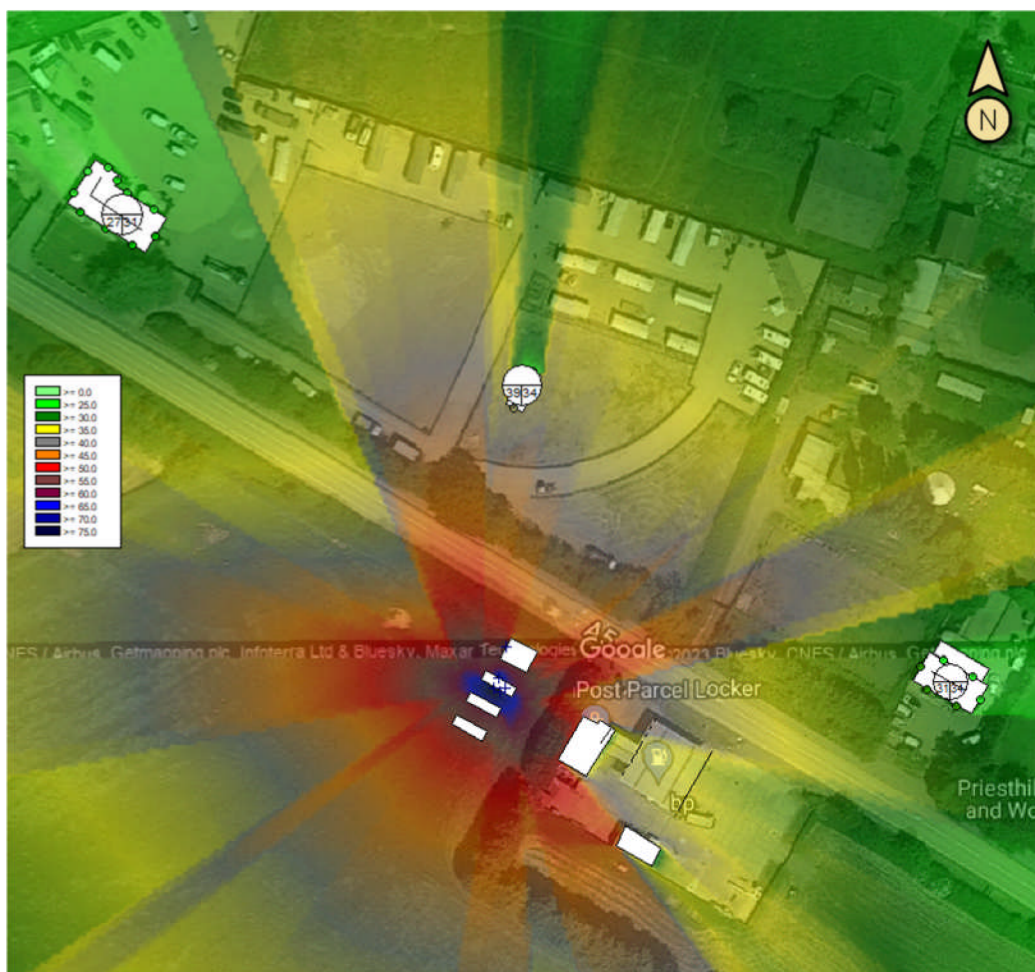
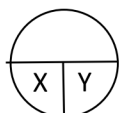


Figure 5: Compressor, DAC operating in isolation – No Refuelling Noise

X – Compressor and DAC plant operating

Y -Pressure relief valve noise



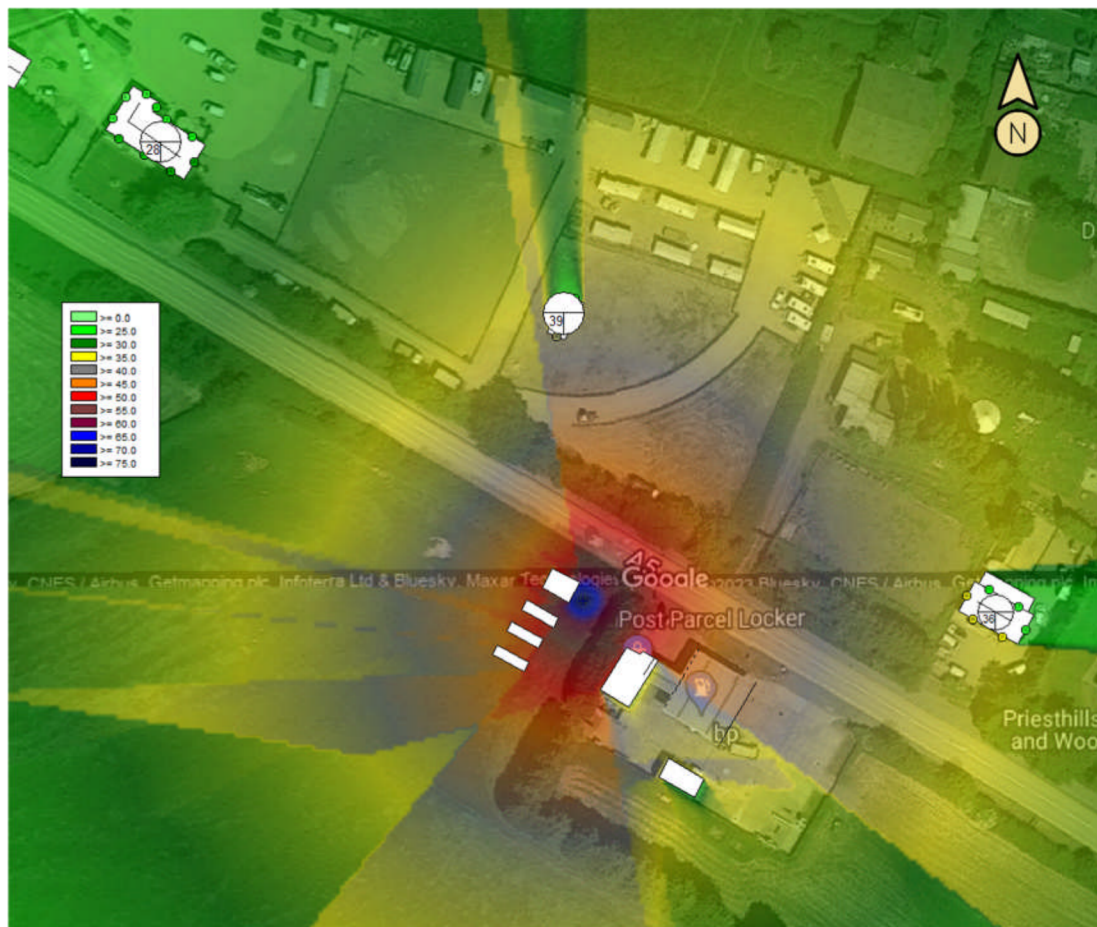


Figure 6: Noise Propagation for operation of emergency Standby Generator to nearest dwellings along Whitehall Drive

7.07 Table 7.3 presents a summary of the results based on each worst case operating scenario outside the most affected windows of the relevant dwelling:

Location	Condition	Scenario	L _{Aeq,1 hour}	L _{Amax} for period
Traveller site	Plant Operation	Refilling of storage tanks on site including gas generator	39 dB(A)	34 dB(A) PRV venting
	Peak Condition	20 No refuelling operations and Compressor, DAC Running	39 dB(A)	31 dB(A) 20 No. lorry manoeuvres only
	Standby Generator	In event of power failure	39 dB(A)	N/A

Table 7.3: Summary of Noise Modelling for nearest most affected receptors at each location

8 NOISE IMPACT ASSESSMENT

- 8.01 The noise impact due to the operation of the new refuelling station has been assessed in accordance with BS4142 for the operating conditions described in Section 7.01. These do not differ between day or night.
- 8.02 The assessment focuses on the noise impact on the expected location of the nearest and most affected static caravan within the Travellers site. These are exposed to the highest levels of noise as calculated in the noise model and also, in the context of the site.
- 8.03 Based on a review of the various parameters (averages and minima) reported for background noise, the following representative background noise levels will be used in the noise assessment for relevant periods; these being based around the average modal values recorded on site.

Period	Representative $L_{A90,15 \text{ mins}}$
Peak Weekend Daytime	47 dB
Weekend/Weekday Night time	39 dB

Table 8.1: Representative background noise levels over proposed assessment periods

- 8.04 The following tables show the BS4142 assessment procedure for the activities and periods described above based upon the noise immissions modelled in CadnaA (Section 7 above). The assessments include commentary on context and reference to absolute noise standards found in BS8233:2014, 'Guidance on sound insulation and noise reduction for buildings' and WHO guidelines, summary details of which are presented in Section 3 above.

Peak Weekday Daytime

Results		Relevant Clause	Commentary
Assessment made during the daytime, so reference time interval is 1 hour		7.2	
Calculated Specific Noise	39 dB $L_{Aeq,1 \text{ hour}}$	7.3.6	Noise modelled using CadnaA, assumes continuous operation of all items during peak periods
Acoustic Character Correction	+ 3 dB	9.2	Noise from PRV and vehicle manoeuvring being slightly tonal, intermittent and impulsive against existing ambient noise that has irregular activity already
Rating Sound Level	(39+3) dB = 42 dB	9.2	Overall 1 hour level
Background Noise Level	47 dB $L_{A90,1 \text{ hour}}$	8	Representative daytime background during peak periods
Difference	(42-47) dB = - 5dB	11	
Assessment indicates the noise will be of low impact		11	
Uncertainty of assessment	Not Significant	10	The noise model uses measured source data and representative background noise levels are based on extended survey including a weekend period.

Table 8.2: BS4142 Assessment for noise impact on the Travellers site based on Peak Weekday Daytime Activity

Peak Night time Activity

Results		Relevant Clause	Commentary
Assessment made during the night time, so reference time interval is 15 minutes		7.2	
Calculated Specific Noise	39 dB $L_{Aeq,15 \text{ mins}}$	7.3.6	Noise modelled using CadnaA, assumes continuous operation of all items during peak periods total 20 No. operations
Acoustic Character Correction	+ 3 dB	9.2	Noise from PRV, gas engine and vehicle manoeuvring being slightly tonal, intermittent and impulsive against existing ambient noise that has irregular activity already
Rating Sound Level	(39+3) dB = 42 dB	9.2	Overall 15 minute level
Background Noise Level	39 dB $L_{A90,15 \text{ mins}}$	8	Representative background during night time periods
Difference	(42-39) dB= +3 dB	11	
Assessment indicates the noise will have low impact		11	
Uncertainty of assessment	Not Significant	10	The noise model uses site measured source data and representative background noise levels are based extended survey including a weekend period.

Table 8.3: BS4142 Assessment for noise impact on the Travellers site based on Peak Night time Activity

8.05 Table 8.4 presents a summary of each assessed scenario at the closest most affected receptor during each period and the relevant BS 4142 conclusion.

Scenario	Rating Level – Background noise dB	BS 4142 Assessment Conclusion
Peak Daytime 20 No. refuelling operations and compressor & DAC	-5	Noise impact will be considered to be low impact , depending on context.
Peak Night time 20 No. refuelling operations and compressor & DAC	+3	Noise impact will be considered to be low impact , depending on context.

Table 8.4: Summary of BS4142 conclusions for each potential worst case scenario

- 8.06 As indicated in the above BS4142 assessments, the impacts of the operational noise from the refuelling station is expected to be of 'low', depending on context. The assessment has been undertaken against the worst case operating scenario with noise levels expected to be significantly lower further reducing the risk of any adverse impact.
- 8.07 The context in this instance is that there is already intermittent noisy activity in the area that is expected to mask the subjective operation and activity associated with the CNG site. The typical ambient noise level that is controlled by traffic flow along the A5 is consistently above 55dB(A) even during the night time. From around 0700hrs until 2100 hours the ambient noise level is over 65dB(A).
- 8.08 There is also the BP service station that is currently open for 24 hours a day and has jet wash and car wash facilities all of which are expected to influence the character of the existing noise climate such that any activity associated with the proposed CNG site would not be out of character for the area already. The majority of the customers that will utilise the CNG Fuels site will already be using the A5 so there should be no significant change in traffic levels but with the added advantage that any Bio-CNG fuelled being quieter than the equivalent diesel lorries what would also utilise the A5 network.
- 8.09 The noise level associated with the 20 No. lorries refuelling in any one hour period has been calculated to be 30dB(A). This is below the lowest background noise recorded during both the daytime and night time and therefore would be expected to be of low impact especially based on the existing traffic along the A5 masking most of this activity noise.
- 8.10 A review of the expected maximum noise levels, typically associated with the pressure relief valve that operates at the end of the compressor operation is no more than 34 dB(A) at the nearest dwellings which is still 1dB below the lowest background noise level recorded on site and therefore not expected to have any adverse impact.
- 8.11 Noise associated with the operation of the standby generator, which will only operate in the event of a power failure to the site or under monthly testing, will be no more than 39 dB(A) which is below the typical representative background noise level during the daytime and night time and therefore would be expected to be of low impact.

9 CONCLUSIONS

- 9.01 CNG Fuels Ltd has appointed Environmental Equipment Corporation Limited to undertake a noise assessment for the new CNG Fuels refuelling station on Land of A5 Watling Street and west of the petrol filling station, Hinckley, LE10 3ED.
- 9.02 The assessment has been carried out in accordance with national planning guidance and current British Standard guidance and is based on an environmental noise survey conducted at the site including a weekend period.
- 9.03 A noise assessment has been undertaken in response to the Environmental Health's ore-application feedback to evaluate the potential worst case noise impact of the proposed operations and equipment on the nearest noise sensitive receptors.
- 9.04 The assessment has shown that during the respective daytime and night time operation of all services will be of low impact at the nearest receptors under the worst case operating conditions with typical refuelling only conditions expected to result in low impact and therefore no adverse impact.

- 9.05 On the basis of this assessment it is considered that noise does not pose a material constraint to planning permission for the development of the site being granted.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

ACOUSTIC TERMINOLOGY

Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to the additional of a new noise source.
dB	Decibel. The logarithmic unit of sound level.
dBA	A-weighted decibel. The A-weighting approximates the response of the human ear.
$D_{nT,w}$	Weighted standardized level difference. A single number quantity of the sound level difference between two rooms. $D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling. Measured in accordance with BS EN ISO 16283-1 and weighted in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	The weighted element-normalized level difference. A single number rating of the sound reduction provided by a sound passing through an individual element. $D_{n,e,w}$ is typically used to define the sound insulation provided by ventilators. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Flanking	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4kHz, roughly equal to the range of frequencies on a piano.
Impact Sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
$L_{Aeq,t}$	The equivalent continuous sound level measured in dBA. This is commonly referred to as the average noise level. 't' is the interval time for the measurement. Typically 't' of 16hrs and 8hrs is used for day and night time ambient noise respectively or 't' is defined by the period of interest in BS4142 assessments.
$L_{A90,t}$	The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.
$L'_{nT,w}$	Weighted, standardized impact sound pressure level. A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard "tapper" machine. The lower the $L'_{nT,w}$, the better the acoustic performance. Measured in accordance with BBS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.
NR	Noise Rating. A single number rating which is based on the sound level in the octave bands 31.5Hz – 8kHz inclusive, generally used to assess noise from mechanical services in buildings.
Octave Band	Frequencies are often grouped together into octaves for analysis. Octave bands are labelled by their centre frequency which are: 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz and 4kHz.
Reverberation Time (T_{mf})	Reverberation time is used for assessing the acoustic qualities of a space. It is defined as the time it takes for an impulse to decay by 60dB. T_{mf} is the arithmetic average of the reverberation time in the mid frequency bands (500Hz, 1kHz and 2kHz).
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. Sound absorption refers to the ability of a material to absorb sound, rated from 0, complete reflection, to 1, complete absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to the ability of a material to prevent the travel of sound.
Structure-borne transmission	Transmission of sound energy as vibrations via the structure of a building.

APPENDIX B
PROPOSED SITE
LAYOUT



APPENDIX C
PLANNING POLICY
AND GUIDANCE

PLANNING POLICY AND GUIDANCE

National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 (as amended on 20th July 2021) and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

Paragraph 174 in Section 15 of the NPPF (2021), entitled Conserving and enhancing the natural environment, states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability..."

Paragraph 185 in Section 15 also states that:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason..."

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

"NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

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

avoid significant adverse impacts on health and quality of life;

mitigate and minimise adverse impacts on health and quality of life; and

where possible, contribute to the improvement of health and quality of life.”

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

2.25 This aim (the third aim), seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

British Standard 4142

To assess the acceptability of the resultant noise levels we have consulted the relevant standards. BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' has been used to assess the likelihood any adverse impacts based on the resultant noise level from the new plant item, including any corrections for the character of the noise against the existing background noise level.

BS4142 gives guidance on assessing the likelihood of adverse impacts by calculating a 'rating level' of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the 'rating level' to assess the likelihood of complaints:

- The greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
- A difference of +5dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background noise level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low sound impact, depending on the context.

This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. For the purposes of the standard it states that daytime and night-time are typically 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

The 'rating level' of the noise source is obtained taking the following factors into consideration:

- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq} .
- An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.

BS 4142 goes onto state that:

'The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.'

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the proposed development.

APPENDIX D

SURVEY RESULTS
(TABULAR)

quietly moving forward

EC 19348 - CNG Hinckley

CNG Fuels

Tabulated Noise data

Sheet 1 of 3

Time	L _{Aeq}	L _{AMax}	L _{A90}
13:15	68.1	81.7	60.5
13:30	69.3	91.3	63.6
13:45	68.1	80.2	61.4
14:00	67.0	78.0	59.2
14:15	67.5	76.3	61.3
14:30	67.8	80.8	62.2
14:45	67.9	77.4	61.5
15:00	68.3	77.7	61.5
15:15	66.1	83.0	58.9
15:30	68.6	84.2	62.0
15:45	66.0	77.8	58.1
16:00	64.9	75.7	55.8
16:15	65.8	74.6	56.9
16:30	68.0	76.4	62.0
16:45	68.0	76.5	61.2
17:00	67.8	82.6	60.0
17:15	67.7	83.2	60.7
17:30	66.8	77.6	59.1
17:45	67.4	79.0	57.7
18:00	66.9	81.5	58.8
18:15	65.8	78.8	52.5
18:30	65.5	78.4	54.4
18:45	65.0	78.5	52.0
19:00	64.2	78.3	49.4
19:15	64.7	77.2	50.5
19:30	64.1	78.0	47.9
19:45	63.7	79.1	47.5
20:00	64.5	77.4	47.6
20:15	62.6	76.6	43.3
20:30	62.8	80.1	46.8
20:45	63.3	78.5	47.3
21:00	62.7	77.0	45.0
21:15	63.6	78.4	47.4
21:30	63.9	78.7	48.0
21:45	63.8	78.2	45.5
22:00	64.5	77.7	46.6
22:15	63.6	79.7	45.0
22:30	64.0	77.7	46.8
22:45	63.5	78.6	45.3
23:00	61.2	76.9	43.3
23:15	61.9	77.0	42.1
23:30	63.4	78.1	44.0
23:45	60.6	77.6	40.2
00:00	61.9	77.4	41.3
00:15	61.6	79.3	42.9
00:30	60.3	76.9	40.4
00:45	61.7	78.4	40.4
01:00	60.8	79.7	38.3

Time	L _{Aeq}	L _{AMax}	L _{A90}
01:15	60.9	77.5	37.3
01:30	61.9	78.6	41.2
01:45	61.2	77.2	41.9
02:00	60.7	77.2	41.4
02:15	61.4	77.1	45.1
02:30	61.9	76.0	44.9
02:45	59.6	76.9	39.4
03:00	61.3	76.3	46.6
03:15	60.4	77.4	43.4
03:30	60.2	78.6	46.3
03:45	61.5	77.3	46.9
04:00	61.4	76.7	45.8
04:15	60.2	75.7	47.4
04:30	61.9	76.4	48.5
04:45	62.8	78.4	48.6
05:00	63.8	77.4	51.1
05:15	63.0	77.5	49.0
05:30	63.1	76.3	49.3
05:45	63.8	76.5	50.0
06:00	63.0	78.0	49.2
06:15	64.2	78.8	49.0
06:30	64.5	77.3	48.5
06:45	65.2	77.4	51.1
07:00	66.1	77.7	53.2
07:15	66.5	79.3	52.6
07:30	66.4	78.2	53.6
07:45	65.5	76.0	53.8
08:00	66.4	77.9	53.1
08:15	66.4	79.7	55.2
08:30	66.7	83.2	56.3
08:45	66.2	78.1	55.5
09:00	67.4	78.6	58.2
09:15	67.2	77.4	58.4
09:30	67.3	78.4	59.6
09:45	68.4	80.1	61.4
10:00	67.3	79.5	57.0
10:15	67.8	76.4	61.3
10:30	67.9	79.9	60.4
10:45	68.5	79.5	62.2
11:00	67.5	79.7	60.4
11:15	67.9	78.4	61.8
11:30	68.2	80.7	60.4
11:45	67.8	77.6	60.7
12:00	67.9	79.0	60.0
12:15	67.8	83.4	61.5
12:30	68.2	82.8	61.0
12:45	68.1	78.9	60.6
13:00	67.7	77.4	60.5

EC 19348 - CNG Hinckley

Firstplan

Tabulated Noise data

Sheet 2 of 3

Time	L _{Aeq}	L _{AMax}	L _{A90}
13:15	67.7	79.1	59.5
13:30	68.4	87.6	60.3
13:45	68.4	79.1	61.9
14:00	67.1	77.9	56.7
14:15	68.7	86.7	61.6
14:30	67.5	77.3	57.9
14:45	67.5	79.9	58.4
15:00	67.8	77.6	60.4
15:15	67.5	82.9	57.6
15:30	68.0	82.1	58.0
15:45	67.3	76.9	59.9
16:00	67.4	78.9	58.3
16:15	66.7	76.6	57.7
16:30	67.0	76.9	57.1
16:45	67.5	80.4	58.2
17:00	66.7	76.3	58.0
17:15	66.0	76.6	55.9
17:30	65.7	76.3	57.3
17:45	65.7	77.4	54.5
18:00	65.3	75.4	54.1
18:15	64.5	75.4	53.1
18:30	65.4	76.0	53.3
18:45	65.2	76.3	53.3
19:00	65.0	76.6	51.0
19:15	64.3	79.2	50.2
19:30	63.8	85.3	50.1
19:45	63.8	75.3	49.5
20:00	63.3	77.0	47.8
20:15	63.8	79.2	49.3
20:30	63.3	76.5	47.8
20:45	63.5	76.7	49.2
21:00	64.1	77.8	49.5
21:15	63.3	76.3	50.3
21:30	63.7	77.0	48.4
21:45	63.9	76.1	48.5
22:00	62.1	75.0	45.3
22:15	62.4	79.2	42.0
22:30	62.4	76.7	46.6
22:45	66.0	88.1	46.4
23:00	61.7	77.5	44.7
23:15	62.7	82.1	45.2
23:30	61.9	79.3	41.3
23:45	60.5	78.6	38.8
00:00	60.5	77.1	38.4
00:15	59.7	76.9	39.0
00:30	61.4	76.7	36.9
00:45	57.6	76.1	35.6
01:00	59.9	78.2	38.2

Time	L _{Aeq}	L _{AMax}	L _{A90}
01:15	58.1	75.7	36.3
01:30	59.7	77.7	35.4
01:45	60.6	77.3	39.8
02:00	61.1	79.4	37.3
02:15	60.2	77.2	36.5
02:30	60.3	78.9	35.3
02:45	59.0	77.2	35.5
03:00	60.6	77.0	37.1
03:15	58.7	78.6	37.5
03:30	60.7	77.3	37.3
03:45	60.2	78.6	40.7
04:00	61.8	79.1	39.3
04:15	62.1	78.8	39.3
04:30	60.8	78.0	41.8
04:45	62.2	78.7	39.9
05:00	62.3	80.5	39.9
05:15	60.5	78.1	39.2
05:30	61.9	78.8	39.2
05:45	62.8	78.5	43.2
06:00	62.0	77.1	44.8
06:15	63.8	77.5	45.7
06:30	63.2	76.5	43.5
06:45	63.5	77.9	44.7
07:00	64.2	77.7	46.9
07:15	64.2	76.9	49.4
07:30	65.5	86.8	49.6
07:45	64.5	79.5	47.4
08:00	65.5	78.5	49.9
08:15	65.7	80.1	51.5
08:30	65.9	78.5	49.3
08:45	66.6	81.4	52.9
09:00	67.0	78.2	56.6
09:15	67.8	78.6	57.6
09:30	67.1	77.4	55.8
09:45	69.6	96.3	58.3
10:00	67.9	81.7	57.8
10:15	67.9	84.2	58.3
10:30	66.8	78.0	56.3
10:45	66.6	77.3	58.0
11:00	66.6	78.3	57.4
11:15	67.2	83.4	58.2
11:30	67.0	78.4	57.6
11:45	66.2	77.7	58.1
12:00	66.3	76.8	58.5
12:15	66.2	78.9	55.2
12:30	66.5	77.9	58.2
12:45	67.4	82.6	58.8
13:00	67.2	78.0	59.7

EC 19348 - CNG Hinckley

Firstplan

Tabulated Noise data

Sheet 3 of 3

Time	L _{Aeq}	L _{AMax}	L _{A90}
13:15	67.0	78.6	58.4
13:30	67.5	90.4	58.1
13:45	67.5	83.3	57.0
14:00	66.2	79.8	53.6
14:15	65.3	79.9	52.6
14:30	69.4	94.8	54.8
14:45	66.1	79.4	56.3
15:00	66.5	83.6	55.8
15:15	66.8	79.5	58.4
15:30	66.6	76.2	56.6
15:45	67.7	77.1	59.7
16:00	67.3	79.8	59.9
16:15	66.2	78.3	54.1
16:30	66.3	76.4	55.8
16:45	66.7	77.2	56.7
17:00	66.3	77.7	55.1
17:15	66.8	79.1	57.8
17:30	66.3	78.5	55.3
17:45	66.0	77.7	55.4
18:00	65.2	78.3	55.1
18:15	66.0	76.8	55.6
18:30	65.4	77.9	53.9
18:45	64.4	77.0	52.9
19:00	63.9	77.4	51.7
19:15	64.0	76.3	51.1
19:30	64.2	78.4	50.0
19:45	62.9	78.0	47.4
20:00	63.8	77.1	48.2
20:15	62.6	74.4	46.1
20:30	63.0	76.7	47.3
20:45	62.0	77.5	44.0
21:00	62.3	76.5	42.6
21:15	62.6	78.4	45.7
21:30	62.4	78.0	41.8
21:45	61.0	77.6	42.9
22:00	60.3	77.3	42.7
22:15	62.4	76.5	42.8
22:30	61.3	78.5	40.7
22:45	65.1	88.2	40.6
23:00	60.9	78.1	37.8
23:15	61.0	78.2	38.2
23:30	60.5	77.3	35.4
23:45	59.5	79.5	35.0
00:00	63.8	91.8	34.5
00:15	59.3	78.3	32.9
00:30	59.0	76.7	33.2
00:45	60.9	78.5	34.9
01:00	60.0	79.7	37.1

Time	L _{Aeq}	L _{AMax}	L _{A90}
01:15	58.3	77.1	33.3
01:30	58.3	77.1	34.7
01:45	57.8	77.2	33.0
02:00	59.8	77.7	34.4
02:15	58.4	78.6	33.0
02:30	59.4	77.3	35.0
02:45	60.8	76.9	35.1
03:00	60.2	80.5	35.2
03:15	60.9	77.0	39.8
03:30	59.3	78.8	37.0
03:45	62.0	83.0	39.4
04:00	62.7	78.4	42.0
04:15	63.3	80.1	45.6
04:30	64.2	77.2	46.2
04:45	65.2	77.5	47.7
05:00	65.2	78.5	50.3
05:15	65.9	76.7	52.2
05:30	66.2	78.0	54.0
05:45	67.2	78.0	57.4
06:00	67.6	77.4	58.6
06:15	67.8	78.0	60.2
06:30	68.6	77.4	62.7
06:45	68.5	78.6	62.1
07:00	68.2	77.2	62.1
07:15	68.4	79.3	62.1
07:30	68.2	79.8	62.1
07:45	67.6	77.9	61.4
08:00	67.5	80.3	58.8
08:15	67.7	77.5	60.2
08:30	67.4	77.9	59.8
08:45	68.0	78.8	58.9
09:00	67.5	78.5	59.4
09:15	68.5	90.4	58.8
09:30	67.0	77.8	58.7
09:45	67.3	79.1	60.3
10:00	66.9	78.7	58.6
10:15	67.0	78.0	58.0
10:30	67.4	79.2	59.4
10:45	67.2	79.7	58.2
11:00	67.3	83.5	59.5
11:15	67.5	79.8	59.9
11:30	67.2	78.0	58.5
11:45	66.6	83.4	57.6

APPENDIX E
SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at CNG Hinckley

