Proposed Residential Development

Le Maresquet Field, La Hure Mare Road,
Northside, Vale, Guernsey.

soundsolution
CONSULTANTS

Environmental Noise Assessment

TECHNICAL REPORT

22227 R1

Proposed Residential Development

Environmental Noise Assessment

Prepared for: Sunnyside Developments

Site address: Le Maresquet Field, La Hure Mare Road, Northside, Vale, Guernsey.

Table of Contents

1 EXECUTIVE SUMMARY 1

2 INTRODUCTION 2

3 DEVELOPMENT SITE 3

GUERNSEY ELECTRICITY POWER STATION 3

LOCAL INDUSTRIAL ACTIVITIES 5

4 NOISE CRITERIA 6

STATES OF GUERNSEY: LOCAL NOISE POLICY 6

BS4142:2014 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND 6

WORLD HEALTH ORGANISATION – GUIDELINES FOR COMMUNITY NOISE 8

5 ENVIRONMENTAL SOUND SURVEY 9

6 NOISE ASSESSMENT 12

BS 4142 ASSESSMENT 15

7 SCHEME DESIGN 19

8 CONCLUSION 21

9 REFERENCES 22

Appendix A: Glossary of Acoustic Terms I

Appendix B: Site Plans II

Appendix C: Site Photographs V

Appendix D: Attended Measurement Results VIII

Appendix E: Meteorological Data IX

Appendix F: Survey Sound Data X

Appendix G: Sound Control for Homes Scheme Designs XII

Appendix H: Acousticians Qualifications and Status XV

soundsolution CONSULTANTS
Cornwall Suite, Dencora Business Centre, Whitehouse Road, Ipswich IP1 5LP
Tel: 0845 5212 096 | Fax: 0845 5212 097
info@soundsolutionconsultants.co.uk | www.soundsolutionconsultants.co.uk
VAT No. 844 9267 90 | Registration No. 5651834
Registered Address: 57 Thorney Road, Capel St. Mary, Ipswich IP9 2XH

SSC PROJECT NO: 22227		
STATUS	**SIGNATURE / NAME | POSITION**	**DATE**
Originated	 Paul Thomson BSc. (Hons) MSc. AMIOA | Acoustic Consultant	22nd October 2015
Approved	 S Skingle BSc. (Hons) MAES MIOA | Principal Acoustic Consultant	22nd October 2015

DOCUMENT REVISION AND CHANGE CONTROL		
REVISION	**CHANGE DESCRIPTION**	**SUPPLEMENT TO**
1	Original Report	-

1 EXECUTIVE SUMMARY

1.1 Sound Solution Consultants Limited have been commissioned by Sunnyside Developments to undertake a noise assessment at Le Maresquet Field, La Hure Mare Road, Northside, Vale, Guernsey (The Site) for a proposed residential development.

1.2 Discussions were held with the States of Guernsey Environmental Health and Pollution Regulation Department to agree a survey methodology and also highlight relevant noise criteria. The Environmental Health Team's concern was the potential for the Vale Power Station to give rise to noise disturbance for any potential residents at the Site.

1.3 The aim of this noise assessment is to determine if a residential development is feasible, that allows for a standard of living for potential residents, which complies with relevant guidelines and identified noise criteria.

1.4 The Site is designated as a "Settlement Area" in the States of Guernsey's Urban Area Plan. It is stated in the Plan that development is to be concentrated within Settlement Areas by taking advantage of underused sites. The Site is a brownfield site of a former vinery which is currently used to accommodate horses. It is comprised of an area of 7013m^2.

1.5 A survey of the Site's sound climate was undertaken from 23:00 Monday 5th October to 07:00 Thursday 8th October 2015. Whist the power station was out of operation a representative background sound level of 35 dBA was measured during the night time period.

1.6 An assessment in accordance with BS4142: 2014 demonstrates the Site is currently exposed to sound levels, when the power station is in operation, of 10 dB above background at measurement position 1 located to the sensitive southern façade. It is realised in context to development, that with effective design the noise levels at sensitive outdoor receptor points could range from no more than background to levels below background. Careful design would ensure outdoor amenity sound levels that are compliant and notably below World Health Organisation health limits and guidance from BS8233: 2014. It is also considered that appropriate internal sound levels could be adequately attained that comply with BS8233: 2014.

1.7 By safeguarding residential amenity from the power plant in operation, in turn, the proposed development site will be adequately protected from the sound of neighbouring industrial activities.

1.8 In conclusion, it is considered that the sound climate of the proposed development site should not be a prohibitive factor to the granting of planning permission for a residential development. When considering the full context of the Site and by adopting practicable noise control design and construction methods an appropriate level of residential amenity for existing and potential residents can be attained. It is concluded that an appropriate level of residential amenity can be achieved without a compromise to the relevant principles set out in the States of Guernsey's Urban Area Plan.

2 INTRODUCTION

2.1 Sound Solution Consultants Limited have been commissioned by Sunnyside Developments to undertake a noise assessment at Le Maresquet Field, La Hure Mare Road, Northside, Vale, Guernsey for a proposed residential development.

2.2 A site appraisal document was produced by Lovell Ozanne Chartered Architects in August 2013[1]. This document has provided three outline design scheme considerations for the site, ranging from Option 1 for 31 dwellings, Option 2 for 70 dwellings and Option 3 for 104 dwellings.

2.3 Discussions were held, on site, with the States of Guernsey Environmental Health and Pollution Regulation Department to agree a survey methodology and also highlight relevant noise criteria appropriate for this assessment.

2.4 It was noted that Guernsey Electric Power Station was the Environmental Health Department's primary area of concern with regard to the potential for noise disturbance at the proposed development site.

2.5 Care was taken to conduct a survey of the site, encompassing a period of time, when the power station was generating electricity when the off island electricity link was not in operation. It was important to assess the site when the power station was solely providing for the Island's electricity needs, demonstrating a typical heightened potential noise scenario.

2.6 It was pointed out by members the Environmental Health Team that the area in close proximity to the proposed development site is industrial in nature and the power station is not the only area of concern when it comes to potentially disturbing noisy activities. For this reason, consideration has been made to other industrial activities during this assessment.

2.7 The aim of this noise assessment is to determine if a residential development is feasible, that allows for a standard of living for potential residents, which complies with relevant guidelines and identified noise criteria. The opportunity will also be taken to provide comment with regard to site layout and scheme design when giving consideration to noise control and mitigation.

2.8 A Glossary of Acoustic Terms can be found in Appendix A that will assist with the terminology used within this report.

3 DEVELOPMENT SITE

3.1 The location of the proposed development site ("The Site") is highlighted in Appendix B, Figures 1 to 3. The site is to the east of La Hure Mare Road and south east of Route Summerfield.

3.2 The Site is designated as a "Settlement Area" in the States of Guernsey's Urban Area Plan [2]. It is stated in the Plan that development is to be concentrated within Settlement Areas by taking advantage of underused sites.

3.3 The Site is a brownfield site of a former vinery which is currently used to accommodate horses. It is comprised of an area of 7013m^2, generally level with minimal planting. Currently the site boundary to the north, east, south and west is a granite wall. To the north the wall is over 2m in height, the remaining wall perimeter ranges from 1.6m to 1.8m in height.

3.4 Adjoining the site to the North West is La Maresquet farmhouse and associated outhouses. This is a protected dwelling owned by the Applicant's family and it has been identified in the site's appraisal document, that it is the intention to restore the farmhouse in to a family home if planning permission were granted.

3.5 Appendix B, Figure 1 illustrates the industrial nature of the locality. The position of a cement works, the quayside, harbour and storage reservoir are illustrated. Appendix B, Figure 2 highlights the immediate land uses in closer proximity to the proposed development site. It can be seen that there is a mixed use, with Guernsey Electricity power station to the south west, various industrial activities to the east and south east and a number of residential dwellings located around the Site. It is noted that there are a number of residential properties in closer proximity to the power station and industrial units than the proposed Site.

3.6 Appendix C provides photographs that best illustrate the makeup of the area around the Site.

3.7 It is deemed necessary to explore the nature of the sound sources neighbouring the Site in greater detail in this Section of the report, as it will offer further background information to this noise assessment.

GUERNSEY ELECTRICITY POWER STATION

3.8 Vale Power Station was built in 1903, since then it has grown to accommodate increasing demand for energy. Appendix B, Figure B3 illustrates a detailed plan of the current site. The power station is gas fuelled.

3.9 At peak demand during January and February the power station is required to produce up to 85MW of electricity. There are currently three power generating stations B, C and D. B Station consists of 2 x gas turbines, C Station consists of 4 slow speed diesel generators and D Station comprises of a slow speed diesel generator 1D and a medium speed diesel generator 2D. (Photographs of each Station are illustrated in Appendix C).

3.10 The Channel Islands Electricity Grid Company Limited (CIEG) was formed to construct and operate a cable link for the importation of electricity from France into Jersey and Guernsey. Currently, a link to France accounts for 90% of Guernsey's electricity demand. Planning permission was granted in 2014 for a new additional power cable from France.

3.11 Guernsey Electric have a mandate from the States of Guernsey to maintain a power station facility that is capable of providing Guernsey's full electricity needs in times of emergency when the cable link with France may not be operating or when there is a requirement to supplement demand during busy winter periods.

3.12 Generator 2D was installed two years ago and was initially subject to reported noise complaints. Both the States of Guernsey Environmental Health Department and Guernsey Electric report incidences of noise complaints from the power station in the past that both parties have worked to resolve the issues identified. Guernsey Electric have to be compliant of noise legislation and ensure they are not generating a noise nuisance whilst adopting the best practicable means that are afforded.

3.13 Guernsey Electricity report a host of noise mitigation measures that have been introduced since the installation of the new generator 2D. Works include the introduction of an acoustically treated barrier "sound wall" around the base of D Station (Appendix C, Figure C3). Noise control works to plant situated on the roof such as cooler units. Care is also taken to maintain and improve the integrity of the building structures of the stations. This is evident whilst on site with concrete and cladding used on the housing structures of each station. A Community Liaison Group has also been formed recently to act as an avenue to deal with any complaints in a constructive manner.

3.14 There have been reports of high pitch noise complaints from the two gas turbines in B Station. This Station is located further away from the proposed development site. By the very nature of the short wavelength of high pitched frequencies they are better attenuated over longer distances due to air absorption. B Station is also used as a last resort during periods of particularly high demand. To set the context, B Station has operated for around 700 hours over the last 18 years whilst D Station has operated in the region of 8,000 hours over the last two years.

3.15 Some C Station's generators have been producing power for over 35 years. As such, there will be a continual need to upgrade and develop the power station site. It has been indicated that there will be a requirement to look to install an additional medium sized diesel generator at site over the next 18 months. It has been earmarked that this may be located between D Station and B Station so not any closer to the proposed development site than the current configuration.

3.16 Any new development of the power station site would be subject to planning approval and potential noise conditions. Guernsey Electricity indicate that the noise control lessons learnt during the installation of generator D2 would be employed for any new development to ensure that current amenity standards are not compromised.

3.17 Deliveries of oil to fuel the power station occur on a fairly infrequent basis taking place around 5 times a year with deliveries being made initially to the local harbour.

LOCAL INDUSTRIAL ACTIVITIES

3.18 The power station is not the only local sound source. The State's Environmental Health Department identify that other noise complaints have been made in the past locally, that they have successfully resolved. For this reason Table 1 has been compiled to illustrate the operations that take place in nearby industrial units detailing the nature of activities and times of operation.

Address	Details of Activity	Times of Operation	Complaint History
Channel Windows Units 3 & 4 La Hure Mare Ind Est, GY3 5UB	Window Fabrication	Mon to Fri 08:00 to 16:30	None
WMS Unit 5 La Hure Mare Ind Est, GY3 5UB	Vehicle Service Centre	Mon to Fri 08:00 to 17:00	None
Arrowsmith, Unit 7 La Hure Mare IndEst, GY3 5UB	Commercial Laundry	Mon to Fri 06:30 to 16:00, Sat 06:30 to 13:00	Complaints in the past have been resolved with neighbouring residents. Try to keep noise down in the early morning.
David Thomson, Unit B La Hure Mare Ind Est	Joinery Workshop	Mon to Fri 07:00 to 19:00	Has had complaints in the past but were resolved with neighbouring resident.
Geomarine Ltd, La Hure Mare, GY3 5UD	Civil Engineering	Mon to Fri 07:00 to 19:00	Complaints in past. Manage noise by restricting activities introduction of white noise reversing beepers.
Mayside Ltd, Unit 1 Les Monmains Ind Est GY3 5UD	Recycling Operation	Mon to Fri 06:00 to 16:00	None
Harrions, Les Monmains Ind Est GY3 5UD	Vehicle Refinishers	Mon to Fri 08:00 to 17:00	None
States Works, La Hure Mare, GY3 5UD	State of Guernsey Operations	24 hour operation	A refuse vehicle yard with HGV departures from 01:00. Drainage vehicles depart from 05:30. A workshop for vehicle maintenance operates from 07:00 to 16:00.

Table 1 – Details of industrial activities that are considered to have the potential to cause noise disturbance at the development site.

4 NOISE CRITERIA

STATES OF GUERNSEY: LOCAL NOISE POLICY

4.1 Care was taken to liaise with the States of Guernsey Environmental Health Team to clarify relevant noise criteria to adopt within this assessment.

4.2 In order to assess the potential noise impact of the power station, when in operation, on the proposed development site it was specified that an assessment should be conducted in accordance with BS4142: 2014 "Methods for Rating and Assessing Industrial and Commercial Sound" [3]. The Standard would also be relevant for any other potentially disturbing sound sources that were identified, which are industrial in nature.

4.3 World Health Organisation Guidelines for Community Noise [4] and the criteria specified in BS8233: 2014 "Guidance on Sound Insulation and Noise Reduction for Buildings" [5] are considered as appropriate Standards for upper noise limits for external and internal areas of the proposed development site.

4.4 It was agreed that the Building Research Establishment's "Sound Control for Homes" [6] would be a useful reference document when considering the design of the proposed development with particular reference to noise control.

4.5 There is one other document that has particular relevance to the proposed development. It is a Development Brief compiled by the Environment Department [7]. The Brief is intended to provide guidance "*which will help to ensure that high quality, sustainable residential development occurs in the La Hure Mare Road site respecting and enhancing the special character of the adjoining protected buildings".*

4.6 The Brief makes specific reference to a number of the States Urban Area Plan's Planning Policies. Policy HO2 has particular relevance to noise and states *"The development must be of an acceptable standard in terms of design, density and amenity".*

4.7 In addition the State's Urban Area Plan provides the following General Policy Principle [3.3.10] that should be used to inform the decisions of Committee *"Development should not give rise to hazards, pollutants or nuisances, which would present a significant risk to the public and environment".*

BS4142:2014 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

4.8 The recently revised British Standard BS4142: 2014 "Methods for Rating and Assessing Industrial and Commercial Sound" describes methods for rating and assessing sound of an industrial or commercial nature. The scope of the standard includes relevant topics for commercial development, such as sound from fixed installations (mechanical and electrical plant and equipment). The standard is applicable to the determination of rating levels for sources of sound as well as ambient, background and residual levels.

4.9 Certain acoustic features can increase the significance of impact that might be expected from a comparison of the specific sound level to the background sound level. Where such features are present at the assessment location, a character correction to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.

+ Tonality: A correction of 0dB to +6dB for sound ranging from not tonal to prominently tonal; using the Joint Nordic Method or subjectively.

+ Impulsivity: A correction of up to +9dB can be applied for sound that is impulsive.

+ Other characteristics: A correction of 3dB can be applied where the sound is neither tonal nor impulsive, but distinctive in the residual acoustic environment.

4.10 Corrections can apply either as a single factor if one feature is dominant, or added linearly if both features are likely to affect perception and response. The rating sound level is equal to the specific sound level if there are no acoustic features present or expected to be present.

4.11 The significance of sound depends upon both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. An initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level. The context of the development is important in assessing the impact.

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

4.12 The scope of the Standard recognises that human response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.

4.13 In light of the above, the relevance of specific site context was discussed with the State's Environmental Health Department. Note was also made to Section 8.5 of BS4142: 2014 "Introduction of a New Noise Sensitive Receptor". The Standard states that *"Where a new noise sensitive-receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognised that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation".*

WORLD HEALTH ORGANISATION – GUIDELINES FOR COMMUNITY NOISE

4.14 The scope of WHO Guidelines for Community Noise was to consolidate scientific knowledge on the health impacts of community noise, to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The health risk to human from exposure to environmental noise was evaluated and guidelines derived.

4.15 The WHO presents a measure to assess adverse health effects from steady-state 'anonymous' noises such as traffic. Noise levels recommended by the WHO are in line with those mentioned in BS8233:2014:

"The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 dB LAeq for continuous noise.... At night-time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedroom windows open. This value was obtained by assuming that the noise reduction from outside to inside with the window open is 15 dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB LAeq."

4.16 BS8233:2014 points out that if relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

5 ENVIRONMENTAL SOUND SURVEY

5.1 A survey of the Site's sound climate was undertaken from 23:00 Monday 5th October to 07:00 Thursday 8th October 2015 in accordance with BS7445-2:1991 [8].

5.2 The equipment used during the survey consisted of the following Class 1 precision noise monitoring equipment listed in Table 2 below. All equipment listed has traceable calibration history to the relevant British Standards. A Davis weather station was also used to measure simultaneous weather conditions during the survey.

Manufacturer	Model No.	Description	Serial No.	Calibration Due Date
Larson Davis	LxT	3rd Octave Band Sound Meter	4203	June 2017
Larson Davis	LxTPRM1L	Microphone pre-amplifier	35997	June 2017
Larson Davis	337B02	½" Electret microphone	154590	May 2017
Larson Davis	LxT	3rd Octave Band Sound Meter	2680	Feb 2017
Larson Davis	LxTPRM1L	Microphone pre-amplifier	29299	Feb 2017
Larson Davis	337B02	½" Electret microphone	122141	Feb 2017
Larson Davis	LxT	3rd Octave Band Sound Meter	3934	July 2017
Larson Davis	LxTPRM1L	Microphone pre-amplifier	29332	July 2017
Larson Davis	337B02	½" Electret microphone	146990	July 2016
Larson Davis	CAL200	Sound Level Calibrator	11165	April 2016
Davis	Vantage Pro	Weather Station	-	-

Table 2 – Environmental monitoring equipment used during survey.

5.3 The calibration of the sound level meter was checked using a reference tone of 114dB at 1kHz before and after measurements were taken. Validation at the end of the survey indicated that all instruments had operated within permitted tolerances for drift and measured level. A calibration drift of no more than 0.12dB was observed across the assessment period.

5.4 The weather conditions at the start of the noise survey was measured using a Hold-peak anemometer serial number 1231846 as 17°C, 100% cloud cover, no rain, 90% humidity with a south east wind averaging 1 m/s with gusts no more than 3m/s. At the end of the survey weather conditions were 15°C, 20% cloud cover, no rain, 79% humidity with a very light south east breeze averaging no more than 1m/s. The Davis weather station recorded regular gusts of wind over 5m/s from 03:45 5/10/15 to 21:00 7/10/15 which may have adversely effected the sound measurements taken during this period. Attended measurements taken during this period have provided an insight into the level of uncertainty of the recordings made during gusty wind conditions. Appendix E shows the meteorological survey data graphically.

5.5 Two unattended monitoring locations were selected to measure the environmental sound levels over the course of the survey period. The measurement positions are highlighted on the site plan Appendix B, Figure B2 and are illustrated in photographs Appendix C, FiguresC1 and C2 and can be described as:

Position 1) *A microphone was placed to the southern façade of the proposed development site located equidistantly from the power station and the neighbouring industrial estate. The location was 10m from the boundary wall, the microphone was located 1.5m from the ground at a free field measurement position.*

Position 2) *A microphone was placed to the northern façade of the proposed development site located over 20m from the each boundary wall and 8m from the nearest building façade. The microphone was located 1.5m from the ground and at a free field measurement position.*

5.6 The selected measurement positions allow for the extent of the proposed development site to be surveyed to illustrate any differences measured with the sound climate.

5.7 During the course of the survey supplementary attended measurements were taken at both the measurement positions. In addition, attended short spot readings were taken at a total of 7 additional locations to further aid the assessment (see Appendix B, Figure B3 for the locations and Appendix D for the measurement results.).

5.8 The residual sound at the measurement positions, in the absence of the power station, consisted of local industrial activities and vehicle movements by day and distant traffic and waves from the sea at night.

5.9 Interval noise data was recorded at the unattended measurement location at 15 minute periods, time synchronised between sound level meters and to BST. The sound level meters were configured to record average equivalent (LAeq), maximum (LAmax), minimum (LAmin) and statistical (Ln) parameters.

5.10 Results of the survey are shown graphically in Appendix F. The power station was inactive during the hours of 23:00 5/10/15 until 06:00 6/10/15 so a period of time during this interval has been used to establish a background sound level in the absence of any source sound from the power station.

5.11 Background L_{A90} sound levels at the measurement positions have not been established for the day time period 07:00 to 23:00 as the power station was always in operation in some capacity during this time frame.

5.12 The “typical” night time background sound levels have been established, for the purposes of this noise assessment, from histograms of the recorded $L_{A90,\ 15min}$ data at the unattended measurement locations. In practice, there is no single level for a background sound level as this is a fluctuating parameter, although the Standard recommends that a representative value for the period should be used. Note, this is neither the lowest nor mean average value of $L_{A90,\ 15min}$.

5.13 The results shown in Figure 1 highlight that a background sound level of 35dB was most commonly occurring at measurement position 1 during the night time background survey. During the same period a level of 39dB was most commonly occurring at measurement position 2, see Figure 2. It is noted that the background sound level increased to 40 dB and above from 3.45 am onwards. This coincided with an increase in wind speed averaging 3 m/s and gusts over 5m/s. Data at this time has therefore been discounted from the background sound level survey.

5.14 For the purposes of the BS4142 night time assessments, shown in Figures 5, the aforementioned background sound level of 35 dB will be used for position 1 to the south façade.

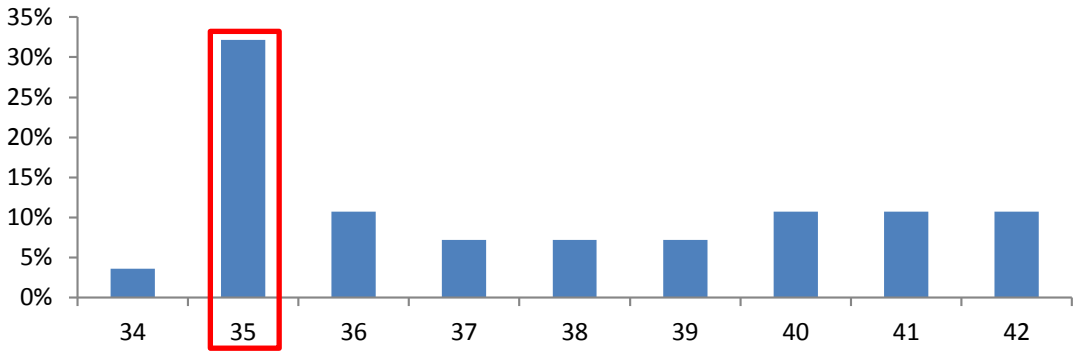

Figure 1 - Measurement Position 1 South Facade Night Time (23.00 to 06.00) Background Sound Level dB $L_{A90,15min}$

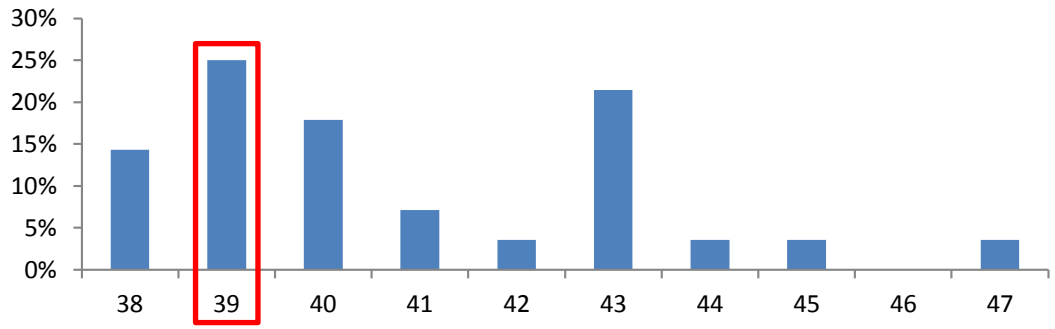

Figure 2 - Measurement Position 2 North Facade Night Time (23.00 to 06.00) Background Sound Level dB $L_{A90,15min}$

6 NOISE ASSESSMENT

6.1 Table 1 shows the results of the values recorded during the day time (07:00 to 23:00) and night time (23:00 and 07:00) periods, at both the unattended measurement positions, over the course of the sound survey.

Location	Duration	Date and Time	Time	LAeq dB
Position 1 (South)	8h	5/10/15 (23:00 to 07:00)	Night	45
	16h	6/10/15 (07:00 to 23:00)	Day	53
	8h	6/10/15 (23:00 to 07:00)	Night	51
	16h	7/10/15 (07:00 to 23:00)	Day	51
	8h	7/10/15 (23:00 to 07:00)	Night	45
Position 2 (North)	8h	5/10/15 (23:00 to 07:00)	Night	47
	16h	6/10/15 (07:00 to 23:00)	Day	51
	8h	6/10/15 (23:00 to 07:00)	Night	49
	16h	7/10/15 (07:00 to 23:00)	Day	57
	8h	7/10/15 (23:00 to 07:00)	Night	40

Table 3 – Ambient sound levels recorded over the survey period.

6.2 As previously stated there were adverse wind conditions from 03.45, 5/10/15 until 21:00, 7/10/15. This is not an issue, for the purposes of this assessment, as a BS4142 assessment of the power station can be conducted using the night time background sound level from 5/10/15 and calculate the specific sound level, with the power station operating, using measurements during the night time period starting 23:00 7/10/15.

6.3 An assessment during the night time period will be a worst case scenario as it was clearly evident that the background sound levels were lower during the night as compared to the day time when there was more local activity. It is considered that there will not be a notable increase in the sound levels from the power station during the day at the proposed site because any additional day time power production is likely to be from C Station which has been assessed to have minimal impact at the Site. It is evident, that by safeguarding against any adverse sound impact during the most sensitive night time period, adequate provision will be afforded for day time sound levels.

6.4 Ambient sound measurements taken from 23:00, 7/10/15 to 07:00, 08/10/15 were made with a total of three generators running at the power station. This consisted of both generators in D Station and an additional generator in C Station. This is typical of night time electricity generation to supply the island.

6.5 On the morning of 8/10/15 the weather conditions were calm and conducive for sound monitoring. During the period 9am to 10am a level of 51 dB $L_{Aeq,\ 1hr}$ was recorded at position 1 nearest to the power station and 46 dB $L_{Aeq,\ 1\ hr}$ at position 2. These levels were recorded with 5

generators in total in operation, two in D Station and three in C Station. Again typical for on island electricity generation, this time during the day. These levels were supported by attended measurements and they are considered representative ambient day time levels at the development site with the power station in operation.

6.6 When the power station was in operation a constant low level, general hum, was audible at the proposed development site. The sound was less evident with increased distance from the power station. To the north of the Site the sound was not the dominant source during the day; bird song, vehicle movements and industrial activity were more evident.

6.7 At the proposed development site entrance, by Maresquet Farmhouse, the power station sound was completely masked by a car engine idling.

6.8 The power station sound had no tone and no impulsive noises were evident. Table 4 illustrates the 1/3 octave band components of the power station sound as measured at position 1. No tone was evident when using the "objective method for assessing the audibility of tones in sound" detailed in Annex C of BS4142: 2014. The measurement used for the tonal assessment was made at 23.09, 7/10/15 with a positive wind vector during acceptable weather conditions. The overall level was 46 dB LAeq.

6.9 Table 2 also illustrates the 1/3 octave band component of a measurement made at a commercial boiler flue at Arrowsmith, 7 La Hure Mare Industrial Estate, GY3 5UB. The premises is to the south east of the proposed development site and is shown in Appendix C, Figure C6. Again there is no tonal element to this sound source.

6.10 When arriving at site, a sound from the commercial laundry's boiler flue was evident to the south of the proposed development site. A measurement was made 4m from the flue and a level of 58 dBA was recorded. At the south east boundary of the development site the level dropped to 51 dBA. A level of this nature is within World Health Organisation health limit for outdoor amenity areas. However it is worth noting and any proposed building design should mitigate the presence of this sound source in rear amenity areas.

6.11 The State's Environmental Health Department informed that there are no formal planning mechanisms in place for a developer to mitigate against a sound source by means of implementing measures away for the development site. Therefore the notion of a planning agreement being drawn up for a developer to pay for noise mitigation works not related to the site is not available. It was however stated by the Environmental Health Team that any private agreements for any mitigation measures away from the proposed site would be supported in principle.

6.12 In short, further to an on-site assessment, it is considered that the sound emanating from the commercial boiler flue could cause an adverse impact however, this could be adequately mitigated through design or private negotiation.

6.13 During the survey, attended measurements were taken 18m from C Station on the road Hougue Jehannet. Three out of four of the generators were in operation. Appendix C, Figure C5 offers a view of C Station from the measurement location. A measurement with the door open was 75 dBA and this significantly reduced to 58 dBA with the door closed. The door is routinely

closed during operation. It is evident that a level of 58 dBA would have minimal impact at the proposed development site due to distance attenuation and screening afforded by D Station.

6.14 It is considered that D Station will have the most notable impact at the proposed development site. Both generators at D Station were in operation during the course of measurement period that has been used in the BS4142 assessment shown in Table 5.

1//3 Octave Band Hz	Measurement Position 1 with Power Station On	Measurement 4m from Arrowsmith Laundry Boiler Flue
1/3 LZeq 25.0	63	69
1/3 LZeq 31.5	65	67
1/3 LZeq 40.0	59	66
1/3 LZeq 50.0	57	65
1/3 LZeq 63.0	56	62
1/3 LZeq 80.0	50	59
1/3 LZeq 100	47	58
1/3 LZeq 125	50	60
1/3 LZeq 160	44	57
1/3 LZeq 200	39	53
1/3 LZeq 250	39	52
1/3 LZeq 315	36	51
1/3 LZeq 400	40	51
1/3 LZeq 500	42	52
1/3 LZeq 630	40	49
1/3 LZeq 800	36	48
1/3 LZeq 1000	35	46
1/3 LZeq 1250	34	45
1/3 LZeq 1600	32	44
1/3 LZeq 2000	30	44
1/3 LZeq 2500	30	44
1/3 LZeq 3150	30	42
1/3 LZeq 4000	29	40
1/3 LZeq 5000*	25	39

Table 4 – 1/3 octave band data at specified monitoring positions. The data demonstrates that the sources have no tonal element in accordance with Annex C BS4142: 2014.

(*Recordings beyond 5000Hz were omitted, the equipment was unable to record the low levels).

6.15 The scope of BS 4142 recognises that human response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.

BS 4142 ASSESSMENT

6.16 The following assessment shown in Figure 5 has been conducted for the night time period at measurement position 1, to the south façade of the proposed residential development, in accordance with BS 4142:2014.

6.17 The assessment indicates a rating level of 10 dB above background, which is likely to give rise to a significant adverse noise impact for any residents living in the proximity of position 1 at the proposed Site. Adverse impacts include, but are not limited to, annoyance and sleep disturbance and may lead to complaint.

6.18 Attended measurements suggest that a higher level of 13 dB above background would be experienced at the south west façade of the development site which is nearest to the power station. Again, giving rise to a significant adverse impact at this area of the Site.

6.19 A BS4142 assessment for position 2, to the north of the development site, was not possible as the power station was not always the dominant sound source during the assessment period. The source sound was affected by other sources at position 2. This is exemplified by the fact that the measured ambient sound level, with the power station in operation, was lower than the measured residual sound level without the power station in operation. Analysis of the sound data demonstrates that the sound levels experienced at position 2 to the north of the site are generally 5 dB less than position 1 to the south. This was evident when the power station was in operation and the weather was conducive to a sound survey.

6.20 The State's Environmental Health Department indicated that for the installation of a new industrial activity to a residential location, a level of 5 dB below background would be favoured. As stated previously, this situation is different and is best described by Section 8.5 of BS4142: 2014 "Introduction of a New Noise Sensitive Receptor" where it is pointed out that "it ought to be recognised that the industrial sound forms a part of the acoustic environment."

6.21 The 2014 version of BS4142 places much emphasis on "context" and site specifics. As such, this assessment, of the impact of the power station activity at the proposed development site, must be considered in context. The prediction of significant adverse impact in this assessment does not mean that the development may not be viable. The reasoning behind this assertion and consideration of context is explored as part of this noise assessment.

Result	Position 1 of Development Site Night Time (23:00 to 07:00)	Commentary
Measured ambient sound level dB L_{Aeq}	45	Sound source on. Taken from 23:00 7/10/15 to 07:00 8/10/15.
Residual sound level dB L_{Aeq}	42	Measured level at position 1 with the sound source off. Taken from 23:00 to 03:00 5/10/15
Background sound level dB L_{A90}	35	LA90 level considered to be the most representative for position 1. (See Section 4.13).
Reference time interval	15-minutes	Night time
On-time correction	0	The sound source is continuous.
Specific sound level dB $L_{Aeq,T}$	42	Calculated by correcting the ambient sound level to remove the contribution of the residual sound level.
Tonality Correction dB	0	There is no tonality associated with the specific sound source. (See Section 5.8 and Table 2).
Impulsivity Correction	0	The sound source is constant with no notable impulsivity
Other characteristic Correction	+3	A low level hum is evident at the proposed development site from the sound source.
Rating level	45	Includes acoustic feature corrections.
Excess of rating level over background sound level	+10	The rating level minus the background level.
Assessment indicates likely indication of **depending on context*	Significant Adverse Impact*	The greater likelihood of adverse impact is night time.
Uncertainty of the assessment		The weather station, calibration procedures and supplementary attended data reduces uncertainty to a level considered not have any significance to the outcome.

Table 5 – Assessment of the power station during night time at position 1 at the proposed development site in accordance with BS 4142:2014.

6.22 **The assessment of the noise impact of the power station must be considered in context to the development itself and surrounding premises.** For example:

- The Site has been allocated as a "Settlement Area" within the States of Guernsey Urban Area Plan and as such is favoured for redevelopment opportunities. The Site is industrial in nature and an element of industrial activity should be expected by anyone moving to the area.

- The operational sound of the power plant is not continual. Currently 90% of the Islands electricity requirements are met by a cable link to France. There are significant periods of time when the power plant will not be in operation, typically during the summer. During the winter period October to March it is likely the power plant will be in operation on some capacity but not necessarily during the night.

- There are residential properties that are in closer proximity to the power station than the development site. Guernsey Electricity are not permitted to subject these residents to a noise nuisance and the same would be true for the proposed development site.

- The sound emitted from the power station is a constant low level hum, similar in many ways to the anonymous sound of a busy road. Residents become acclimatised to sounds of this nature and also they are relatively straight forward to mitigate against. The sound from the power station is much less evident during day time when other local activities mask the sound and also elevate the background levels.

- The sound levels at the far south west façade of the proposed development site, nearest the power station and considered worst case, are in the region of 54 dB LAeq daytime and 48 dBA night time when the power station is in typical generation mode. When analysing the data in Appendix F1, typical LAmax levels of low 70 dB would be considered representative. When taking these values into account it would be relatively straight forward to specify building components such as windows and ventilators that adequately meet the internal sound requirements of BS8233: 2014 (See Section 6.24 and 6.25 below).

- No account is made to assess the character and level of the residual sound compared to the character and level of the specific sound.

6.23 The contextual reference to absolute internal / external sound levels is applicable to steady state sound levels that would be experienced over the course of the day and night. In this regard it is necessary to look at the level of specific sound against the residual sound at the development site.

- Figure 5, for measurement position 1, illustrates that the residual sound level at night during reasonable weather conditions is 42 dB $L_{Aeq,T}$ with no power plant in operation. With the power plant in operation an ambient sound level of 45 dBA was measured at night. A 3 dBA increase is subjectively just perceptible by the human ear.

6.24 To further address context of the development impacts at proposed receiver locations it can be relevant to review the internal level of the power station within the receiver.

6.25 Table 4 of British Standard 8233 *Guidance on sound insulation and noise reduction for buildings* (2014) gives performance standards for internal sound levels within dwellings.

- BS 8233 determines that a level of 35dB $L_{Aeq,T}$ should not be exceeded inside living areas to avoid annoyance and disturbance during the daytime. A level of 30dB $L_{Aeq,T}$ should not be exceeded to avoid sleep disturbance during the night. *These limits can also be relaxed by 5dB so reasonable internal conditions are maintained.*

- At the façade of the premises, a reduction of approximately 15dB will occur through a partially open window.

- It is therefore reasonable to consider an external limit of 45-50dB $L_{Aeq,T}$ in accordance with the guidance of BS 8233.

6.26 The measured operational sound level at position 1 during the night was 45dB $L_{Aeq,T}$ at the façade south. This demonstrates that the night time levels could be adequately met at this sensitive location of the proposed development site purely by way of a partly open window.

6.27 The World Health Organisation [4] (WHO) suggest that to protect the majority of people from moderate annoyance during the day time outdoor noise levels should not exceed 50dB L_{Aeq}. To prevent the majority of people becoming seriously annoyed during the daytime the sound pressure level should not exceed 55dB L_{Aeq} which should be considered for gardens and outdoor living spaces. Where the external noise is 50dB L_{Aeq} internal noise levels (open windows) will be acceptable (35dB L_{Aeq}) considering a 15dB loss from external to internal areas. *For indoor spaces there is, in theory, no restriction to the outdoor noise level as long as the building envelope provides sufficient insulation although this will result in a very poor outdoor environment.*

6.28 When taking in to account the upper values measured at the proposed development site at the most sensitive south western façade it will be straightforward to meet and exceed WHO Guidelines. Appendix D demonstrates that attended measurements taken on the proposed development site never exceed WHO external amenity area guidelines.

6.29 It is reasonable to summarise, in context, that the proposed residential development would be wholly acceptable. It is further considered that acceptable outdoor amenity sound levels and internal sound levels could be maximised through architectural noise control design.

6.30 It must be recognised that there is currently no prescribed noise limit which has to be met to satisfy planning policy. As a means to satisfy overarching planning guidance, a low level of noise impact is targeted from industrial activity, generally described by 0dB rating level. When taking this assessment in accordance with BS 4142: 2014, a target improvement can be realistically realised. For example, Sound Control for Homes, highlighted in the following section, establishes commensurate noise control measures for this proposed development site that would ensure an appropriate level of residential amenity in accordance with the noise criteria that has been highlighted.

7 SCHEME DESIGN

7.1 The Building and Research Establishment (BRE) is a principal organisation in the United Kingdom carrying out research into building and construction. In 1993, in conjunction with other professional bodies the BRE produced Sound Control for Homes which presents practical advice including the control within dwellings of noise from outside sources.

7.2 The full scope of Sound Control for Homes covers the following aspects of acoustic design in housing:

- Appraisal of noise affecting the site,
- Planning to control external noise,
- Planning to control internal noise,
- Selection of appropriate forms of construction to control external and internal noise, and
- Detailing of noise control.

7.3 In light of the above, the document is significantly relevant to this case where it is proposed that a residential receptor is introduced to a sound source that is above the background sound level. It is therefore recommended that a selection of principles established within Sound Control for Homes are incorporated in to the design of the proposed development as much as is practicable.

7.4 Building design noise control concepts that are presented in the BRE document are highlighted in Appendix G.

7.5 Appendix G, Figure G1 demonstrates using a building structure as a noise barrier. When line of sight is completed obscured from receiver to sound source a conservative reduction of 10 dBA can be expected. A partial block in line of sight can offer 5 dBA and above. It is understood that this concept could be effectively adopted at the south east and south west facades of the proposed development site without compromising the policy requirements of GE12 – State's Urban Area Plan that adjoining properties should not be particularly overlooked or overshadowed.

7.6 Within buildings, which are used as barrier blocks, care should be provided to the positioning of sensitive rooms. Appendix G, Figure G2 demonstrates that rooms such as kitchens, bathrooms and stair wells can be orientated to the noisier façade. These barrier rooms can make advantage of smaller well insulated windows to further reduce the potential for disturbance internally. Appendix G, Figure G3 goes further by adopting a courtyard house principle with no windows to the most sensitive façade.

7.7 Finally Appendix G, Figure G4 demonstrates the concept of staggering a row of terraced housing to offer self-protection by shielding most of the windows from a noise source. This principle can be adopted where the dwellings are not parallel to the sound source.

7.8 On review of the three outline architect plans, in the Site Appraisal Document, many of the aforementioned concepts are apparent and only minor alterations need take place to fully develop effective noise control strategies.

7.9 Conditions may be attached to any planning permission that may be granted which require further detail and assessment of building design to be submitted, for prior written approval, that demonstrate compliance to the relevant noise criteria that have been highlighted.

7.10 The site is currently exposed to industrial sound levels above background sound levels when the power station is in operation. It is acknowledged that by effective design the sensitive outdoor receptor points could range from no more than background to levels below background further north within the Site. Careful design would ensure outdoor amenity sound levels that are compliant and below World Health Organisation Standards and those recommended in BS8233: 2014. It is also considered that appropriate internal sound levels could be adequately attained that concur with BS8233: 2014.

7.11 By safeguarding residential amenity from the power plant in operation, in turn, the proposed development site will be adequately protected from neighbouring industrial activities.

8 CONCLUSION

8.1 It is considered that the sound climate of the proposed development site should not be a prohibitive factor to the granting of planning permission for a residential development. When considering the full context of the site and by adopting practicable noise control design and construction methods an appropriate level of residential amenity for existing and potential residents can be attained. It is realised that an appropriate level of residential amenity can be achieved without a compromise to the relevant principles set out in the States of Guernsey's Urban Area Plan.

9 REFERENCES

[1] Site Appraisal Document (August 2013). Le Maresquet Field: A glimpse of what might be. Lovell Ozanne Chartered Architects.

[2] States of Guernsey (July 2002). Urban Area Plan (Review Number 1) Written Statement. www.gov.gg

[3] BS4142: (2014). Methods for rating and Assessing Industrial and Commercial Sound.

[4] World Health Organisation (WHO) (1999). Guidelines for Community Noise.

[5] BS8233: (2014). Guidance on Sound Insulation and Noise Reduction for Buildings.

[6] Building Research Establishment (1993). Sound Control for Homes. CIRIA

[7] Environment Department (February 2015). Development Brief.

[8] BS 7445–2: (1991). Description and Measurement of Environmental Noise – Part 2: Guide to the Acquisition of Data Pertinent to land use.

Appendix A: Glossary of Acoustic Terms

'A' weighting dB(A): Filtering of the sound frequencies designed to reflect the response of the human ear to noise. The human ear is more sensitive to noise at frequencies in the middle-high end of the audible range than to either very high or very low frequencies. Noise measurements are often A-weighted (using a electronic filter) to compensate for the sensitivity of the ear.

Attenuation: Noise reduction, measured in decibels.

Calibration: A check of the function of a sound level meter by comparing the meter reading with a known sound pressure level.

Decibel: The unit of sound level and noise exposure measurement. The range of audible sound pressures is approximately 0 dB to 140 dB.

Equivalent continuous sound pressure level (LAeq,T): A measure of the average A-weighted sound pressure level during a period of time, in dB(A). It is a notional steady sound level which would cause the same A-weighted sound energy to be received as that due to the fluctuating sound level over a given period of time (T).

Frequency (Hz): The pitch of the sound, measured in Hertz.

Frequency analysis: Analysis of a sound into its frequency components.

Hz: Hertz, the unit of frequency.

Noise spectrum: A noise represented by its frequency components.

Octave-bands: A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit. The width of the octave-bands increases at higher frequencies.

Octave-band centre frequency: The frequency at the centre of an octave band.

Pa: Pascal, unit of measurement of sound pressure.

Sound level meter (SLM): Instrument for measuring various noise parameters.

Sound pressure level (SPL): The basic measure of sound, expressed in decibels, usually measured with an appropriate frequency weighting (e.g. the A-weighted SPL in dB(A)).

Appendix B: Site Plans

Figure B1 – Photograph showing the proposed development site in proximity to neighbouring industrial uses.

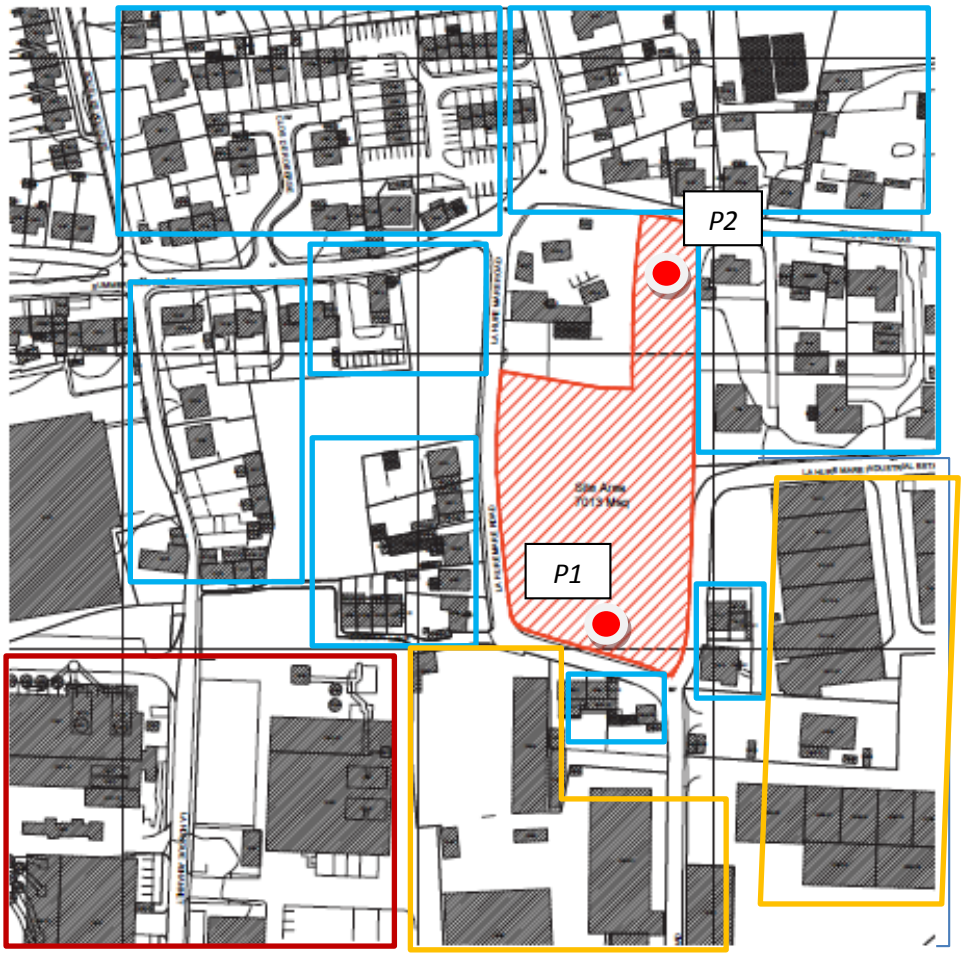

Figure B2 – Block plan highlighting the proposed development site in red. See the key below to identify other neighbouring uses of land.

Key:

Guernsey Electric Power Plant

Existing Residential

Industrial Units

Measurement positions

N

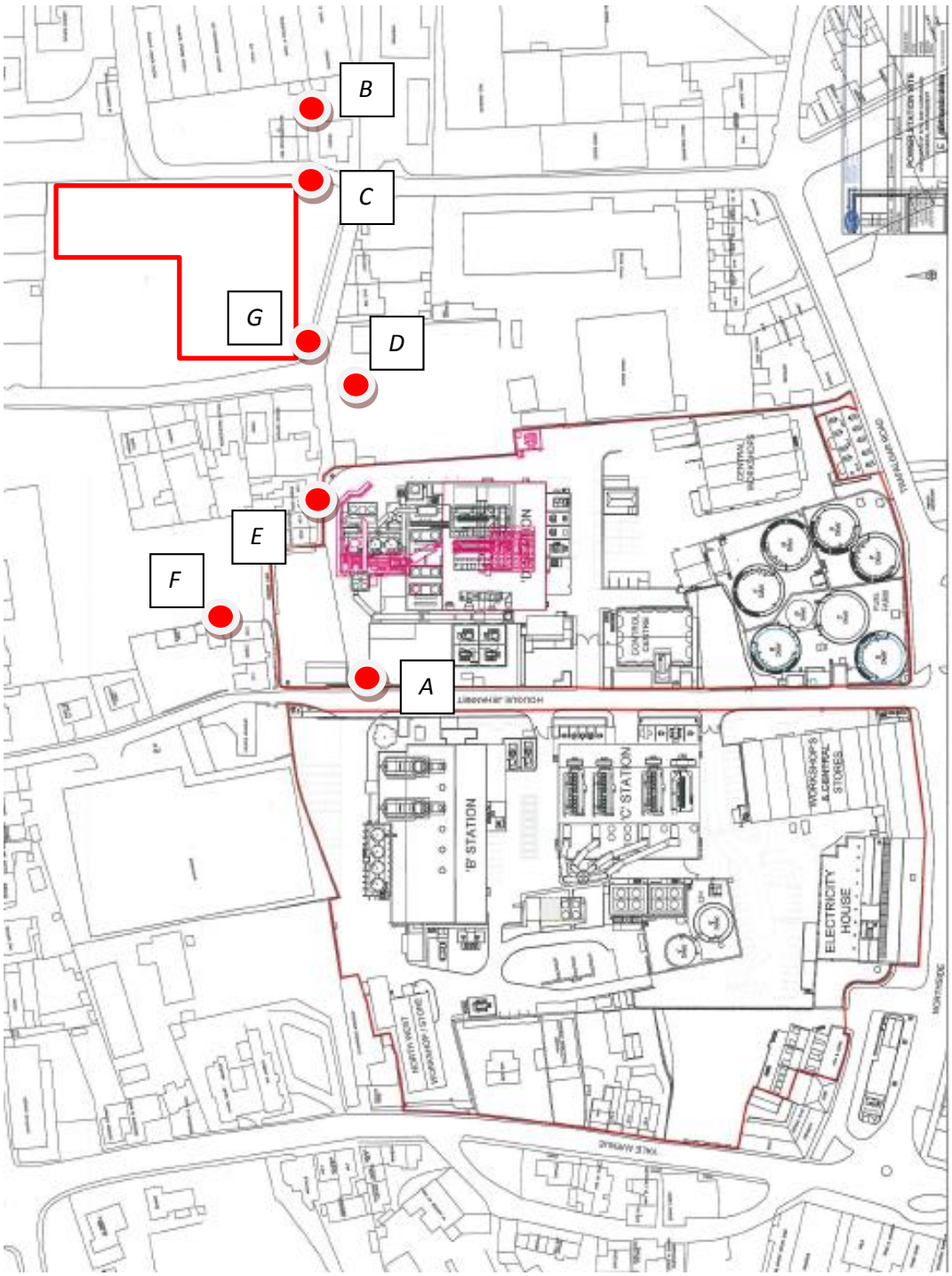

Figure B3 – Detailed plan of Guernsey Electricity's power station site. The proposed development site is marked with a red boundary. (See Appendix D, Figure D1 for measurements).

Attended spot measurement locations to aid the assessment

Appendix C: Site Photographs

Figure C1 – Location of measurement position 1. Also highlighting the location of the power station and existing residential properties.

Figure C2 – Location of measurement position 2, highlighting Le Maresquet Farmhouse and the power station in the background

Figure C3 – Photograph of the sound wall located at D Station in front of residential cottages.

Figure C4 – Photograph illustrating the proximity of B Station to existing residential cottages.

Figure C5 – Photograph of C Station taken from the kerbside on Hougue Jehannet.

Figure C6 – Measurement position 1 showing the proximity of the boiler flue of the commercial laundry Arrowsmith.

Appendix D: Attended Measurement Results

Location Reference	Location Description	Date / Time	Measurement Results dB	Site Notes
A	18m From C Station door open	6/10/15 10:16	75 L_{Aeq}	SE wind, no gusts, 3 generators in C station
A	18m from C Station door closed	6/10/15 10:18	58 L_{Aeq}	SE wind, no gusts, 3 generators in C station
B	4m from commercial laundry flue	6/10/15 13:22	58 L_{Aeq}	SE wind, no gusts, no tone
C	South east boundary of the Site	6/10/15 13:43	51 L_{Aeq}	SE wind, no gusts, laundry flue audible. Power station in operation, 3 generators
C	South east boundary of the Site	7/10/15 23.32	45 L_{Aeq}	NW wind, no gusts, power station not intrusive
D	States yard gate near to D Station	6/10/15 13:49	54 L_{Aeq}	SW wind, gusting evident, 3 generators
D	States yard gate near to D Station	6/10/15 23:24	54 L_{Aeq}	NW wind gusting, 3 generators
D	States yard gate near to D Station	7/10/15 23:24	51 L_{Aeq}	WSW wind, no gusts, 3 generators
E	Cottages in front of sound wall at D Station	6/10/15 13:58	50 L_{Aeq}	SW wind, 5 generators in operation
F	At boundary Maison Hougue Jehannet	6/10/15 14:07	52 L_{Aeq}	SW wind, 5 generators in operation
G	South west boundary of the Site nearest Site location to D Station	7/10/15 23:30	49 L_{Aeq}	NW wind, no gusts, 3 generators in operation. Typical night mode.
Position 1	10m from South Facade	5/10/15 17:55	50 L_{Aeq}	SE wind, no gusts, 1D in operation
Position 1	10m from South Facade	5/10/15 23:02	38 L_{Aeq} 37 L_{A90}	SW wind, no gusts, background reading no power station
Position 1	10m from South Facade	6/10/15 23:04	50 L_{Aeq}	SW wind, positive vector, gusting, 3 generators
Position 1	10m from South Facade	7/10/15 23:09	46 L_{Aeq}	NW wind, no gusts, 3 generators
Position 2	22.5m from North Facade	7/10/15 23:17	41 L_{Aeq}	NW wind, no gusts, 3 generators
Position 2	22.5m from North Facade	8/10/15 10:56	46 L_{Aeq}	SE breeze almost still, 5 generators.

Figure D1 – Attended survey measurement results. (See Appendix B, Figures B2 and B3 to see the position of the measurement positions referenced above).

Appendix E: Meteorological Data

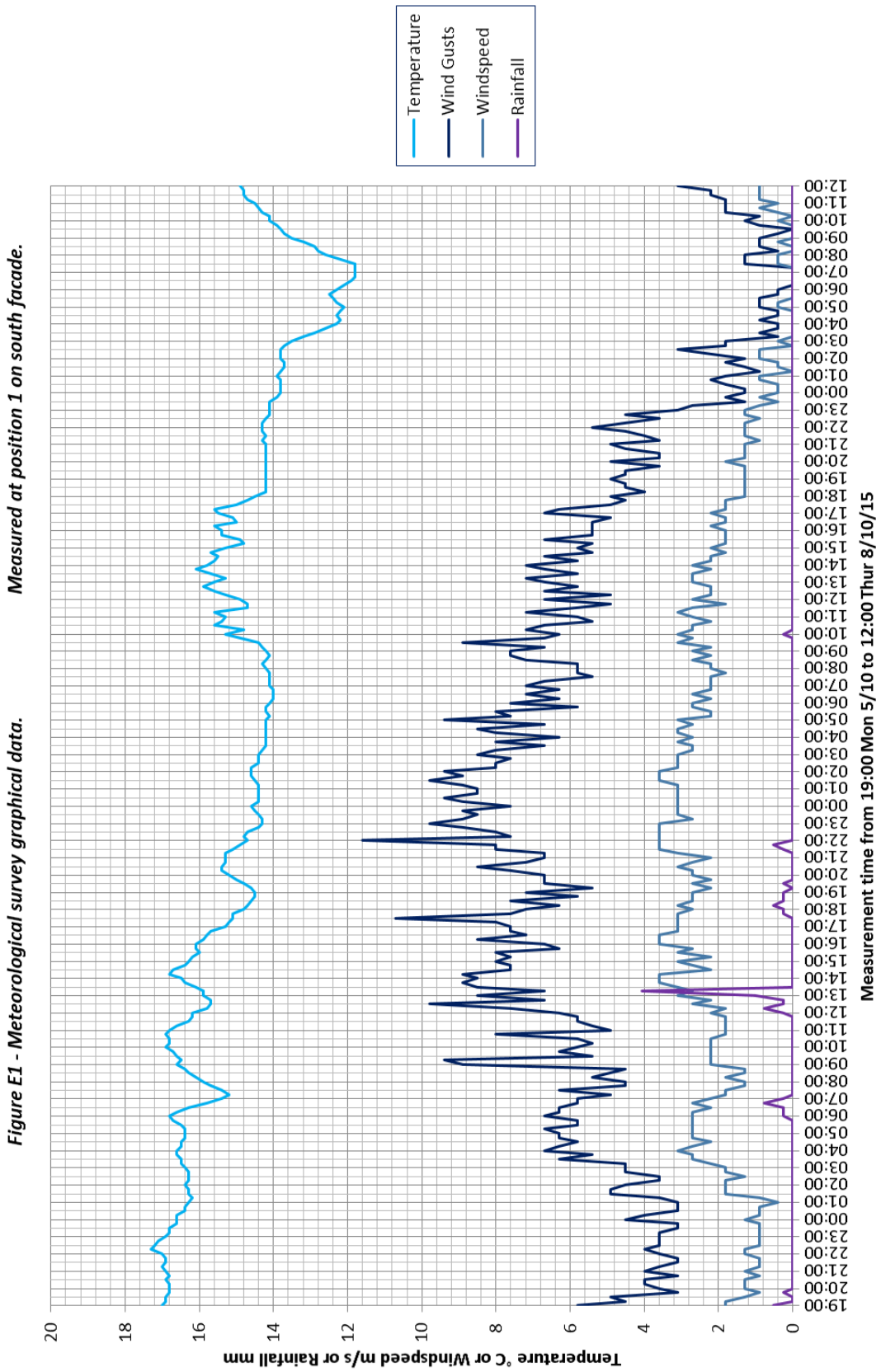

Figure E1 - Meteorological survey graphical data. *Measured at position 1 on south facade.*

Appendix F: Survey Sound Data

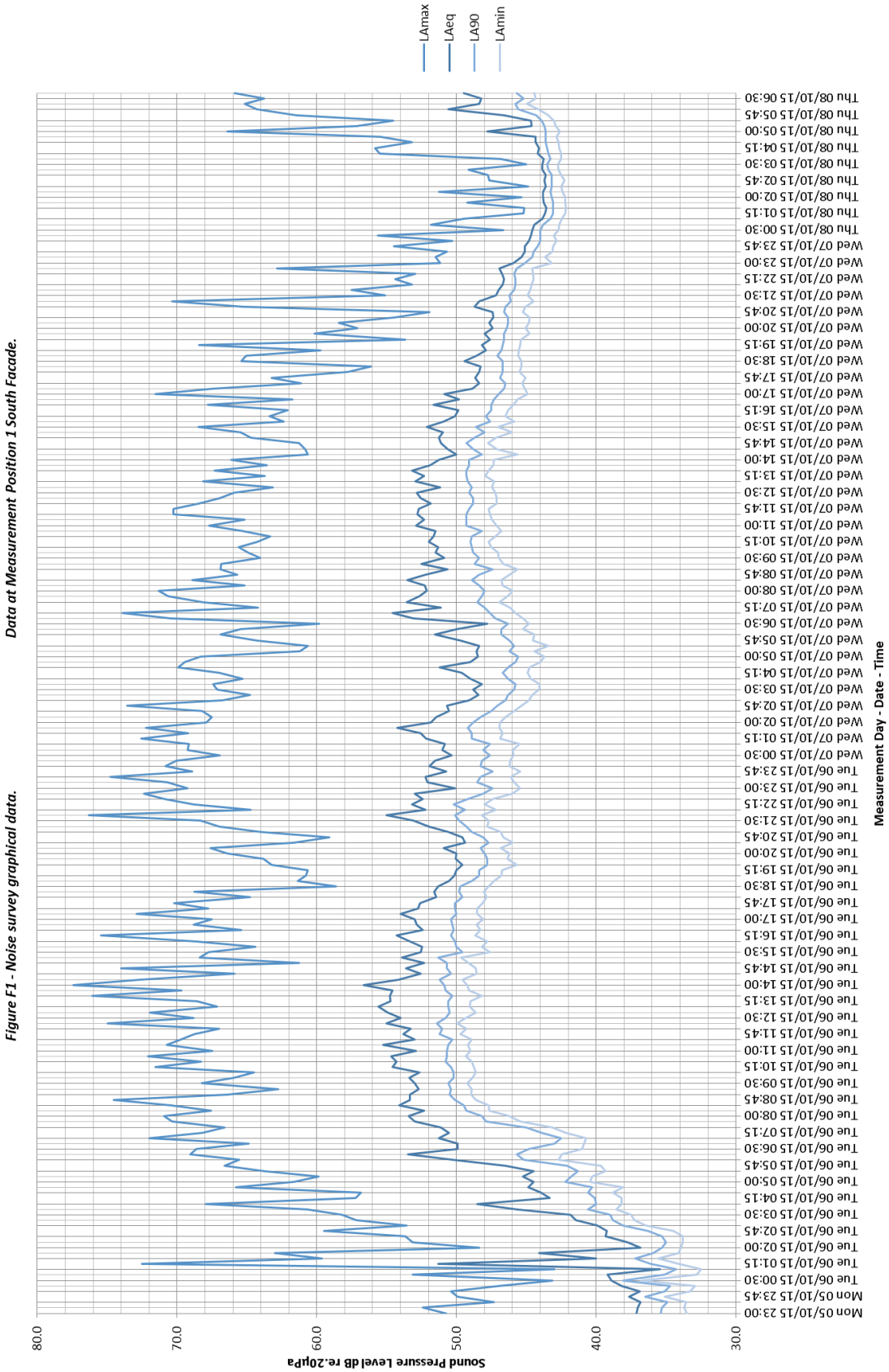

Figure F1 - Noise survey graphical data.

Data at Measurement Position 1 South Facade.

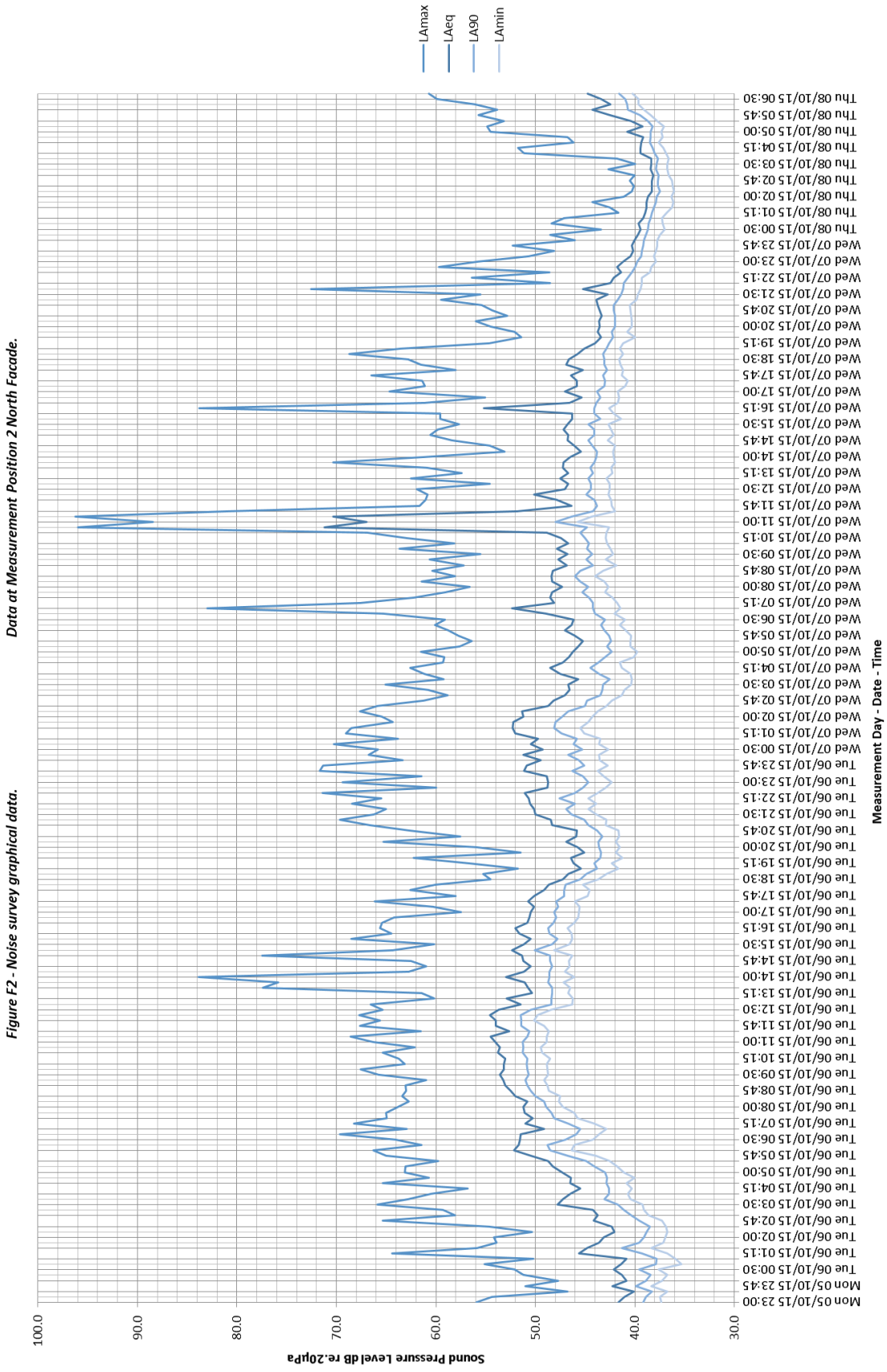

Figure F2 - Noise survey graphical data.

Data at Measurement Position 2 North Facade.

Appendix G: Sound Control for Homes Scheme Designs

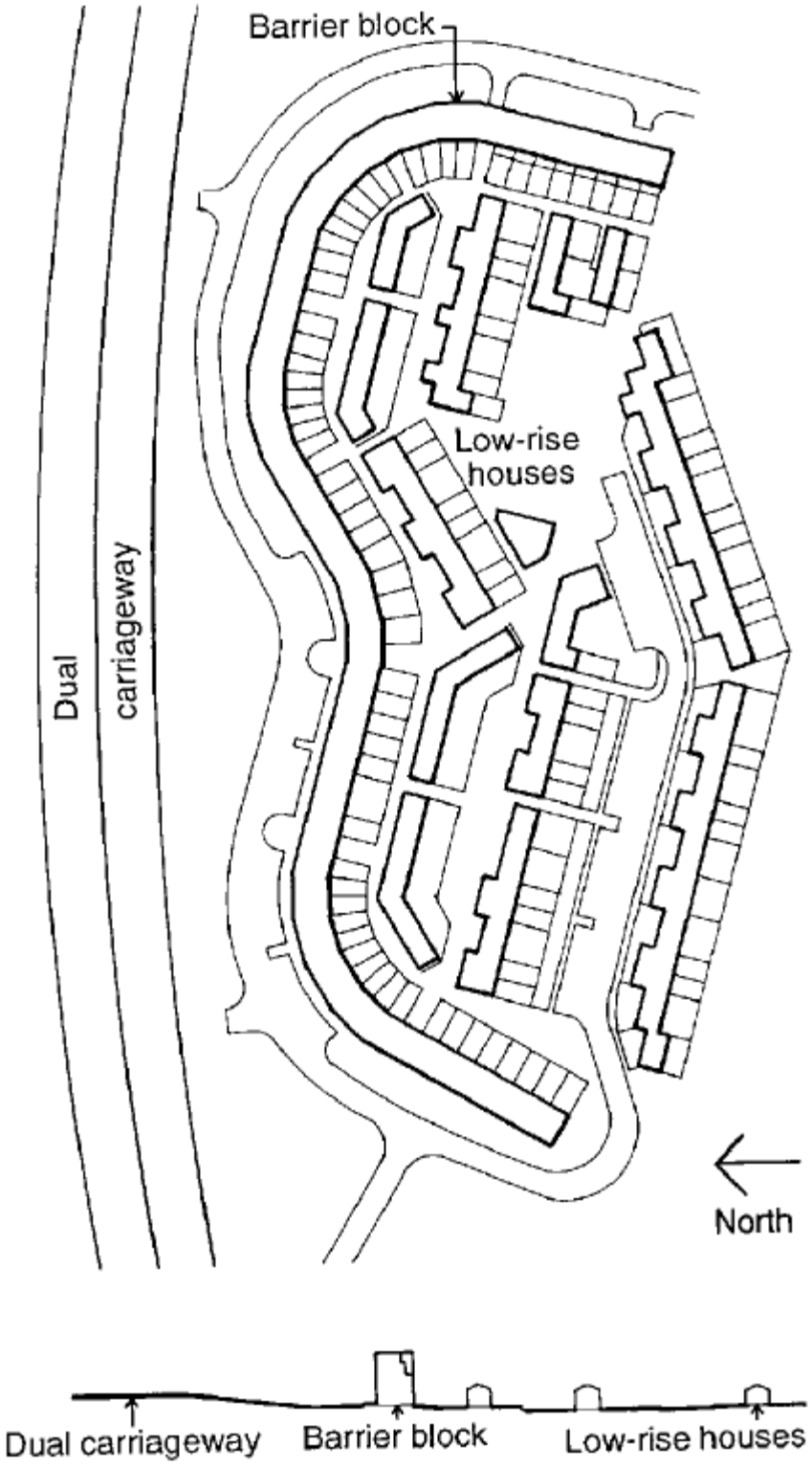

Figure G1 – Example of an effective building barrier block.

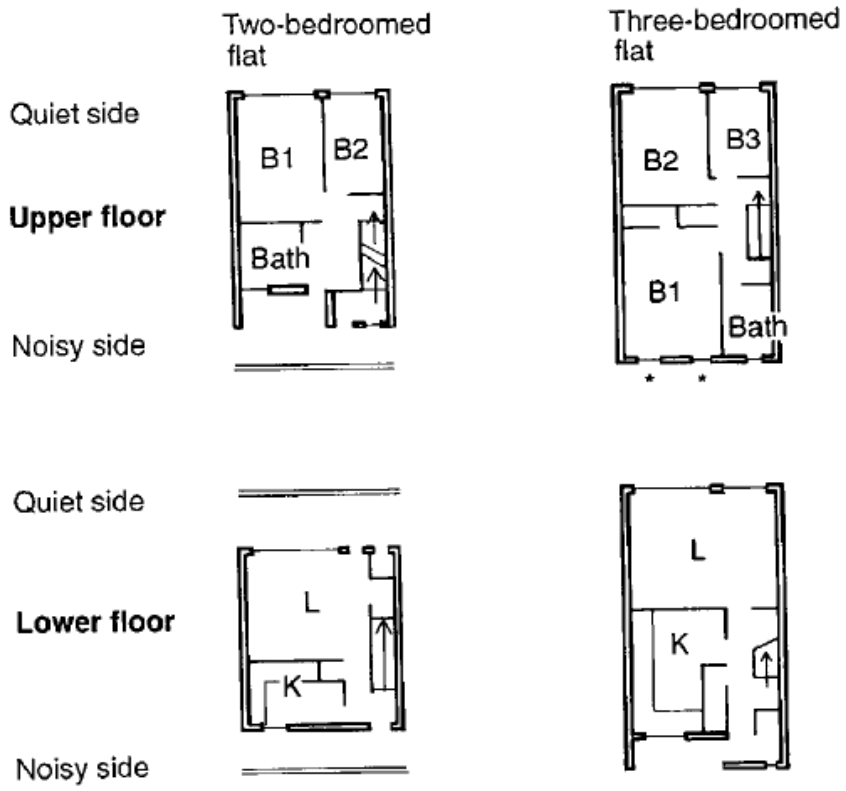

Figure G2 – Internal planning of a barrier block structure.

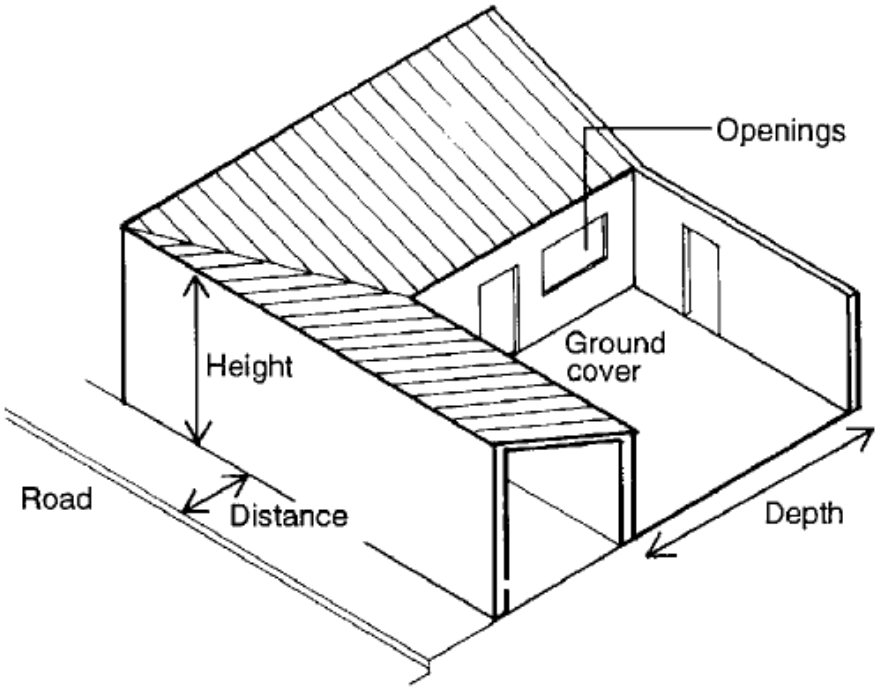

Figure G3 – The utilisation of a courtyard design to control noise.

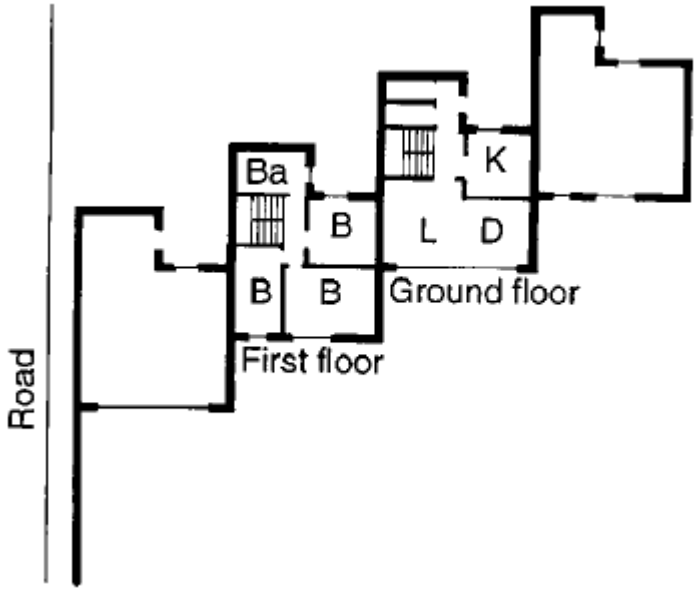

Figure G4 – A staggered row of terraces that offers self-protection from a noise source.

Appendix H: Acousticians Qualifications and Status

Paul Thomson BSc. (Hons) MSc. AMIOA

Position Held:	Acoustic Consultant.
Qualifications:	BSc. (Hons) Environmental Studies.
	MSc. Environmental Change – Social and Physical Aspects.
	Institute of Acoustics Diploma in Acoustics and Noise Control.
	Certificate of Competence in Environmental Noise Measurement.
Affiliations:	Associate Member of the Institute of Acoustics.
Acoustics Experience:	7 years (Over 6 years working as an Environmental Health Practitioner).
Core Competences:	Environmental acoustics, entertainment projects, statutory nuisance assessment and enforcement.

Steve Skingle BSc. (Hons) MAES MIOA

Position Held:	Principal Acoustic Consultant.
Qualifications:	BSc. (Hons) Acoustics.
	Institute of Acoustics Diploma in Acoustics and Noise Control.
Affiliations:	Corporate Member of the Institute of Acoustics.
	Corporate Member of the Audio Engineering Society.
Acoustics Experience:	13 years.
Core Competences:	Building acoustics, environmental acoustics, entertainment projects and electro acoustics.

Proposed Residential Development

Le Maresquet Field, La Hure Mare Road,
Northside, Vale, Guernsey.

soundsolution CONSULTANTS

Environmental Noise Impact Assessment

TECHNICAL REPORT

27550 R2

[Addendum to 22227 R1]

Proposed Residential Development

Environmental Noise Impact Assessment

Prepared for: Sunnyside Developments

Site address: Le Maresquet Field, La Hure Mare Road, Northside, Vale, Guernsey.

Table of Contents

1 EXECUTIVE SUMMARY 1

2 INTRODUCTION 2

3 DEVELOPMENT SITE 3

GUERNSEY ELECTRICITY POWER STATION 3

4 NOISE CRITERIA 5

ProPG: PlANNING & NOISE 5

5 ENVIRONMENTAL SOUND SURVEY 7

6 NOISE ASSESSMENT 9

BS 4142 ASSESSMENT 10

CONTEXT 11

STATEMENT OF UNCERTAINTY 14

7 CONCLUSION 15

8 REFERENCES 16

Appendix A: Glossary of Acoustic Terms I

Appendix B: Site Plans II

Appendix C: Site Photographs V

Appendix D: Sound Survey Measurement Results VIII

Appendix E: Acousticians Qualifications and Status XI

soundsolution CONSULTANTS
Cornwall Suite, Dencora Business Centre, Whitehouse Road, Ipswich IP1 5LP
Tel: 0845 5212 096 | Fax: 0845 5212 097
info@soundsolutionconsultants.co.uk | www.soundsolutionconsultants.co.uk
VAT No. 844 9267 90 | Registration No. 5651834
Registered Address: 2 Lemons Hill, Tattingstone, Ipswich, Suffolk IP9 2NH

SSC PROJECT NO: 27550		
STATUS	**SIGNATURE / NAME | POSITION**	**DATE**
Originated	 P Thomson BSc. (Hons) MSc. MIOA | Acoustic Consultant	4th July 2017
Approved	 S Skingle BSc. (Hons) MAES MIOA | Principal Acoustic Consultant	4th July 2017

DOCUMENT REVISION AND CHANGE CONTROL		
REVISION	**CHANGE DESCRIPTION**	**SUPPLEMENT TO**
1	Original Report	27550 R1
2	Reference to Island Development Plan & Planning ProPG	-

1 EXECUTIVE SUMMARY

1.1 It is imperative that this report is read in conjunction with Sound Solution Consultant Limited's Noise Impact Assessment (Ref: 22227 R1, 22nd October 2015). It is the intention that both reports are submitted in tandem to accompany a planning application for a proposed residential development at Le Maresquet Field, La Hure Mare Road, Northside, Vale, Guernsey GY3 5BL (Hereinafter, "The Site").

1.2 Following the initial Noise Impact Assessment, a major new installation took place at Vale Power Station, with the introduction of a new generator and associated works to D Station (Planning Reference: FULL/2015/2730). Sound Solution Consultants Limited have been commissioned to conduct a further investigation. The aim is to assess the potential noise impact on The Site, from the recent Guernsey Electric 3D development, when taking place alongside the existing operations. An investigation into any notable changes that may have occurred, in the locale, since the first assessment shall also be conducted and documented.

1.3 An environmental sound survey was conducted between 17:00 Wednesday 24th May and 17:00 Thursday 25th May 2017. The results of the survey are provided in Appendix D. The new 3D generator was in operation for the full duration of the survey, providing typical summer time, full Island, electricity generation. The scope of assessment was agreed, in principle, with The Office of Environmental Health and Pollution Regulation. Further consultation was undertaken with Guernsey Electricity during a site meeting, to establish the recent changes in operations that have been brought about.

1.4 It is evident that there have been no material changes to the sound climate of the locale since the initial investigation was conducted. An assessment in accordance with BS4142: 2014 (See Section 6, Table 2) demonstrates that there is no additional noise impact at the proposed development site as a consequence of the recent power station development. There is an indication that the installation has brought about a positive noise impact to the north west residential area, neighbouring the power station. As such, the findings and conclusions of the initial assessment are maintained.

1.5 By safeguarding residential amenity from the power plant in operation, in turn, the proposed development site will be adequately protected from the sound of neighbouring industrial activities.

1.6 In conclusion, it is considered that the sound climate of the proposed development site should not be a prohibitive factor to the granting of planning permission for a residential development. When considering the full context of the Site and by adopting practicable noise control design and construction methods an appropriate level of residential amenity for existing and potential residents can be attained. It is concluded that an appropriate level of residential amenity can be achieved without a compromise to the relevant policies set out in the States of Guernsey's Island Development Plan (November 2016). It is evident that the recent installation of the 3D generator at D Station has not led to a detriment of the residential amenity experienced at the proposed development site.

2 INTRODUCTION

2.1 Sound Solution Consultants Limited conducted a Noise Impact Assessment, 22nd October 2015 (Ref: 22227 R1) for the proposed residential use of Le Maresquet Field, Vale, Guernsey. The assessment demonstrated that The Site can accommodate residential living, when accounting for the neighbouring activities, subject to the implementation of considered and practicable acoustic design and noise control measures. It was concluded that the sound climate of The Site should not be a prohibitive factor to the granting of planning permission.

2.2 Subsequent to the initial Noise Impact Assessment, Guernsey Electricity were granted planning permission (Ref: FULL/2015/2730), 20th April 2016, for a further D Station engine (3D) with associated works to the building and installation of a sound barrier.

2.3 To summarise a letter, from The Office of Environmental Health and Pollution Regulation (EOHPR) (Ref: WK/201601435, 21st June 2016), it was stated that:

"*The granting of Planning Permission for a new engine at Guernsey Electricity occurred after the consultant's report*"; that the further engine (3D) *"will change the noise dynamic further and has not been considered".*

"Will the designs be robust enough to address the additional impact of the further development of the Guernsey Electricity Site?".

"*Until this has been further quantified and the impact of the development considered, I could not support the proposals within the Development Brief".*

"*We strongly recommend that further investigations are carried out into the feasibility of the development taking into account the accumulated impact from the addition of the 3D generator at the Guernsey Electricity Site".*

2.4 In light of the above comments and concerns, Sound Solution Consultants Limited have been commissioned to conduct a further Noise Impact Assessment. The aim of this assessment is to investigate the potential noise impact on The Site from the recent Guernsey Electricity 3D development, when taking place alongside the existing operations. An investigation into any notable changes that may have occurred, in the locale, since the first assessment shall also be conducted and documented.

2.5 An assessment scope was agreed, in principle, with EOHPR prior to investigation. The survey methodology was established, mindful of the benefits of offering a direct comparison with the first assessment. Additionally, it was agreed that an addendum to the original assessment should be provided to keep the report concise and relevant to changes, avoiding any unnecessary duplication of information.

2.6 As before, the assessment of any potential vibration impact shall be investigated by another consultancy. Again, providing continuity with assessment.

2.7 A Glossary of Acoustic Terms can be found in Appendix A, to assist with the terminology used.

3 DEVELOPMENT SITE

3.1 The location of the proposed development site ("The Site") is highlighted in Appendix B, Figures 1 to 3. Apart from the exception of the introduction of the new 3D generator at the power station, there are no notable changes to the industrial activities in the locale, since the initial assessment.

3.2 Report 22227 R1 (Table 1, Page 5) details industrial activities in the proximity of The Site that have the potential to cause noise disturbance. It was checked that all these activities and times of operation, remain unchanged since the initial assessment. It is not evident that there has either been the introduction or removal of any noise source that should be separately accounted for.

GUERNSEY ELECTRICITY POWER STATION

3.3 Vale Power Station continues to have three power generating Stations B, C and D. B Station consists of 2 x gas turbines, C Station consists of 4 slow speed diesel generators and D Station now comprises of a slow speed diesel generator 1D, a medium speed diesel generator 2D and the newly installed 3D gas powered generator.

3.4 Generator 3D was first operated on 6th April 2017 and was subject to a 30 day reliability run, with one short down period for scheduled maintenance. The unit and associated plant is largely running to plan and was commissioned on the 16th May 2017. The power station is currently producing full Island generation whilst the cable link to France is temporarily deactivated. Generator 3D has been consistently utilised during the recent supply of full Island generation.

3.5 Full Island power generation continues to be largely provided by mainland cable, accounting for more than 80% of supply. Full Island supply from the power station remains the notable less frequent option for supply. The potential for noise disturbance continues to be mitigated during the prolonged periods during off Island cable supply.

3.6 Guernsey Electricity report one noise complaint since the commissioning of the new generator. The Office of Environmental Health and Pollution Regulation (EOHPR) are aware of the complaint and are investigating, in line with procedure. It is not evident, at this time, if the complaint has been substantiated in accordance with Statutory Nuisance assessment. It is understood that the recent complaint is not in the immediate vicinity of the proposed development site.

3.7 As part of the planning consultation process, for the new generator, EOHPR offered the following noise condition, should consent be granted:

"The site boundary noise level should not exceed 44dB LAeq,1hour at the northern boundary when generator 3D is running (in isolation). The site boundary relates to the northern edge of Cadastre land parcel C006430000, adjacent to Cognon Lane, as monitored at the three representative monitoring locations highlighted in Guernsey Electricity's "Statement of Supplementary Information" (Ref: 3D-GEL-145-PMC-17-A)."

3.8 The highlighted recommended condition was not a requirement of the final planning permission and is not apparent of the final decision notice FULL/2015/2730. It is understood the restriction was omitted as the planning application was considered to be for the new building structure rather than any plant to be housed.

3.9 Although the condition does not have official planning control, it forms an integral part of safeguarding residential amenity, when considering the new 3D installation. Guernsey Electricity very much see compliance with the condition's noise criteria as playing a part in the illustration of Best Practicable Means at their site. It is understood that the condition's requirements have been formalised as part of the 3D installation contract with the appointed sub-contractor. Mitigation design has been implemented with the intention of complying with EOHPR's stated condition requirements. The introduction of a significant sound wall; the silencing of exhausts and a new design to roof mounted radiators, all form part of mitigation design measures.

3.10 It is reported that post installation compliance sound testing was only fractionally over the desired sound level at one of the allocated monitoring points. It has been explained that it is the intention to conduct additional exhaust work when the cable link is re-instated. It is therefore the intention, of Guernsey Electricity, to fully comply with the EOHPR's sound level threshold, that is deemed appropriate for the locale, giving appropriate consideration of the mixed commercial, residential make up.

3.11 The location of the newly installed 3D generator, sound wall and associated external plant is highlighted in Figure B3, Appendix B and illustrated in Figures C1 and C2, Appendix C.

3.12 Guernsey Electricity have purchased 7 x residential properties in the closest proximity to the northern boundary. These properties are also highlighted in Figure B3, Appendix B and currently are vacant. These purchases are a further mitigation technique to minimise the potential for noise or vibration disturbance to neighbouring residents.

3.13 It has been explained that Guernsey Electricity has learnt a lot in terms of noise and vibration control, subsequent to the installation of generator 2D. Mitigation techniques have been honed and developed during the 3D installation. The two newest D Station generators therefore provide the most bespoke installations in terms of noise and vibration control. They are secured to their supports on substantial resilient mountings accompanied with the other mitigation design measures. The newer units are also the least potentially polluting generators. For these reasons, the use of the D Station generators come top of the merit order and are the preferred units of use during energy production.

3.14 It is also typical during full Island production for a couple of D Station units to be operated, accompanied by C Station units. Other combinations of use provide lesser merit order. None of the generators have been de-commissioned as part of the newest installation. It may be that a generator can be moth-balled, however it will always be the intention that full Island production can be achieved with an additional 2 x generators on stand-by, should the need arise for their use. It is possible that additional expansion of the power station may take place in the future, but it was explained that it would always be the intention that any installation would comply with the highest of noise and vibration control measures, always developing and evolving from those currently implemented.

4 NOISE CRITERIA

4.1 It has been established through consultation with The Office of Environmental Health and Pollution Regulation (EOHPR) that the noise criteria adopted for the previous Noise Impact Assessment is relevant and continues to be appropriate for this assessment. Reference should therefore be made to Section 4, Pages 6 to 8 of 22227 R1. Notable additions to relevant criteria involve the launch of ProPG Guidance and the adoption of the States of Guernsey's Island Development Plan, outlined below.

PROPG: PLANNING & NOISE

4.2 There has been a major development in terms of Professional Practice Guidance on Planning and Noise. The production of the guidance acknowledges that noise is a material consideration in the planning process and that noise control is a key aspect of sustainable development.

4.3 ProPG: Professional Practice Guidance on Planning and Noise [1] has been developed by a working group consisting of representatives of the Association of Noise Consultants (ANC), Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CIEH) and practitioners from a planning and local authority background. The document has gone through consultation and was officially launched on 22nd June 2017.

4.4 The preparation of the ProPG reflects the Government's overarching Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and Planning Practice Guidance (including PPG-Noise), as well as other authoritative sources of guidance.

4.5 The guidance offers advice for Local Planning Authorities and developers, and their respective professional advisers and aims to:

- advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- encourage the process of good acoustic design in and around new residential developments;
- outline what should be taken into account in deciding planning applications for new noise-sensitive developments.
- promote appropriate noise exposure standards;
- and assist the delivery of sustainable development.

4.6 It is acknowledged that the advice and procedures contained in the ProPG centre around the consideration of new residential development that will be exposed predominantly to airborne noise from existing transport sources. However, it is advocated that the principles of ProPG will be relevant to other types of noise-sensitive development and to other sources of noise when accompanied by assessment from other relevant criteria; for example, the assessment of industrial noise in accordance with BS4142:2014 [2].

4.7 ProPG introduces and advocates the concept of an Acoustic Design Statement. Such a statement would detail the chosen building design and demonstrate that the use of layout, orientation, spatial design has been fully explored to ensure that non-building envelope mitigation is implemented, where practicable, to minimise the need for reliance upon closed windows to achieve adequate internal residential noise levels.

STATES OF GUERNSEY ISLAND DEVELOPMENT PLAN (IDP)

4.8 The States of Guernsey's Island Development Plan (IDP) [3] was adopted on 2nd November 2016 and sets out the land planning policies for the whole of Guernsey in a single document. The IDP replaces the Urban Area Plan detailed in the initial Noise Assessment 22227 R1.

4.9 The IDP sets out factors that shall be taken in to account by the Authority when reaching decisions on applications for planning permission. The stated principle aim is:

"*To ensure land planning policies are in place…. which help to maintain and create a socially inclusive, healthy and economically strong Island, while balancing these objectives with the protection and enhancement of Guernsey's built and natural environment and the need to use land wisely".*

5 ENVIRONMENTAL SOUND SURVEY

5.1 A survey of The Site's sound climate was undertaken from 17:00 Wednesday 24th May to 17:00 Thursday 25th May 2017, in accordance with BS7445-2:1991 [4]. The reason for the additional survey was to assess any impact, on the proposed development site, as a result of the newly commissioned 3D generator at Vale Power Station. Consideration was given to any other potential material changes to the sound climate of the locale, since an initial assessment in October 2015.

5.2 The equipment used during the survey consisted of the following Class 1 precision noise monitoring equipment listed in Table 1 below. All equipment listed has traceable calibration history to the relevant British Standards.

Manufacturer	Model No.	Description	Serial No.	Calibration Due Date
Larson Davis	LxT	3rd Octave Band Sound Meter	4700	March 2019
Larson Davis	LxTPRM1L	Microphone pre-amplifier	042606	March 2019
Larson Davis	337B02	½" Electret microphone	159315	March 2019
Larson Davis	CAL200	Sound Level Calibrator	13096	March 2018

Table 1 – Environmental monitoring equipment used during survey.

5.3 The calibration of the sound level meter was checked using a reference tone of 114dB at 1kHz before and after measurements were taken. Validation at the end of the survey indicated that all instruments had operated within permitted tolerances for drift and measured level. A calibration deviation of no more than 0.5dB was observed across the assessment period.

5.4 The weather conditions at the start of the sound survey were measured using a Hold-peak anemometer and recorded as 14°C, no cloud cover, with a north-east breeze averaging 1 m/s. At the end of the survey weather conditions were 22°C, no cloud cover, sunny, with an east breeze averaging 1m/s. The wind direction during the duration of the survey was representative of the prevailing wind for the Island. The weather conditions were fully conducive to survey work for the full 24-hour duration. No rain or high gusts of wind over 5 m/s were experienced.

5.5 As agreed with The Office of Environmental Health and Pollution Regulation (EOHPR) the measurement positions selected were consistent to those used during the survey in October 2015. It was considered that the positions were representative of The Site and that the consistent approach provided a the option for direct comparison with previous results. The two significant measurements positions remained as Position 1 and Position 2 as detailed below:

Position 1) A microphone was placed to the southern façade of the proposed development site located equidistantly from the power station and the neighbouring industrial estate. The location was 10m from the boundary wall, the microphone was located 1.5m from the ground at a free field measurement position. The position is highlighted in Figure B2, Appendix B and illustrated in Figures C3 and C4, Appendix C.

Position 2) A microphone was placed to the northern façade of the proposed development site located over 20m from the boundary wall and 8m from the nearest building façade. The microphone was located 1.5m from the ground and at a free field measurement position. The position is highlighted in Figure B2, Appendix B and illustrated in Figure C5, Appendix C.

5.6 In addition to the above positions, a selection of other short-term measurement locations were utilised, in accordance with the previous survey. These locations are highlighted as Positions A to G in Figure B3, Appendix B. A summary of the measurement results taken during the 2015 and 2017 surveys are presented in Appendix D.

5.7 A log of the power station's operations during the survey period is provided in Appendix E. This demonstrates the level of activity that was experienced during each of the most recent measurements.

5.8 The sound climate at The Site during the day-time survey consisted of neighbouring industrial activities. Whilst in operation, the commercial laundry flue to the south east of The Site was the dominant sound source. A continual prevailing broadband sound was evident to the south of The Site from this source. There were intermittent clanks and clatters from industrial units accompanied by vehicle movements in the neighbouring lanes and access roads. The sound climate during the day can best be described as light industrial in nature, subjectively not considered noisy or disturbing when accounting for the locale. The power station was providing full Island generation during the whole course of the survey. During the day, the power station was barely distinguishable within the ambient sound scape. At night, the power station activities were more distinguishable giving rise to an underlying hum or low-level rumble that was not subjectively considered intrusive or potentially disturbing. During full Island generation, at the power station, it was possible to sit at the proposed development site whilst enjoying an environment appropriate to facilitate outdoor residential amenity. Bird song and low-level community activity was prevalent in the evening and on into the night.

5.9 Interval noise data was recorded at the measurement locations, synchronised between the sound level meter and BST. The sound level meter was configured to record average equivalent (LAeq), maximum (LAmax), minimum (LAmin) and statistical (Ln) parameters.

5.10 It was not possible to measure background L_{A90} sound levels, during the most recent survey, as the power station was always in typical full Island generation mode. As it was evident that nothing had significantly altered to the sound climate in the locale since the first assessment, other than the introduction of the 3D generator, it was agreed with EOHPR that the previously established background sound levels could be utilised for purposes of BS4142:2014 assessment.

5.11 The "typical" night time background sound levels were established in October 2015 as 35dB $L_{A90,\ 15min}$ for Position 1 to the south façade and 39dB $L_{A90,\ 15min}$ at Position 2 to the north façade of proposed development site.

6 NOISE ASSESSMENT

6.1 The findings of Assessment 22227 R1, 22nd October 2015, demonstrated that the proposed development site could accommodate residential living with the implementation of considered acoustic design and commensurate mitigation. The primary aim of this subsequent assessment is to investigate the noise impact, upon The Site, as a consequence of the additional 3D generator development at D Station, Vale Power Station.

6.2 In addition, an investigation shall be made as to any other potential material changes to the sound climate of the local since the initial survey and assessment. Section 3.2 of this report illustrates that there have been no notable changes to the activities in the surrounding area. Of note, whilst at the south of The Site, the commercial laundry flue remains the dominant subjective source during day-time working hours. This is even when assessed against the power station in full operation. Figure D1, Appendix D provides sound level measurement results from both the 2015 and 2017 surveys. It is shown, with reference to measurements # 3 and 4, that the sound levels from the laundry remain consistent. Figure D3, Appendix D demonstrates that there continues to be no tone associated with the laundry flue.

6.3 Reference is made to Section 6.10 to 6.12 of the initial assessment 22227R1, where the laundry flue sound output is investigated. It is concluded that *"the sound emanating from the commercial boiler flue could cause an adverse impact however, this could be adequately mitigated through design or private negotiation*". As no change has been experienced to the laundry flue in terms of the sound levels, this initial finding is maintained.

6.4 As no material change has been experienced to the sound climate of The Site, it therefore remains to investigate the primary purpose of this assessment, namely investigating and quantifying any impact imposed by the installation of 3D generator.

6.5 During the course of the survey, the power station was providing, typical summer, full Island electricity generation. Fortuitously, the newly installed 3D generator was in operation for the full 24-hour period of the survey providing an ideal assessment scenario. The 3D Generator was always accompanied by 2D, as a minimum, at all times.

6.6 During the initial assessment 22227 R1 it was established that the proposed development site is more sensitive to the operations of D station due to the closer proximity. Both B Station and C Station have a negligible impact.

6.7 During full Island generation, the merit order would see a preference for the use of D Station generators. There may be 2 or 3, D Station generators in use during typical generation, possibly accompanied by additional generators subject to demand. A combination of D Station and C Station generators would be high up the merit order.

6.8 From 17:00 to 21:00 on the first day of survey 3D and 2D were accompanied by 3C and 4C generators. 3C went off at 21:00, however the remaining three generators continued in typical full Island generation until 01:00. In addition, and to accommodate the survey, Guernsey Electricity operated all three D Station generators on Thursday 25th May 11:00 to 17:00.

BS 4142 ASSESSMENT

6.9 The following assessment shown in Table 2 has been conducted for the night-time period at measurement Position 1, to the south façade of the proposed residential development, in accordance with BS 4142:2014.

6.10 The assessment offers a direct comparison to that conducted for the same location in the initial report (22227 R1). The initial assessment accounted for the use of 1D, 2D and a C generator. The difference on this occasion is that 2D, 3D and a C generator were in operation. The new installation is therefore accounted for.

6.11 A night-time assessment offers a worst-case scenario, as the background sound levels are lower during the night as compared to the day time when there was more local activity. It is evident, that by safeguarding against any adverse sound impact during the most sensitive night-time period, adequate provision will be afforded for day time sound levels. Also, an assessment of the typical day-time ambient sound levels, experienced at Site, with D Station in full operation, can be conducted separately.

Result	Position 1 of Development Site Night Time (23:00-07:00)	Commentary
Measured ambient sound level dB L_{Aeq}	41	Sound source on. Taken from 00:15-00:30, 25-5-17. (See Figure D2, Appendix D).
Residual sound level dB L_{Aeq}	-	No residual sound level was taken during recent survey.
Background sound level dB L_{A90}	35	LA90 level Position 1. (See Section 4.13, 22227 R1).
Reference time interval	15-minutes	Night time
On-time correction	0	The sound source is continuous.
Specific sound level dB $L_{Aeq,T}$	41	As source is dominant at night no correction made for residual level, offering worst case.
Tonality Correction dB	0	There is no tonality associated with the specific sound source. (See Figure D3, Appendix D).
Impulsivity Correction	0	The sound source is constant with no notable impulsivity
Other characteristic Correction	+3	A low level hum is evident at the proposed development site from the sound source.
Rating level	44	Includes acoustic feature corrections.

Result	Position 1 of Development Site Night Time (23:00-07:00)	Commentary
Excess of rating level over background sound level	+9	The rating level minus the background level.
Assessment indicates likely indication of **depending on context*	Significant Adverse Impact*	The likelihood of a significant adverse impact is reviewed below when considering context.
Uncertainty of the assessment		See Statement of Uncertainty below.

Table 2 – Assessment of the power station during night time, 25th May 2017, at Position 1 at the proposed development site in accordance with BS 4142:2014.

6.12 The BS4142:2014 assessment in Table 2, indicates a significant adverse noise impact from the power station activities at Position 1, during the night, on the proposed development site. The numerical result is a 1dB reduced impact from that experienced in the initial assessment from October 2015. In essence, the introduction of the 3D generator development has not brought about any additional noise impact to that previously experienced. As before, this result must be considered with in "context" and it is permissible, in accordance with BS4142:2014, that the impact can be reviewed after taking the context of the Site in to account.

CONTEXT

6.13 The concept of "context" is important within BS4142:2014. Section 11 of the Standard stipulates *"that 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".*

6.14 BS4142:2014 points out that in certain cases the initial numerical impact needs to be modified due to the context, all pertinent factors should therefore be taken into consideration and may include:

- Consideration of the permitted use, locality, time, duration and frequency of the specific sound.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The absolute level of sound.
- The sensitivity of the receptor and the ability to mitigate by way of physical means.

6.15 In light of the above, it is therefore important to account for site specifics and other relevant standards and guidance. Many of the considerations of context, highlighted below, have been re-iterated from the initial assessment as they remain relevant in this instance.

- The Site falls within the "Main Centre Outer Boundary" demarcation in the Island Development Plan (November 2016). As such, it is acknowledged the area is of predominantly high density, mixed use and urban. An element of industrial activity should be expected by anyone moving to the area. This assertion is validated with in Section 8.5 of BS4142: 2014 where it is pointed out that *"Where a noise sensitive receptor is introduced and there is an extant of industrial sound, it ought to be recognised that the industrial sound forms a component of the acoustic environment."*

- The operational sound of the power plant is not continual. Currently in excess of 80% of the Islands electricity requirements are met by a cable link to France. There are significant periods of time when the power plant will not be in operation, typically during the summer. During the winter period October to March it is likely the power plant will be in operation on some capacity but not necessarily during the night.

- There are residential properties that are in closer proximity to the power station than the development site. Guernsey Electricity are not permitted to subject these residents to a noise nuisance and the same would be true for the proposed development site. It is evident that Guernsey Electricity take noise control very seriously and have developed and implemented practicable measures during recent years and intend to maintain this approach in to the future. Guernsey Electricity are committed to adhering to a noise condition stipulated by The Office of Environmental Health and Pollution Regulation.

- The sound emitted from the power station is a constant low-level hum, similar in many ways to the anonymous sound of a busy road. Residents become acclimatised to sounds of this nature. The sound from the power station is much less evident during day time when other local activities mask the sound and elevate the background levels.

- Figure B3, Appendix B highlights the location of the new 3D generator installation in relation to the proposed development site. It is evident the installation is shielded by virtue of the existing D Station developments. The new installation's operations are attenuated due to positioning, orientation and screening.

6.16 In addition to the above, and whilst continuing to assess the context of the Site, BS4142:2014, Section 8.5 stipulates that when a noise sensitive receptor is introduced in to an industrial setting other guidance, in addition or alternative to BS4142:2014, can also inform the appropriateness of the development and further inform the extent of required noise mitigation.

6.17 The World Health Organisation [5] (WHO) suggest that to protect the majority of people from moderate annoyance during the day time outdoor noise levels should not exceed 50dB L_{Aeq}. To prevent the majority of people becoming seriously annoyed during the daytime the sound pressure level should not exceed 55dB L_{Aeq} which should be considered for gardens and outdoor living spaces. Where the external noise is 50dB L_{Aeq} internal noise levels (open windows) will be acceptable (35dB L_{Aeq}) considering a 15dB loss from external to internal areas. *For indoor spaces there is, in theory, no restriction to the outdoor noise level as long as the building envelope provides sufficient insulation although this will result in a very poor outdoor environment.*

6.18 Table 4 of British Standard 8233 *Guidance on sound insulation and noise reduction for buildings* (2014) [6] gives performance standards for internal sound levels within dwellings.

- BS 8233 determines that a level of 35dB $L_{Aeq,T}$ should not be exceeded inside living areas to avoid annoyance and disturbance during the daytime. A level of 30dB $L_{Aeq,T}$ should not be exceeded to avoid sleep disturbance during the night. *These limits can also be relaxed by 5dB so reasonable internal conditions are maintained.*

- At the façade of the premises, a reduction of approximately 15dB will occur through a partially open window.

- It is therefore reasonable to consider an external limit of 45-50dB $L_{Aeq,T}$ in accordance with the guidance of BS 8233.

6.19 Reference is made to the survey measurements detailed in Figure D1, Appendix D. Measurement # 15 details 4 x 1-hour measurements taken at Position 1 between 12:00 and 16:00 Thursday 25th May 2017 at Position 1, with all three generators in D Station in operation. Typical industrial activities, including the commercial laundry flue and traffic movements locally were also evident. Sound levels recorded ranged from 51 – 54 $L_{Aeq,1\text{-hour}}$. This demonstrates that outdoor residential amenity can be achieved at the Site in accordance with WHO guidelines.

6.20 Measurement Position G (Figure C6, Appendix C) was located 3.5m from the Site's south west boundary, the nearest free-field position in proximity to D Station. A sound level of 46 L_{Aeq} was measured at Position G with D Station in full operation at 16:11 on Thursday afternoon 25th May 2017. Again, a clear indication of appropriate outdoor residential amenity levels.

6.21 Simple acoustic design mitigation measures, as advocated in Sound Control for Homes [7] and detailed in Section 7 of 22227 R1, can be implemented at Site to ensure adequate internal residential sound levels in habitable rooms by way of a partly open window during the day-time across the full extent of Site.

6.22 Reference is made to measurement # 13 in Figure D1, Appendix D. A level of 46dB $L_{Aeq,T}$ was measured at Position 1 between 20:00 and 08:00 Wednesday 24th May to Thursday 25th May. When purely considering the night-time period (23:00 – 07:00), during this measurement, a sound level of 44 dB $L_{Aeq,\ 8hour}$ was realised. This facilitates an appropriate internal noise level with in bedrooms by way of a partly open window.

6.23 When taking all the above context in to consideration it is reasonable to amend the numerical BS4142:2014 assessment, indicating a significant adverse impact, and to predict that an adverse noise impact will be avoided for potential future residents of the proposed development site. In fact, the implementation of practicable acoustic design will ensure no observed adverse effect from noise from the surrounding locale.

6.24 It is shown, Measurement 10 Figure D1, Appendix D that a significant 3dB reduction was experienced at Position F, the boundary of Maison Hougue Jehannet, after 3D's installation. This is probably a result of the sound wall construction accompanied with other mitigating factors, such as silencers.

6.25 It is recognised that the sound output from the power station may be elevated during winter month production, however adequate design will compensate for this. Also, during the winter, residents are less likely to want to have their windows open or sit out in their gardens. Careful acoustic design will also safeguard against any elevated sound levels experienced by virtue of a positive wind vector, blowing from the power station towards the Site.

STATEMENT OF UNCERTAINTY

6.26 There are a variety of factors that inevitably limit the accuracy associated with all steps of any noise assessment, including measurement, calculation or prediction. Factors include, but are not limited to:

- The inherent limitation of calculation / prediction methodology in Standards and guidance.
- Variability in meteorological conditions.
- The accuracy of sound source input data of a calculation or noise model.

6.27 It is imperative to minimise the uncertainty to a level commensurate with the intention of the assessment objective. Measures taken in this assessment to minimise uncertainty are:

- Baseline sound levels have been measured over an extensive time frame therefore a good indication of representative background sound levels without the proposed development site in operation.
- Sound level measurements were undertaken in accordance with recognised Standards and were undertaken during suitable weather conditions, e.g. acceptable wind speeds and no precipitation.
- Field calibration checks were undertaken prior and after measurements to record acceptable drift.
- The sound source data was either measured on site and clarification of what was being measured at any time has been clarified by Guernsey Electricity.
- A mixture of subjective and objective observations were made to determine the requirement for any acoustic feature character rating.
- Relevant noise criteria have been utilised during assessment.

6.28 The aforementioned measures reduce uncertainty to a level considered not to have any significance to the outcome of the assessment.

7 CONCLUSION

7.1 Further to assessment, it has been established that the introduction of the 3D generator at Vale Power Station has not led to a detriment of the residential amenity of the proposed development site, when considering noise. The conclusions drawn from an initial assessment (22227 R1, October 2015) remain consistent. It is evident that the sound climate of the proposed development site should not be a prohibitive factor to the granting of planning permission for a residential development.

7.2 When considering the full context of the site and by adopting practicable noise control design and construction methods an appropriate level of residential amenity for existing and potential residents can be readily attained. It is realised that an appropriate level of residential amenity can be achieved without a compromise to the relevant principles set out in the States of Guernsey's Island Development Plan (IDP). Particular reference is made to Policy GP8: Design and Policy GP9: Sustainable Development of the IDP. The assertion for the use of practicable and sustainable acoustic design, is echoed in the most recent planning guidance available, namely with in Planning ProPG "Professional Guidance for Planning and Noise – Residential Development".

7.3 If considered necessary, it could be a condition requirement of any planning permission granted that a detailed scheme of acoustic design is submitted and approved in writing by the Local Planning Authority, prior to any development.

8 REFERENCES

[1] Island Development Plan (2nd November 2016). States of Guernsey.

[2] BS4142: (2014). Methods for rating and Assessing Industrial and Commercial Sound.

[3] ProPG: Planning and Noise (May 2017). Professional Practice Guidance on Planning and Noise – New Residential Development.

[4] BS 7445–2: (1991). Description and Measurement of Environmental Noise – Part 2: Guide to the Acquisition of Data Pertinent to land use

[5] World Health Organisation (WHO) (1999). Guidelines for Community Noise.

[6] BS8233: (2014). Guidance on Sound Insulation and Noise Reduction for Buildings.

[7] Building Research Establishment (1993). Sound Control for Homes. CIRIA

Appendix A: Glossary of Acoustic Terms

'A' weighting dB(A): Correction applied to the frequency range of a noise in order to approximate the response of the human ear. Noise measurements are often A-weighted using an electronic filter in the sound level meter.

Attenuation: Sound reduction, measured in decibels (dB).

Ambient Sound: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far. Note: The ambient sound comprises the residual sound and the specific sound when present.

Background sound level: A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

Calibration: A check of the function of a sound level meter by comparing the meter reading with a known sound pressure level.

Decibel (dB): The unit of sound level and noise exposure measurement. The range of audible sound pressures is approximately 0 dB to 140 dB.

Frequency (Hz): The pitch of the sound, measured in Hertz.

LAeq,T: The A-weighted equivalent continuous sound pressure level during a period. It is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period, T.

Octave-bands: A division of the frequency range into recognised bands.

Rating level, LAr,Tr: The specific sound level plus any adjustment for the character of the sound.

Residual sound: Ambient sound remaining in the absence of the specific sound or that it is supressed as not to contribute to the ambient sound level.

Residual sound level, Lr or Leq,T: The equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given reference time interval, T.

Sound pressure level (SPL): The basic measure of sound, expressed in decibels, usually measured with an appropriate frequency weighting (e.g. the A-weighted SPL in dB(A)).

Sound power level (Lw): The sound energy radiated per unit time by a sound source measured in watts (W). Sound power can be weighted (e.g. A-weighted) and is not influenced by environmental or physical factors such as weather or distance.

Specific sound: Sound source being assessed.

Specific sound level, Ls or Leq,T: The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval, T.

Appendix B: Site Plans

Figure B1 – Ariel photograph showing the proposed development site in proximity to neighbouring industrial uses.

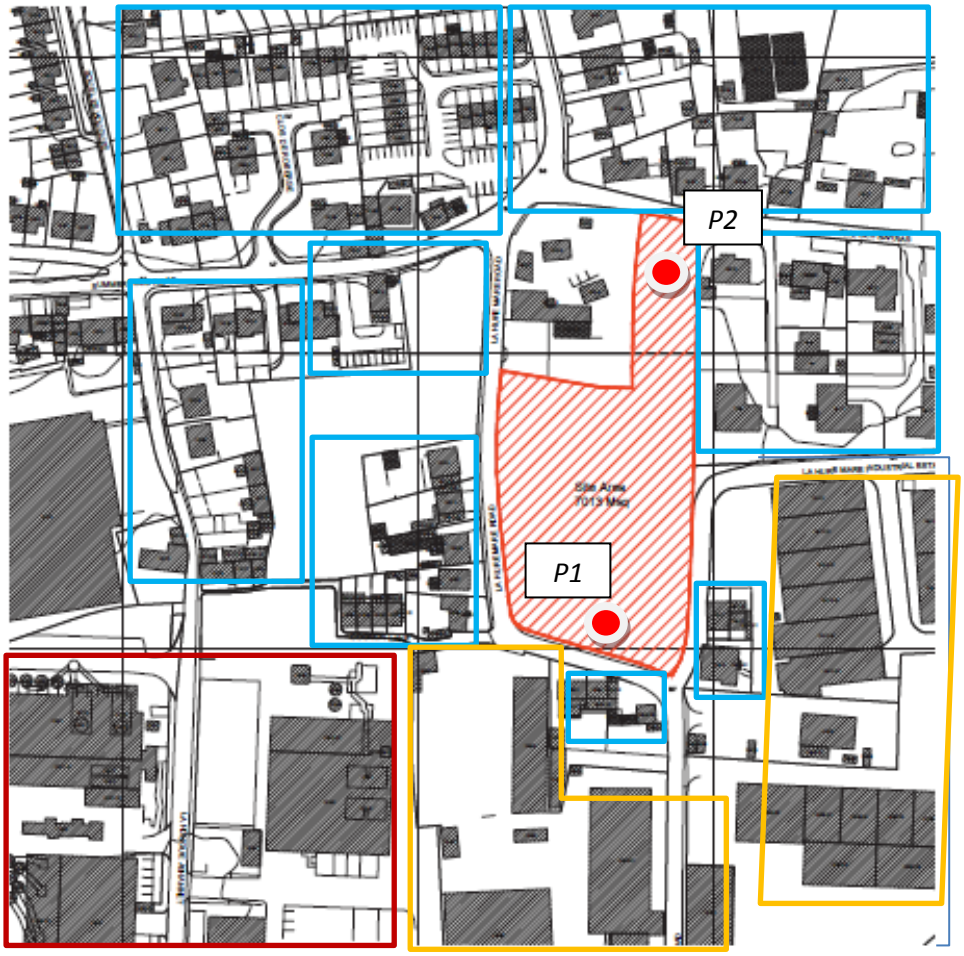

Figure B2 – Block plan highlighting the proposed development site in red. See the key below to identify other neighbouring uses of land.

Key:

Guernsey Electric Power Plant

Existing Residential

Industrial Units

Measurement positions

N

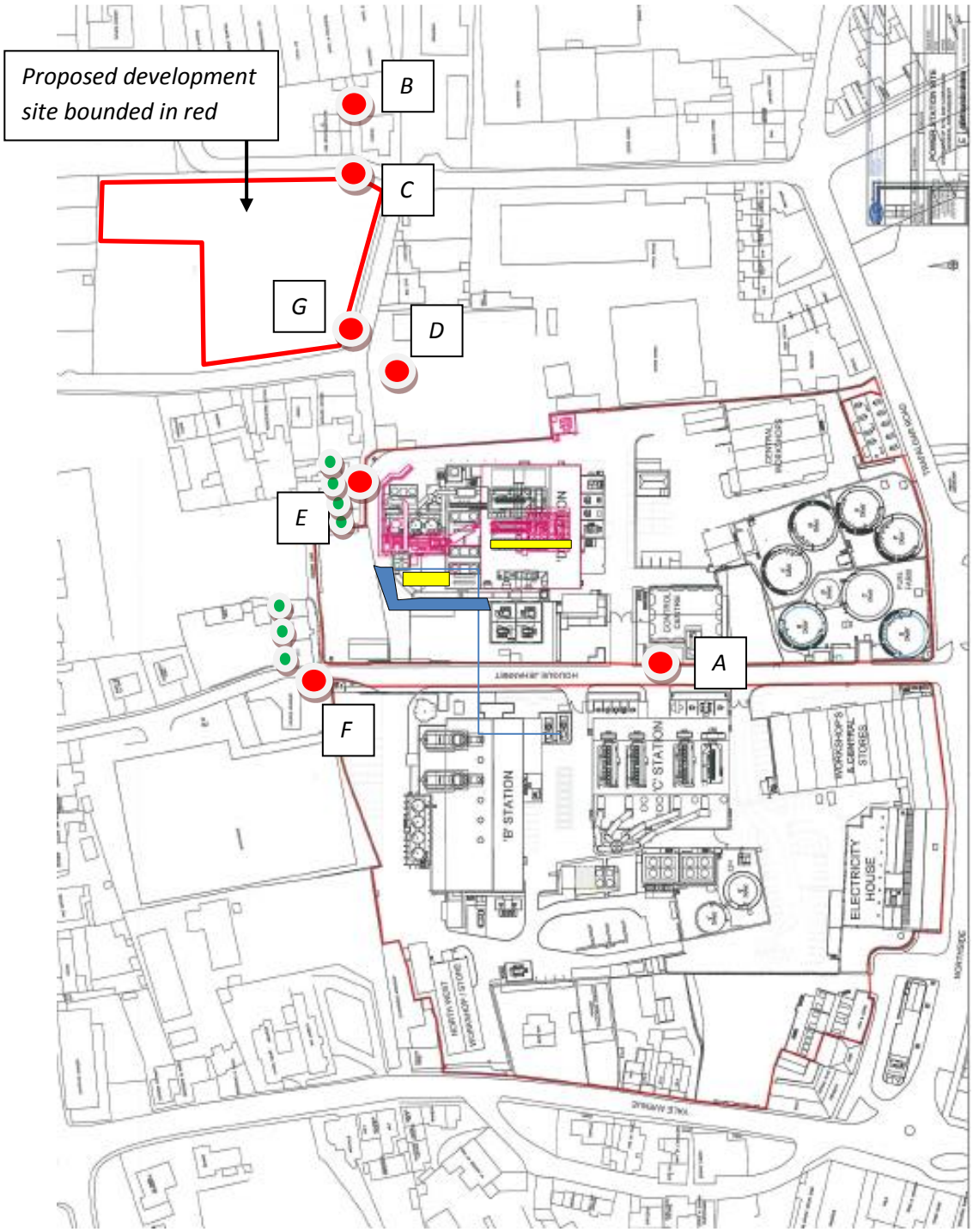

Figure B3 – Detailed plan of Guernsey Electricity's power station site. The proposed development site is marked with a red boundary; the recent 3D development, with associated plant, is highlighted in yellow and the new sound wall installation is highlighted in blue.

Attended spot measurement locations

7 x residential properties purchased by Guernsey Electricity that are currently vacant

Appendix C: Site Photographs

Figure C1 – South façade of D Station, illustrating the new 3D generator installation location.

Figure C2 – North west façade outside D Station, illustrating external ducting and the sound wall.

Figure C3 – Microphone at Measurement Position 1, illustrating the proximity of D Station.

Figure C4 – Measurement Position 1, illustrating the proximity of Arrowsmith Laundry's extraction flue and neighbouring industrial units to the east.

Figure C5 – Measurement Position 2, illustrating the proximity to D Station to the west and the nearest neighbouring industrial units to the east.

Figure C6 – Measurement Position G, illustrating the closest free-field point of the proposed development site to D Station. Note the closer proximity of an existing neighbouring residential dwelling to the power station.

Appendix D: Sound Survey Measurement Results

Ref #	Location	Location Description	Date / Time	Results dB	Site Notes 2015	Date / Time	Results dB	Site Notes 2017
1	A	18m From C Station door open	06/10/2015 10:16	75 L_{Aeq}	SE wind, no gusts, 3 generators in C station	-	-	Measurement not taken at this location in 2017.
2	A	18m from C Station door closed	06/10/2015 10:18	58 L_{Aeq}	SE wind, no gusts, 3 generators in C station	-	-	Measurement not taken at this location in 2017.
3	B	4m from commercial laundry flue	06/10/2015 13:22	58 L_{Aeq}	SE wind, no gusts, no tone	25/05/2017 10:45	57 L_{Aeq}	Short source measurement. East wind, no gusts no tone. Laundry dominant source.
4	C	South east boundary of the Site	06/10/2015 13:43	51 L_{Aeq}	SE wind, no gusts, laundry flue audible. Power station in operation, 3 generators	25/05/2007 10:53	51 L_{Aeq}	East wind, power station in typical operation, laundry dominant source.
5	C	South east boundary of the Site	07/10/2015 23.32	45 L_{Aeq}	NW wind, no gusts, power station not intrusive	-	-	-
6	D	States yard gate near to D Station	06/10/2015 13:49	54 L_{Aeq}	SW wind, gusting evident, 3 generators	25/05/2017 11:16	52 L_{Aeq}	3 x generators in D Station in operation
7	D	States yard gate near to D Station	06/10/2015 23:24	54 L_{Aeq}	NW wind gusting, 3 generators	-	-	-
8	D	States yard gate near to D Station	07/10/2015 23:24	51 L_{Aeq}	WSW wind, no gusts, 3 generators	-	-	-
9	E	Cottages in front of sound wall at D Station	06/10/2015 13:58	50 L_{Aeq}	SW wind, 5 generators in operation	25/05/2017 11:21	49 L_{Aeq}	3 x generators in D Station in operation.
10	F	At boundary Maison Hougue Jehannet	06/10/2015 14:07	52 L_{Aeq}	SW wind, 5 generators in operation	25/05/2017 11:30	49 L_{Aeq}	3 x generators in D Station in operation.
11	G	South west boundary of the Site nearest Site location to D Station	07/10/2015 23:30	49 L_{Aeq}	NW wind, no gusts, 3 generators in operation. Typical night mode.	24/05/2017 18:49	49L_{Aeq}	1 hr measurement. Power station in typical full Island generation. No activity at Industrial Estate
12	G	South west boundary of the Site nearest Site location to D Station	-	-	-	25/05/2017 16:11	46 L_{Aeq}	3 x generators in D Station in operation. Laundry off.
13	Position 1	10m from South Facade	05/10/2015 17:55	50 L_{Aeq}	SE wind, no gusts, 1D in operation	24/05/2017 20:00	46 L_{Aeq}	12-hour unattended measurement. See Figure D2, Appendix D
14	Position 1	10m from South Facade	05/10/2015 23:02	38 L_{Aeq} 37 L_{A90}	SW wind, no gusts, background reading no power station	25/05/2017 09:00	51L_{Aeq}	I hour measurement. Power station in typical operation. Laundry in operation and other units.
15	Position 1	10m from South Facade	06/10/2015 23:04	50 L_{Aeq}	SW wind, positive vector, gusting, 3 generators	25/05/2017 12:00 to 16:00	52 L_{Aeq} 54 L_{Aeq} 54 L_{Aeq} 51 L_{Aeq}	4 x 1 hour measurements, 3 x D Station generators in operation. Laundry off in last hour. Industrial activities
16	Position 1	10m from South Facade	07/10/2015 23:09	46 L_{Aeq}	NW wind, no gusts, 3 generators	-	-	-
17	Position 2	22.5m from North Facade	07/10/2015 23:17	41 L_{Aeq}	NW wind, no gusts, 3 generators	24/05/2017 17:12	45 L_{Aeq}	Measurement taken over 1hr, with power station in typical full Island generation
18	Position 2	22.5m from North Facade	08/10/2015 10:56	46 L_{Aeq}	SE breeze almost still, 5 generators.	-	-	-

Figure D1 – A summary chart of the survey measurement results from Oct 2015 and May 2017. (See Figures B2 and B3, Appendix B for an illustration of the measurement positions detailed).

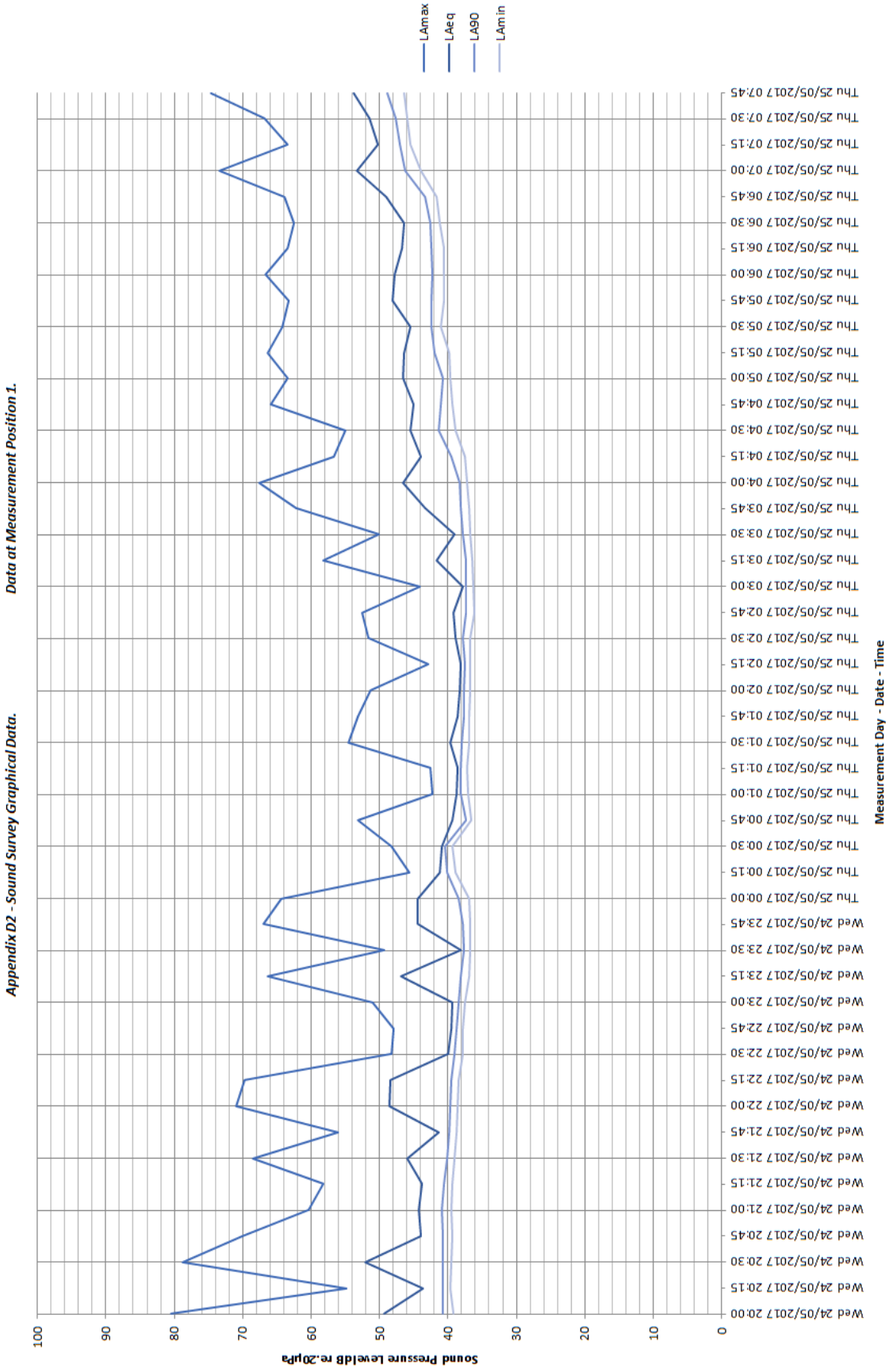

Figure D2 – A graph of sound survey measurement results taken at Position 1 from 20:00 24th May to 08:00 25th May 2017.

1//3 Octave Band Hz	Measurement Position 1 with Power Station on (00:15-00:30, 25-5-17)	Measurement 4m from Arrowsmith Laundry Boiler Flue (10:48, 25-5-17).
1/3 LZeq 25.0	67	69
1/3 LZeq 31.5	74	65
1/3 LZeq 40.0	63	63
1/3 LZeq 50.0	56	59
1/3 LZeq 63.0	55	55
1/3 LZeq 80.0	49	51
1/3 LZeq 100	45	54
1/3 LZeq 125	41	55
1/3 LZeq 160	37	60
1/3 LZeq 200	36	56
1/3 LZeq 250	36	53
1/3 LZeq 315	31	56
1/3 LZeq 400	34	51
1/3 LZeq 500	34	50
1/3 LZeq 630	33	48
1/3 LZeq 800	32	48
1/3 LZeq 1000	30	45
1/3 LZeq 1250	26	43
1/3 LZeq 1600	25	43
1/3 LZeq 2000	22	41
1/3 LZeq 2500	20	40
1/3 LZeq 3150	17	38
1/3 LZeq 4000	-	35
1/3 LZeq 5000*	-	34
1/3 LZeq 6300*	-	31
1/3 LZeq 8000*	-	29
1/3 LZeq 10000*	-	-

Figure D3 - 1/3 octave band data at specified monitoring positions. The data demonstrates that the sources have no tonal element in accordance with Annex C BS4142: 2014.

(*The equipment was unable to reliably record all the sound levels experienced at some of the higher frequencies).

Appendix E: Acousticians Qualifications and Status

Paul Thomson BSc. (Hons) MSc. MIOA

Position Held:	Acoustic Consultant.
Qualifications:	BSc. (Hons) Environmental Studies.
	MSc. Environmental Change – Social and Physical Aspects.
	Institute of Acoustics Diploma in Acoustics and Noise Control.
	Certificate of Competence in Environmental Noise Measurement.
Affiliations:	Member of the Institute of Acoustics.
Acoustics Experience:	8 years (Over 6 years working as a Local Authority Pollution Officer).
Core Competences:	Environmental acoustics, entertainment projects, statutory nuisance assessment and enforcement.

Steve Skingle BSc. (Hons) MAES MIOA

Position Held:	Principal Acoustic Consultant.
Qualifications:	BSc. (Hons) Acoustics.
	Institute of Acoustics Diploma in Acoustics and Noise Control.
Affiliations:	Corporate Member of the Institute of Acoustics.
	Corporate Member of the Audio Engineering Society.
Acoustics Experience:	14 years.
Core Competences:	Building acoustics, environmental acoustics, entertainment projects and electro acoustics.