

Attachment 7-1-3-1 Emissions Compliance Report

Subsection 7-1 Emissions Overview
Application ID: LA015988

SSE Generation Ireland Limited

February 2025

Quality information

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1. Introduction

SSE Generation Ireland Limited, hereafter referred to as SSE, is applying to the Environmental Protection Agency (EPA) for a review of the existing Industrial Emissions Licence (IEL) at the Tarbert Power Station, Tarbert, Listowel, County Kerry, IEL reference P0607-02. SSE were granted planning permission by An Bord Pleanála on 4 October 2024 (ABP-318540-23) to develop a new Open Cycle Gas Turbine (OCGT) power plant, associated administration building, workshop, ancillary plant and site services. A further submission in accordance with Section 146B of the Planning Development Act 2000, as amended, was submitted to alter the permitted installation on 07 January 2025, hereafter referred to as the Section 146B application and was granted approval by ABP on 17 February 2025 (ABP-321590-25).

The site of the proposed development, hereafter referred to as the installation, is located wholly within the existing boundary of the Tarbert Power Station. The installation consists of an OCGT which will be fuelled by hydrotreated vegetable oil (HVO) with a gross electrical power output of up to 350 MWe (megawatt electrical output). The installation will also include an emission stack, fuel supply pipework, fuel storage and unloading area, water storage tanks, electrical grid connection and associated ancillary development works and services. This document presents the Emissions Compliance Report for the site.

Further details on the installation are presented in Attachment 4-8-1-Operational Report.

The main objectives of the installation are:

- To support the security of electrical power supply.
- To support the continued expansion of Ireland's renewable generation capacity.
- To provide support to the electricity supply system at times of peak demand and at times when other electricity generation sources are not sufficient to meet demand.

A compliance report with the current Emission Limit Values (ELVs, where applicable) and BAT (See Attachments 4-7-1 to 4-7-4 for BAT assessments) is included for each future emission thematic as follows:

- Air
- Noise
- Surface Water
- Storm Water

There are no emissions to sewer, to ground/ groundwater emissions and/or landspreading activities undertaken in associated with the installation.

2. Air

2.1 Main Air Emission Points

The current licence for the site includes four main emission points; A1-1, A1-2, A1-3 and A1-4, which are the emission points associated with the Heavy Fuel Oil (HFO) boiler units referenced onsite as Unit 1, 2, 3 and 4. SSE chose the Limited Lifetime Derogation under the Industrial Emissions Directive 2010/75EC (IED), and therefore the existing installation has not been operational since the 31st of December 2023; in accordance with Condition 5.17 of the installations IE Licence (Reference No: P0607-02). Main emission points A1-1, A1-2, A1-3 and A1-4 are therefore to be removed from the licence during this review as they are no longer in use. Hence, information on emissions compliance for these emission points is not relevant for this IE licence review application.

The main emission point to air at the installation will be for the consented OCGT (emission point reference A2-1). The emissions are released to atmosphere via a single stack, and consist of combustion emissions. The details of the new emission point are presented in Table 2-1. Further information on the OCGT main atmospheric emission point can be found in Attachment 7-4-1- Emissions-to-Air-Main of this application.

Table 2-1 Main Air Emission Point Summary

Emission Point	Unit	Fuel	Location	Stack Height	Stack Diameter
A2-1	OCGT	HVO	107538, 149580	55m	8m (internal)

In accordance with Chapter III and Annex V of the IED and Commission Implementing Decision (EU) 2021/2326 establishing best available techniques (BAT) conclusions, the proposed OCGT will be a liquid-fuel-fired turbine and specifically a gas oil fired turbine. The OCGT will be fuelled by HVO, which is aligned to gas oil in relation to BAT associated emission levels (AELs).

The details of the air emission impact assessment are provided in Chapter 7 of the Environmental Impact Assessment Report (EIAR) for the consented OCGT plant, and the subsequent S146B updated assessment for non-material amendments of the design are provided in Attachment 6-3-1 and Attachment 6-3-1-1 of this application respectively. The proposed emissions limit values to for emission point to air A2-1 are shown in Table 2-2.

Table 2-2 Proposed Emission Limit Values

Emission Point	Pollutant	Emission Limit Value (mg/Nm ³) (*)			
		Hourly	Daily	Monthly	Annual
A2-1	Nitrogen oxides, NO _x (as NO ₂)	100	55	50	N/A
	Carbon monoxide, CO	200	110	100	N/A
	Dust	N/A	10	N/A	5
	Oxides of sulphur (as SO ₂)	N/A	5	N/A	35-65
	Flow rate	2,551,506 Nm ³ /h	-	-	-

(*) Emission Limit Values and flow rate at standard temperature and pressure, dry gas and 15% oxygen by volume. Emission limit values for NO_x and CO for gas turbines apply above 70% load only as outlined in Part 1 of Annex V of the IED and confirmed by the EPA.

2.2 Monitoring

The installation will include a continuous emissions monitoring system (CEMS). The CEMS will log and record flue gas emissions from emission point A2-1 during operation. The CEMS will include continuous monitoring of flow rate, temperature, oxygen content and water vapour content as well as pollutant species to facilitate the conversion of recorded pollutant emission data to standard conditions within the CEMS and data handling systems. The following pollutants will be monitored by the CEMS:

- Nitrogen oxides (NO_x), as Nitrogen dioxide (NO₂)
- Carbon monoxide, CO
- Dust

The IED, Annex V, Part 3-1 states that the concentrations of SO₂ from each combustion plant (>100MWth) shall be measured continuously. However, Part 3-2(c) states that continuous measurements for SO₂ are not required for combustion plants firing oil with known sulphur content. The installation will use commercially available HVO. SSE is committed to sourcing HVO that is third party certified. It is expected that the HVO will have minimal sulphur content with a maximum sulphur content of 5ppm. SSE will receive fuel analysis data and therefore fuel sulphur content will be known. Therefore this derogation should be applicable.

The modelled pollutant emission rates are determined by the daily average BAT-AEL values set out within the BAT conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants (BAT-LCP) or Emission Limit Values (ELVs) set out within the IED.

2.2.1 Emission Abatement Techniques

2.2.1.1 NO_x Water Injection and Low NO_x Burners (LNB)

The installation will utilise a NO_x water injection system. This injection system adds water directly into the pipes of the premix fuel manifold, and the water injection manifold in the combustion chamber to reduce the NO_x emissions. The water injected into the combustion chamber evaporates in the combustion chamber, thus reducing the flame temperature and allowing for a reduction of NO_x.

The installation will also use low NO_x burners as another means to reduce thermally produced NO_x emissions. Low NO_x 'hybrid' burners utilise a premixing of the fuel and air which are to be combusted. The fuel and air will be homogeneously mixed prior to entry into the combustion chamber, so that there are no zones of stoichiometric mixture and therefore no zone of high peak temperatures, which are mainly responsible for NO_x formation.

2.3 Minor, Potential and Fugitive Air Emission Points

There will be 13 new minor emission points associated with the installation, in addition to 19 existing minor emission points which will be retained. There are 5 new potential emission points including relief valves on fuel lines and an emergency HVO fuelled generator. There are also 4 existing potential emission points on the site.

Further details on these emission points to atmosphere are provided in Attachment 7-4-2-Emissions to Air-Minor and Potential.

2.4 Odour Emissions

Operation of the installation will not generate off-site odours under normal operating conditions. Further details on air monitoring and discharges are presented in Attachment 7-4-1 and Attachment 7-4-2 of this application.

3. Noise

Guidance on permissible noise emission limits for licensed facilities is contained in the EPA's Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (2016). Noise levels at nearby residential properties (NSRs) during the operational phase will be subject to daytime and night-time noise limits set down in NG4, as set out Table 3-1.

Table 3-1 NG4 Recommended Operational Noise Limit Criteria

Scenario	Daytime Noise Criterion dB L _{ar,T} (0700 to 1900 hours)	Evening Noise Criterion dB L _{ar,T} (1900 to 2300 hours)	Night-time Noise Criterion dB L _{aeq,T} (2300 to 0700 hours)
Quiet Area	Noise from the licensed site to be at least 10 dB below the average daytime background noise level measured during the baseline survey.	Noise from the licensed site to be at least 10 dB below the average evening background noise level measured during the baseline survey.	Noise from the licensed site to be at least 10 dB below the average night-time background noise level measured during the baseline survey.
Areas of Low Background Noise	45 dB	40 dB	35 dB
All other Areas	55 dB	50 dB	45 dB

The installation location does not meet the definition of a ‘Quiet Area’ as outlined in the NG4 guidance. Analysis of the measured baseline levels indicated that the location can be classed as ‘All other Areas’. The noise analysis included in the EIAR and the subsequent S146B application indicates that the operation of the installation will not result in any noise ELVs above those set out in the NG4 guidance for ‘All other Areas’. More information on the impact assessment of operational noise associated with the installation can be found in Chapter 11 of the EIAR (Attachment 6-3-1 of this application) and S146B assessment (Attachment 6-3-1-1).

3.1 Monitoring

The existing Tarbert site operates under the existing IE Licence from the EPA (Reference number P0607-02). Condition 3.5 of the licence states the following:

3.5 Noise

Noise from the activity shall not give rise to sound pressure levels (Leq,30 minutes) measured at the noise sensitive locations which exceed the limit value(s) by more than 2 dB(A).

The limit values referenced in Condition 3.5 are outlined in Condition 8.2 of the IE Licence and set out in Table 3-2.

Table 3-2 Noise Limit Values

Daytime L _{Ar,T} (30 minutes)	Night-time L _{Ar,T} (30 minutes)
55	45

Source: Condition 8.2 of IE Licence P0607-02

Furthermore, in accordance with Condition 8.3 of the licence, there is a requirement that

“There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise sensitive location”.

Noise monitoring is undertaken annually in accordance with Condition 8 of the existing licence (P0607-02). Noise monitoring is proposed to be undertaken annual at one monitoring location; N1. N1 is a monitoring point representative of the identified noise sensitive receptors (NSRs) in the EIAR, as set out in Table 3.2 and shown in Attachment 3-1 Site Drawings Figure 6.

Table 3-3 Noise Sensitive Receptor Locations

Receptor	Height	Coordinates		
	(m)	X (m)	Y (m)	Distance to Red Line Boundary (m)
NSR 1	1.5	507471	649266	245
NSR 2	4	507423	649020	505
NSR 3	4	507723	648493	1,050

Table 3-4 Noise Monitoring Location as per IE Licence P0607-02

Receptor	Proposed Monitoring Frequency	Coordinates	
		X (m)	Y (m)
N1	Annual	475195	5826374

Further details on noise monitoring and discharges are presented in Attachment 7-5 of this application. The last round of annual monitoring submitted to the EPA were undertaken in October 2024, as is provided in Appendix 2 of this report. The noise monitoring assessed that SSE were in compliance with all licence requirements.

4. Surface Water Emissions

Surface water emissions at the site will consist of process effluent and foul wastewater.

4.1 Process Effluent

The installation will include a demineralised water treatment plant, which will be utilised to control NOx emissions via the injection of demineralised water into the OCGT combustors. The generation of process wastewater will be the result of the production of the demineralised water. This process wastewater will contain the naturally occurring minerals which have been removed from the mains water supply. Prior to being discharged the wastewater will be treated so that the pH will be adjusted to a neutral range. Once treated, this wastewater will then be discharged to the Shannon Estuary via the existing licenced emission point, PE4, which is located to the north of the site.

There will be no other process wastewater emissions made to the estuary from the installation. The installation includes a fuel polishing system, used to remove low levels of impurities within the HVO. Liquid waste generated from the fuel polishing process will be contained within a storage tank. This tank will be periodically emptied and disposed offsite by a road tanker. The internal blading of the OCGT accumulates deposits from the air over time, which also requires periodic washing. Wastewater from the blade washing will be collated in a dedicated drain tank and will also be disposed offsite by a road tanker.

Within the existing licence there are eight surface water emission points which were previously licenced to discharge process effluent, such as boiler “blow down” water and drainage from the engine room. However, as previously outlined, the existing HFO thermal units onsite are no longer in operation and

therefore there are no longer process effluents generated from the associated activities. Therefore, SSE propose to retain the existing surface water emission point PE7, PE8 and PE9, although there will be no discharges via these emission points. Existing emission points: PE1, PE2, PE3, PE5, PE6 will no longer emit process effluent, however they will continue to emit uncontaminated storm water discharges and therefore are to be retained onsite. More details on these emission points are provided in Attachment 7-2.

4.2 Foul Effluent

The installation has a dedicated drainage strategy which has been developed with reference to industry good practice and will provide a separate foul and surface water drainage network across the site. A new underground wastewater treatment plant (WWTP) will be installed at the site as part of the installation to treat domestic / sanitary waste water from on-site personnel facilities under planning permission ABP-318540-23 granted 4 October 2024. Once the effluent has been treated at the new WWTP it will be discharged to the Shannon Estuary via the existing licenced emission point FE1.

There are four foul sewage treatment units which discharge via licenced emission points FE1, FE3, FE4 and FE5. The effluent from FE1 and FE3 is monitored quarterly as per the existing licence. The installation will not lead to an increase in staff onsite at Tarbert station during the operational phase, and therefore there will be no additional foul water generated.

4.3 Monitoring

Process effluent discharges via licenced emission point PE4 and foul effluent discharges via FE1 will be monitored in accordance with Schedule 2(i) - (iii) and 2(iii) of Technical Amendment C of the existing IE Licence (P0607-02). The ELVs and monitoring requirements as per the existing IEL (P0607-02) for PE4 are shown in Table 4-1 and

Table 4-2. The monitoring requirements for FE1 are shown in Table 4-3.

Table 4-1 Emission Limit Values for PE4

Parameter	ELV	Unit
Volume (max one day)	480	m ³
Volume (max rate per hour)	160	m ³
pH	6-9	-
Suspended Solids	100	mg/l
	18	kg/day
Vanadium	5	mg/l
Iron	5	Mg/l

Source: Schedule 2(i) P0607-02 Technical Amendment C

Table 4-2 PE4 Monitoring Requirement

Monitoring to be Carried Out	Monitoring Frequency	Monitoring Equipment/Method
Flow	Continuous (while discharging)	Calculation from pump usage with recorder
pH	Continuous (while discharging)	Online pH probe with recorder
Total Ammonia (as N)	Quarterly	
Suspended Solids	Quarterly	Standard Method
Vanadium (Boiler Wash)	per discharge	Standard Method
Iron (boiler Wash)	per discharge	Standard Method

Source: Schedule 2(iii) P0607-02 Technical Amendment C

Table 4-3 FE1 Monitoring Requirements

Parameter	Monitoring Frequency	Analysis Method/Technique
BOD	Quarterly	Standard Method
Suspended Solids	Quarterly	Standard Method

Source: Schedule 2(iii) P0607-02 Technical Amendment C

The ELVs and monitoring requirements as per the existing IEL (P0607-02) for Vanadium and Iron are due to historic activities onsite relating to boiler wash discharges from the HFO thermal units, which have since been decommissioned. There are no longer any boiler wash discharges from the site, and the proposed installation will not be discharging boiler wash effluent. Therefore, it is proposed that the ELV and monitoring requirement for these parameters at PE4 is removed from the IE Licence at this review.

Further details on surface water monitoring and discharges are presented in Attachment 7-2 of this application.

5. Storm Water

The existing drainage/storm water system onsite collects all water from impervious surfaces and pipes it to an underground drainage system. Surface water/ storm water is discharged to the Lower Shannon via licenced emission points under IE Licence P0607-02. All runoff with the potential to become contaminated passes through oil interceptors to retain any hydrocarbons present. The surface water/ storm water emissions points are monitored on a quarterly basis, in accordance with IE Licence P0607-02.

The proposed installation storm water drainage design will combine with the existing onsite storm water drainage network. All storm water collected from the installation area by means of underground drainage network will be conveyed to a full retention oil separator and then to attenuation storage. The attenuation storage will include a combination of a below ground storage with a capacity of 990m³ and an additional 1,410m³ of above ground storage. All of the proposed installation outfalls and drainage outlets at the site require flap valves or flood gates to prevent backflow during extreme events. All storm water from the installation area will be discharged via the existing licenced emission point SE3. The other existing

storm water emissions points will continue to be maintained and monitored (when operational) in accordance with the existing licence P0607-02.

Prior to the decommissioning of the HFO Units, a number of minor incidents were recorded in relation to storm water ELV exceedances, as seen in Table 5.1.

Table 5-1 EPA trigger level breaches between 2022-2024 for SSE Tarbert

EPA Incident Reference	Date EPA notified	Summary	Status
INCI027489	29/03/2024	SE4 TPH levels recorded at 314 ug/l, threshold is 80 ug/l).	Closed
INCI025773	19/07/2023	SE3 and SE11 pH and TPH ug/l trigger levels exceeded. SE3 – pH 10 [8.7 pH threshold] SE11 – 355 ug/l [80 ug/l threshold].	Closed
INCI025037	27/03/2023	SE9 TPH levels recorded at 271 ug/l, threshold is 80 ug/l).	Closed
INCI023164	29/04/2022	SE4 TPH levels recorded at 152 ug/l, threshold is 80 ug/l).	Closed

Source: SSE Tarbert P0607-02 LEAP Compliance Records, EPA

5.1 Monitoring

Storm water discharges from the installation via licenced emission point SE3 will be monitored in accordance with Schedule 4(ii) of Technical Amendment C of the existing IE Licence (P0607-02). Further details on storm water monitoring and discharges are presented in Attachment 7-7 of this application.

Table 5-22 SE3 Monitoring Requirements

Parameter	Monitoring Frequency	Analysis Method/Technique
pH	Quarterly during discharge	pH electrode/meter
COD	Quarterly during discharge	Standard Method
Visual Inspection	Daily	Not Applicable

Source: Schedule 4(i) Surface Water Discharge Monitoring

SSE established trigger warning levels for storm water monitoring points licenced under P0607-02 in 2016. This report is provided in Appendix 1 of this document for reference. These trigger levels will remain in-place on the site.

A.1 Storm Water Trigger Values Report

Stormwater Trigger Levels Industrial Emissions Licence P0607-02

**SSE Generation Ireland,
Tarbert Generating Station,
Tarbert,
County Kerry.**

04th May 2016

Rev 2

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Appendix A Stormwater Trigger Level Drawing

Appendix B Stormwater Monitoring Data

1. Introduction

This report proposes trigger levels for storm water discharges to off-site surface waters at Industrial Emission (IE) licenced Tarbert Generating Station, in Tarbert, Co. Kerry.

A trigger level is defined by the Environmental Protection Agency (EPA) as “parameter value, the achievement or exceedance of which requires certain actions to be taken by the licensee”.

The exceedance of a trigger level provides for early detection of likely contamination problems. It allows for early intervention by the licensee to minimise or prevent escalating contamination issues. It is noted that these trigger levels are not considered emission limit values or an Environmental Quality Standard (EQS).

The objective of report is to assess existing stormwater monitoring data and recommend trigger levels for each monitoring location and parameter. Future stormwater monitoring data will be compared to these trigger levels to allow for early detection of likely contamination.

2. Background

During an EPA site audit in 2013, the EPA requested that the licensee shall develop trigger levels for emission to water from emission monitoring locations stipulated in the IPPC licence.

In August 2013, a report titled “Assessment for Proposed Trigger Values for Storm Water Discharges” was submitted to the EPA. This report proposed trigger levels for pH for all parameters however, there as insufficient data available to set trigger levels for COD at all locations. It was recommended that the monitoring frequency be increased from quarterly to monthly and that monitoring for Total Petroleum Hydrocarbons (TPHs) is carried out in order to collate adequate monitoring data to establish trigger levels.

This report assesses this additional monitoring data in order to establish trigger levels for pH, COD and TPHs for all stormwater monitoring locations.

3. Methodology

This assessment is undertaken in accordance with the EPAs guidance “*Guidance on the setting of Trigger Values for Stormwater Discharges to Off-site Surface Waters at EPA IPPC and Waste Licenced Facilities*” (EPA, 2012). The assessment consists of:

- A brief description of the site, the onsite stormwater drainage system, location of emission point and potential contaminants that may affect each monitoring point is outlined.
- A description of the receiving water body and a review of existing information from the Water Framework Directive on the status/sensitivity of the receiving water body.
- The onsite stormwater monitoring data is reviewed and analysed to establish the range of “normal” background levels. Monitoring data from 2008 to 2015 was reviewed for this assessment. This data is included in Appendix B of this report.

Under the sites IED licence, Schedule 4(i) of Technical Amendment C on surface water discharge monitoring requires quarterly pH and COD monitoring at SE 2, SE 3, PE 5, SE 4, SE 5, SE 7, SE 8, SE 9, SE 10 and SE 11.

Following a recommendation in the trigger level report submitted to the EPA in August 2013, Total Petroleum hydrocarbon (TPH) is also monitored at each location. The monitoring frequency was increased to monthly to allow the collection of a sufficient quantity of baseline data to set trigger values. This additional monitoring data will be assessed to establish trigger levels for pH, COD and TPHs for stormwater monitoring locations.

The average, standard deviation (SD) and the relative standard deviation (%) is calculated for each parameter at each monitoring location. Where monitoring results were reported as less than the laboratory Limit of Detection (LOD), the LOD value was used to determine the average. In accordance with EPA guidance, elevated samples identified as likely to have contamination issues were not included in the calculation of the average and SD. Sampling results excluded from the calculations are highlighted in yellow in the sampling data provided in Appendix B.

- Following the data review and analysis, proposed trigger values are calculated. The EPA guidance calculation approach using standard deviations to set warning and action levels was used:
 - o Warning level - the average plus two standard deviations
 - o Action level - the average plus three standard deviations

4. Site Location and Stormwater Drainage System

Tarbert Generating station is located on the Shannon Estuary, approximately 45km west of Limerick City. The station consists of four generating units which are fuelled by Heavy fuel oil (HFO) and gas oil is used for start up.

Stormwater drainage is monitored at ten locations onsite (SE 2, SE 3, PE 5, SE 4, SE 5, SE 7, SE 8, SE 9, SE 10 and SE 11) as shown in Drawing No. 845_0804_0010_00_00 Stormwater Trigger Level Drawing in Appendix A and outlined in Table 1.

As shown in the drawing in Appendix B, SE7, SE8 and SE10 are discharge points from a drainage system that is within the 220kV and the 110kV transformer compounds, which are under the control of ESB. Therefore, trigger levels will not be set for these locations.

All discharges to surface waters from the site flow into the Lower Shannon Estuary or to the onsite lagoon which in turn flows into the estuary at its outfall. The tidal lagoon covers an area of 40,000m² approximately. The surface water drainage system collects rainwater run-off from hardstanding areas within the site. Oil interceptors are installed on drains that have serve oils storage areas.

Table 1: Details of Stormwater Monitoring Points

Monitoring Location	Inflow	Discharge to	Potential Contaminants
SE-2	Rainwater from the diesel bund and from carpark area onsite	Lower Shannon Estuary via Oil Interceptor No 2	Diesel spills, fuel leaks from vehicles
SE-3	Rainwater drainage from bulk chemical unloading point, around water treatment plant and internal roadways	Lower Shannon Estuary via Oil Interceptor No. 7	Chemical spills, fuel leaks from vehicles
SE-4	Rainwater drainage from Island tank farm	Lower Shannon Estuary via Oil Interceptor No. 11	HFO leaks/spills
SE-5	Rainwater discharge from a land drain outside island tank farm bund	Lower Shannon Estuary	None
PE-5	Rainwater drainage from the chemical compound bund	Lower Shannon Estuary via Oil Interceptor No. 8	Chemical/ oil spills
SE-7	Rainwater drainage from 220kV transformer compound under the control of ESB	Lagoon via interceptor No. 15	Transformer oil leaks
SE-8	Rainwater drainage from 220kV transformer compound under the control of ESB	Lagoon via interceptor No. 18	Transformer oil leaks
SE-9	Rainwater drainage from Island Fuel Pumphouse	Lagoon via Interceptor No. 17	HFO leaks/spills
SE-10	Rainwater drainage from 110kV transformer compound under the control of ESB	Lagoon	Transformer oil leaks
SE-11	Rainwater drainage from fire fighting pumphouse	Lower Shannon Estuary	Lubricating oil leaks

5. Receiving Water Course and Surrounding Area

Stormwater is discharged to the Lower Shannon Estuary which is classified as a transitional coastal water body. Under the Water Framework Directive (WFD), the Lower Shannon estuary is categorised as having a “Moderate Status” with an overall risk of 1a – which is defined as “at risk of not achieving good status”.

The WFD objective is to ensure that our waters achieve at least good status by 2015, and that their status does not deteriorate. The “at risk” category means there is a risk that the waterbody will not achieve good ecological or good chemical status/potential at least by 2015. The WFD was identified measures to retain and

improve the status of the Lower Shannon Estuary and has extended the timeframe for completion of these measures until 2021.

The Lower Shannon Estuary is a Special Area of Conservation (SAC) and has high ecological interest as it contains a number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive. The habitats include intertidal mudflats, intertidal reefs, lagoons and alluvial woodlands. The only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species are present in the Shannon as well as Otters and Freshwater Pearl Mussel.

A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

6. Onsite Stormwater Monitoring Data Assessment

The onsite stormwater monitoring data was reviewed and analysed to establish the range of “normal” background levels. Monitoring data from 2008 to 2015 was assessed. The average, standard deviation (SD) and the relative standard deviation (%) was calculated for each parameter at each monitoring location. This data is included in Appendix B of this report.

As pH levels are relatively close across the monitoring locations, the EPA suggested having one set of pH trigger levels for all monitoring points. This was completed and the pH data is included in Appendix B of this report.

7. Proposed Trigger Values

Based on the assessment undertaken in Section 6, trigger values for pH, COD and TPHs are proposed for six locations onsite (SE 2, SE 3, PE 5, SE 4, SE 9 and SE 11). Trigger levels proposed are outlined in Table 2.

Trigger levels could not be proposed for SE5 as this is an over-land drain which allows rainfall to soak into soil and ground water rather than run off as surface water. Therefore, there is no data for SE 5 available as it has not been possible to sample it.

Table 2: Proposed Trigger Levels

Monitoring Location	Warning Trigger Levels			Action Trigger Levels		
	pH (pH units)	COD (mg/l)	TPH (ug/l)	pH (pH units)	COD (mg/l)	TPH (ug/l)
SE2	8.3	55	54	8.7	74	71
SE3	8.3	92	73	8.7	124	102
SE4	8.3	44	60	8.7	58	82
PE5	8.3	25	48	8.7	31	64
SE9	8.3	82	32	8.7	109	42
SE11	8.3	35	35	8.7	45	45

Once these trigger levels are agreed by the EPA, it is proposed to reduce the monitoring frequency of storm waters to quarterly in accordance with the sites licence.

Trigger Levels Response

The response required when assessing future monitoring values against the trigger levels proposed is outlined below.

Warning Trigger Level Reached:

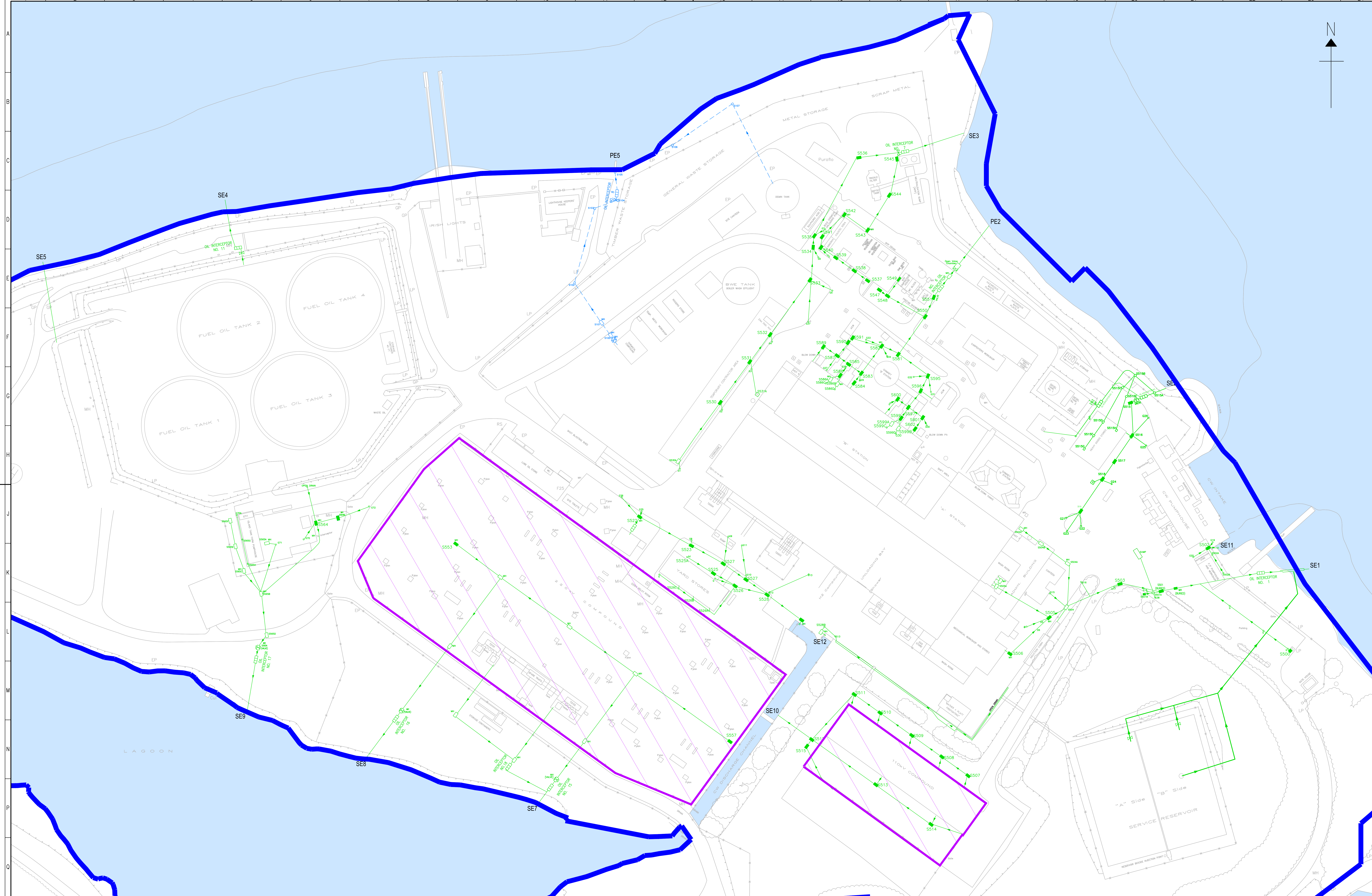
Where future monitoring values are equal to or in excess of the warning trigger on three consecutive occasions, an investigation will be carried out.

Action Trigger Level Reached:

Where future monitoring values are equal to or in excess of the action trigger levels, an investigation will be carried out and a notification of potential contamination of stormwater discharge to the EPA will be provided in accordance with the EPA's "Guidance on the notification management and communication of Environmental Incidents". During this investigation period, the frequency of monitoring may be increased until such time as the source of the contamination is identified and eliminated.

Appendix A

Stormwater Trigger Level Drawing



LEGEND:

LINEWORK/HATCHING:

- SURFACE WATER DRAINS: —
- PROCESS WATER DRAINS: - - -
- LAGOON/WATERCOURSE: [Blue Area]

SYMBOLS:

- PIPE MANHOLES: [P]
- VALVE MANHOLES: [V]
- SUMP MANHOLES: [S]
- MANHOLES: [S500-S599]
- GULLY SHOWN: [G]

ARMSTRONG JUNCTION: [Symbol]

VALVE LOCATION: [Symbol]

SURFACE WATER DISCHARGE POINTS: [Symbol]

PROCESS WATER DISCHARGE POINTS: [Symbol]

FOUL WATER DISCHARGE POINTS: [Symbol]

PROPERTY BOUNDARY: [Thick Blue Line]

TRANSFORMER COMPOUNDS UNDER THE CONTROL OF ESB: [Purple Hatched Area]

10	-	-	-	-	-
09	-	-	-	-	-
08	-	-	-	-	-
07	-	-	-	-	-
06	-	-	-	-	-
05	-	-	-	-	-
04	-	-	-	-	-
03	-	-	-	-	-
02	-	-	-	-	-
01	-	-	-	-	-
REV	DATE	DRAWN BY	APPROVED BY	AMENDMENTS	

sse generation

SCALE: 1:1025 @ A0

DRAWN BY: D. CONWAY

APPROVED BY: C. O'CONNELL

SSE PROJECT NUMBER: [Blank]

DRAWN DATE: 15/10/2015

APPROVED DATE: 15/10/15

DRAWING STATUS	
AS-BUILT	
LOCATION	
TARBERT POWER STATION	
TITLE	
STORMWATER TRIGGER LEVEL DRAWING	
SSE DRAWING NUMBER	SHEET
845_0804_0010	00
REV	REV
00	00

Appendix B

Stormwater Monitoring Data

Appendix B

Monitoring Location SE 2			
Date	pH (pH units)	COD (mg/l)	TPH (ug/l)
Q1 2011	7.3	554	
Q2 2011	7.3	420	
Q3 2011	7.7	250	
Q4 2011	7.5	79	
Q12012	7.7	7	
Q2 2012	8	91	
Q32012	7.5	5	
Q42012	7.2	6	
Q12013	8.1	10	
Q2 2013	7.4	10	
Q 3 2013	7.8	14	
Q42013	7.6	10	
Q12014	7.8	10	10
Apr-2014	7.9	348	10
May-2014	7.4	10	10
Jun-2014	7.6	10	10
Jul-2014	7.4	26	62
Aug-2014	7.4	16	20
Sep-2014	7.1	18	10
Oct-2014	7	10	11
Nov-2014	7.1	10	10
Dec-2014	7.4	7	10
Jan-2015	7.6	10	10
Feb-2015	7.3	10	12.5
Mar-2015	7.7	15	40
Apr-2015	7.7	13	32
May-2015	7.5	10	42
Jun-2015	7.5	10	46
Jul-2015	7.7	10	54
Aug-2015	7.4	22	10
Sep-2015	7.5	10	10
Oct-2015	7.6	10	10
Nov-2015	8	10	10
Dec-2015	7.6	10	10
No. of Samples	34	30	22
Average		16.3	20.4
Standard Deviation		19.2	17.0
% Standard Dev.		118%	83%
Warning Limit		55	54
Action Limit		74	71

Appendix B

Monitoring Location SE 3			
Date	pH (pH units)	COD (mg/l)	TPH (ug/l)
Q1 2011	7.8	904	
Q2 2011	7.7	990	
Q3 2011	8	720	
Q4 2011	7.7	84	
Q1 2012	8	125	
Q2 2012	8	1469	
Q3 2012	8	130	
Q4 2012	8	145	
Q1 2013	7.8	143	
Q2 2013	7.9	146	
Q 3 2013	7.9	135	
Q4 2013	7.6	10	
Q1 2014	7.6	18	
Apr-2014	7.7	10	10
May-2014	7.3	10	10
Jun-2014	7.9	10	10
Jul-2014	7.8	10	10
Aug-2014	7.9	120	11
Sep-2014	8.2	17	10
Oct-2014	7.3	100	10
Nov-2014	8	136	10
Dec-2014	8	5	10
Jan-2015	8	57	10
Feb-2015	8.1	149	10
Mar-2015	8.1	12	10
Apr-2015	8	550	10
May-2015	8.1	95	10
Jun-2015	7.7	26	137
Jul-2015	7.9	13	148
Aug-2015	7.7	10	10
Sep-2015	8	63	10
Oct-2015	8.1	10	10
Nov-2015	7.9	10	10
Dec-2015	8	10	10
Count	34	20	20
Average		29.0	16.4
Standard Deviation		32	28
% Standard Dev.		109%	173%
Warning Limit		92	73
Action Limit		124	102

Appendix B

Monitoring Location SE 4			
Date	pH (pH units)	COD (mg/l)	TPH (ug/l)
Q1 2008	7.12	15	
Q2 2008	7.22	15	
Q3 2008	6.97		
Q4 2008			
Q1 2009	7.5		
Q2 2009			
Q3 2009	7.6	15	
Q4 2009	7.9	15	
Q1 2010	7.4	15	
Q1 2011	7.5	5	
Q22011	7.3	5	
Q3 2011	7.7	5	
Q4 2011	8.7	59	
Q12012	7.6	2	
Q2 2012	7.5	5	
Q32012	7.6	9	
Q42012	7.6	9	
Q12013	7.6	10	
Q2 2013	7.6	57	
Q 3 2013	7.5	10	
Q42013	7.1	10	
Q12014	7.7	10	
Apr-2014	7.5	30	10
May-2014	7.2	11	10
Jun-2014	7.5	10	10
Jul-2014	8	12	10
Aug-2014	7.6	42	72
Sep-2014	7.6	15	10
Oct-2014	7.6	16	10
Nov-2014	7.8	10	10
Dec-2014	7.6	2	10
Jan-2015	7.6	26	10
Feb-2015	7.6	10	10
Mar-2015	7.6	19	10
Apr-2015	7.6	25	14
May-2015	7.6	16	46
Jun-2015	7.7	20	82
Jul-2015	7.4	50	10
Aug-2015	7.6	23	10
Sep-2015	7.6	20	10
Oct-2015	7.4	<10	<10
Nov-2015	7.7	18	<10
No. of Samples	40	38	20
Average		17.3	18.7
Standard Deviation		13.8	21.6
% Standard Dev.		80%	115%
Warning Limit		45	62
Action Limit		59	83

Appendix B

Monitoring Location PE 5			
Date	pH (pH units)	COD (mg/l)	TPH (ug/l)
Q1 2011	7.7	5	
Q22011	7.7	15.3	
Q3 2011	7.9	17.1	
Q4 2011			
Q12012			
Q2 2012	7.7	21	
Q32012	7.9	34	
Q42012	7.9	5	
Q12013	7.7	10	
Q2 2013	8.1	10	
Q 3 2013	7.9	10	
Q42013	7.2	10	
Q12014	7.7	21	10
Apr-2014	7.7	22	10
May-2014	7.5	12	10
Jun-2014	7.9	10	10
Jul-2014	7.7	22	10
Aug-2014	7.9	16	10
Sep-2014	7.7	17	10
Oct-2014	7.9	10	10
Nov-2014	8	10	10
Dec-2014	8	4	10
Jan-2015	8	10	10
Feb-2015	8.2	10	10
Mar-2015	8	16	86
Apr-2015	8.3	17	21
May-2015	8.1	10	10
Jun-2015	7.9	14	10
Jul-2015	7.9	12	29
Aug-2015	8.1	14	10
Sep-2015	8	12	10
Oct-2015	7.9	13	10
Nov-2015	8.1	10	10
Dec-2015	8	10	10
No. of Samples	32	32	22
Average		13.4	14.8
Standard Deviation		6.0	16.5
% Standard Dev.		45%	112%
Warning Limit		25	48
Action Limit		31	64

Appendix B

Monitoring Location SE 9			
Date	pH (pH units)	COD (mg/l)	TPH (ug/l)
Q1 2008	6.98	15	
Q2 2008	6.88	15	
Q3 2008	7.12		
Q4 2008			
Q1 2009	7.7	15	
Q2 2009			
Q3 2009	7.5		
Q4 2009	7.5	15	
Q1 2010	7.3	15	
Q2 2010			
Q3 2010			
Q4 2010			
Q1 2011	7.5	58.7	
Q22011	7.8	5	
Q3 2011	7.3	14.8	
Q4 2011	7.5	62	
Q12012	7.5	6	
Q2 2012			
Q32012	7.4	8	
Q42012	7.6	22	
Q12013	8	16	
Q2 2013	7.4	29	
Q 3 2013	7.3	24	
Q42013	7.4	13	
Q12014	8	63	
Apr-2014	7.6	15	10
May-2014	7.6	12	10
Jun-2014	7.6	35	10
Jul-2014	7.5	46	10
Aug-2014	7.4	62	10
Sep-2014			
Oct-2014	7.3	10	10
Nov-2014	7.6	19	10
Dec-2014	7.7	15	10
Jan-2015	7.7	12	10
Feb-2015	7.7	14	10
Mar-2015	7.7	70	15
Apr-2015	7.7	344	49
May-2015	7.8	52	10
Jun-2015			
Jul-2015	7.7	61	
Aug-2015			
Sep-2015	7.6	20	10

Appendix B

Monitoring Location SE 9			
Date	pH (pH units)	COD (mg/l)	TPH (ug/l)
Oct-2015			
Nov-2015	7.6	10	10
Dec-2015	7.7	114	10
No. of Samples	36	33	16
Average		29.2	12.8
Standard Deviation		26.6	9.7
% Standard Dev.		91%	76%
Warning Limit		82	32
Action Limit		109	42

Appendix B

Monitoring Location SE 11			
Date	pH (pH units)	COD (mg/l)	TPH (ug/l)
Q1 2011	7.8	24.3	
Q22011	8.2	5	
Q3 2011	8.1	7.8	
Q4 2011	8	53	
Q12012	7.7	6	
Q2 2012	7.9	13	
Q32012			
Q42012	8.3	36	
Q12013			
Q2 2013	8.9	10	
Q 3 2013	8.3	11	
Q42013			
Q12014			
Apr-2014	7.5	10	10
May-2014	7.9	18	30
Jun-2014	7.7	10	10
Jul-2014	8.3	11	10
Aug-2014	8.3	16	10
Sep-2014	8	10	10
Oct-2014	8.1	10	10
Nov-2014	8	15	10
Dec-2014	7.5	10	10
Jan-2015	7.8	10	10
Feb-2015	7.8	10	10
Mar-2015	8	15	47
Apr-2015			
May-2015	8.2	2	
Jun-2015	8.1	10	
Jul-2015	8	10	10
Aug-2015			
Sep-2015	8.3	20	10
Oct-2015			
Nov-2015	8	10	10
Dec-2015			
No. of Samples	26	26	15
Average		14	14
Standard Deviation		10.4	10.5
% Standard Dev.		74%	76%
Warning Limit		35	35
Action Limit		45	45

Appendix B

Location	SE2 pH (pH units)	SE3 pH (pH units)	SE4 pH (pH units)	PE5 pH (pH units)	SE9 pH (pH units)	SE11 pH (pH units)
Q1 2008			7.12		6.98	
Q2 2008			7.22		6.88	
Q3 2008			6.97		7.12	
Q4 2008						
Q1 2009			7.5		7.7	
Q2 2009						
Q3 2009			7.6		7.5	
Q4 2009			7.9		7.5	
Q1 2010			7.4		7.3	
Q1 2011	7.3	7.8	7.5	7.7	7.5	7.8
Q2 2011	7.3	7.7	7.3	7.7	7.8	8.2
Q3 2011	7.7	8	7.7	7.9	7.3	8.1
Q4 2011	7.5	7.7	8.7		7.5	8
Q1 2012	7.7	8	7.6		7.5	7.7
Q2 2012	8	8	7.5	7.7		7.9
Q3 2012	7.5	8	7.6	7.9	7.4	
Q4 2012	7.2	8	7.6	7.9	7.6	8.3
Q1 2013	8.1	7.8	7.6	7.7	8	
Q2 2013	7.4	7.9	7.6	8.1	7.4	8.9
Q 3 2013	7.8	7.9	7.5	7.9	7.3	8.3
Q4 2013	7.6	7.6	7.1	7.2	7.4	
Q1 2014	7.8	7.6	7.7	7.7	8	
Apr-2014	7.9	7.7	7.5	7.7	7.6	7.5
May-2014	7.4	7.3	7.2	7.5	7.6	7.9
Jun-2014	7.6	7.9	7.5	7.9	7.6	7.7
Jul-2014	7.4	7.8	8	7.7	7.5	8.3
Aug-2014	7.4	7.9	7.6	7.9	7.4	8.3
Sep-2014	7.1	8.2	7.6	7.7		8
Oct-2014	7	7.3	7.6	7.9	7.3	8.1
Nov-2014	7.1	8	7.8	8	7.6	8
Dec-2014	7.4	8	7.6	8	7.7	7.5
Jan-2015	7.6	8	7.6	8	7.7	7.8
Feb-2015	7.3	8.1	7.6	8.2	7.7	7.8
Mar-2015	7.7	8.1	7.6	8	7.7	8
Apr-2015	7.7	8	7.6	8.3	7.7	
May-2015	7.5	8.1	7.6	8.1	7.8	8.2
Jun-2015	7.5	7.7	7.7	7.9		8.1
Jul-2015	7.7	7.9	7.4	7.9	7.7	8
Aug-2015	7.4	7.7	7.6	8.1		
Sep-2015	7.5	8	7.6	8	7.6	8.3
Oct-2015	7.6	8.1	7.4	7.9		
Nov-2015	8	7.9	7.7	8.1	7.6	8
Dec-2015	7.6	8	7.6	8	7.7	

Appendix B

No. of Samples	203
Average	7.7
Standard Deviation	0.3
% Standard Dev.	4%
Warning Limit	8.3
Action Limit	8.7

Appendix B

A.2 Noise Monitoring Report – October 2024



Environmental Noise Report



Prepared for:

**SSE Generation Ireland Ltd
Tarbert Generating Station**



Executive Summary

SSE Generation Ireland Ltd, Tarbert Generating Station (SSE Tarbert) is required as part of licence Conditions 3 and 8 to carry out a noise survey of the installation on an annual basis. AXIS Environmental Services were commissioned to complete the survey after proposal acknowledgment and acceptance by SSE Tarbert Ltd EHS Environmental Department. Oisín McNulty carried out the survey on the 24th of September 2024.

The purpose of the survey was to monitor noise at predetermined locations and assess the sites compliance against P0607-02 Licence limits.

The survey was carried out in strict accordance with the standard ISO 1996 Parts 1 – 3, Acoustics – description, measurement and assessment of environmental noise. Reference was also made to the EPA guidelines NG4 “*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities*” January 2016.

General operations at Tarbert Generating Station were not running as normal as the plant has essentially ceased production currently. None of the units were in operation on site throughout the survey. There was construction works taking place on site. There was significant interference attributed to traffic movements on the N67, which is a road passing Tarbert Generating Station. Other sources of noise were recorded at each individual location which are summarised in the report.

The main sources of noise audible on this occasion at each location were summarised in the relevant sections of this report.

The impact of road traffic noise was deemed a significant interference on the survey at certain locations as defined in the report. As outlined in the Standard ISO 1996 and the associated noise guidance document NG4 issued by the Agency in 2016, where traffic noise is unduly interfering with noise measurements, it is acceptable to take account of the L_{A90} when assessing compliance for the monitoring period. This is a statistical measurement of the noise level exceeded for 90% of the time at the monitoring point. This therefore seeks to exclude transient sources such as occasional traffic and to include all background sources contributing to the noise level at the monitoring point. The observations made by monitoring personnel at the time of measurement are important in interpreting the dominant contributing noise sources at each point.

Two noise sensitive locations and one boundary location was assessed as part of this compliance environmental noise survey. The Licence assigned noise limits at the nearest noise sensitive receptors of (55 dB $L_{Aeq,T}$, 50 dB $L_{Aeq,T}$ and 45 dB $L_{Aeq,T}$ during the daytime, evening and night-time periods respectively). Furthermore, the Licence stipulates that there shall be no audible tonal or impulsive character to the noise emissions at any noise sensitive location surrounding the facility.

All three monitoring points were determined to comply with P0607-02 licence requirements for noise measurements.

There were no clearly audible tonal or impulsive components noted at any of the noise sensitive locations.

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Document Sign Off			
Document Number:	4360-24-01		
Reason for Issue:	Environmental Noise Survey		
Issue Number:	1	Date:	31/10/2024
Originator:	Signature:	Reviewer:	Company Name:
Oisín McNulty	<i>Oisín McNulty</i>	Joanne Murray	SSE Tarbert
Document History:			
Report Revision Number	Revision Date	Section Revised	Reason for Revision

1. Introduction

As part of compliance monitoring at SSE Generation Ireland Tarbert Generating Station, an annual noise survey is to be carried out at nearest noise sensitive locations in the vicinity of the plant. The Agency and SSE Generation Ireland have agreed the monitoring points chosen to meet the requirements of the license.

The license P0607-02 outlines SSE's requirements under Conditions 3 and 8, which have been documented as follows:

Condition 3:

- 3.5** Noise from the activity shall not give rise to sound pressure levels (Leq,30 minutes) measured at the noise sensitive locations which exceed the limit value(s) by more than 2 dB(A).

Condition 8:

- 8.1** The licensee shall carry out a noise survey of the site operations annually. The survey programme shall be undertaken in accordance with the methodology specified in the 'Environmental Noise Survey Guidance Document' as published by the Agency. The licensee shall consult with the Agency on the timing of the survey. A record of the survey results shall be available for inspection by any authorised persons of the Agency, at all reasonable times and a summary report of this record shall be included as part of the AER.
- 8.2** Activities on-site shall not give rise to noise levels off-site, at noise sensitive locations, which exceed the following sound pressure limits (Leq,30 minutes) subject to Condition 3 of this licence:
- 8.2.1** Daytime: 55 dB(A),
- 8.2.2** Night-time: 45 dB(A).
- 8.3** There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise sensitive location.

2. Methods

Monitoring was carried out in strict accordance with ISO 1996 Parts 1 – 3, Description and Measurement of Environmental Noise. Reference was also made to the EPA guidelines NG4 “Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities” January 2016.

Table 2-1: Equipment Details

Instrument Details	Meter No 2	Meter No 3	Meter No 4
Manufacturer	Cirrus Optimus	Cirrus Optimus	Cirrus Optimus
Model	CR:171B	CR:171B	CR:172B
Serial Number	G61082	G061817	G078197
Firmware	2.4.1569	3.3.3386	3.3.3386
Calibrator	CR:171B Acoustic Calibrator	CR:172B Acoustic Calibrator	CR:172B Acoustic Calibrator
Microphone	MK:224 218148A	MK:216-405168B	MK:216-414290E
Preamplifier	MV: 200F 9078F	MV:200F 1932F	MV:200F 5617F
Windshield Type	UA:237 90mm Foam Windshield	UA:237 90mm Foam Windshield	UA:237 90mm Foam Windshield
Meter Certificate Number	210137	209040	213293
Meter Calibration Date	08 March 2024 - 2026	22 February 2024 -2026	26 April 2024 - 2026
Microphone Identification	MK:224 218148A	MK:216-405168B	MK:216-414290E
Microphone Certificate	210138	209041	213297
Calibrator Number	CR514:77525	CR514:77525	CR515:97791
Calibration Certificate	209571	209571	216416
Calibrator Setting	94 dB	94 dB	94 dB
Calibration Date	28 February 2024 - 2025	29 February 2024 - 2025	18 June 2024-2025
Pre / Post Cal Drift <0.5 dB	Yes	Yes	Yes
Response Time	Fast	Fast	Fast
Sound Pressure	A Weighting	A Weighting	A Weighting
Spectra	Unweighted	Unweighted	Unweighted

2.1 Laboratory and Field Calibration

Our sound level meters and portable calibrators are independently calibrated on an annual basis. Certificates of calibration for the specific equipment used in this survey are included in the appendix of this report. It is a requirement by all noise standards that an external laboratory must calibrate sound level meters and calibrators on a periodic basis. BS 7580:1997 Specification for the verification of sound level meters recommends, and it is the opinion of the EPA as defined in NG4:2016, that sound level meters should be verified at least every two years. Calibrators must be externally calibrated at least once a year. ISO 1996, recommends a time interval for testing of system performance at once a year, with a maximum allowable interval of 2 years.

The sound level meters are calibrated in the field prior to the measurement campaign with the calibrator. The sound level meter is then verified as fit for purpose, and post checks are carried out with the calibrator to confirm the meter remained within a quantified level of drift. Without any further adjustment, the difference between the readings of two consecutive checks must be less than or equal to 0.5 dB.

2.2 Measurement Condition

The instruments used for measuring sound pressure levels, including microphone, cables, windscreen, recording devices and other accessories, if used, meet the requirements for a class 1 instruments. A windscreen is always used during outdoor measurements to reduce the impact of wind on the microphone.

The installation's operating conditions must be representative of the noise environment under consideration, i.e. the licensed installation under assessment should be representative of normal operations for that activity. To obtain a reliable estimate of the equivalent-continuous sound pressure level, as well as the maximum sound pressure level, the measurement time intervals are measured as outlined by the licence conditions for day, evening and night time surveys.

It is a licence condition that during daytime and evening periods rigorous efforts should be made by the installation under assessment to avoid clearly audible tones and impulsive noise at all sensitive locations. A penalty of 5dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured $L_{Aeq,T}$ values to determine the appropriate rating level ($L_{A,r,T}$). During the night-time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.

2.3 Tonal Noise Assessment

Tonal noise was determined by frequency analysis (1/3 octave) for the noise measurements recorded at the monitoring locations during the noise survey.

This involved the analysis of the spectrum of noise levels recorded at each measurement location with respect to the frequencies (Hz) at which they occurred, in accordance with Section 5.1 of EPA guidance NG4.

One-third octave band tonal analysis was completed, using the calculation of an averaged noise level to represent the frequencies within each third of an octave. These noise levels were then compared with the noise levels calculated for the adjacent one-third octave bands. Further to EPA guidance NG4, a tonal noise can be objectively identified where the time-average sound pressure level in the one-third-octave band of interest exceeds the time-average sound pressure levels of both adjacent one-third-octave bands by a constant level difference as outlined below:

Table 2-2: NG4 Tonal Noise Assessment

Frequency Range	Units	Pressure Level Difference	Units
25 - 125	Hertz	15	dB
160 - 400	Hertz	8	dB
500 – 10,000	Hertz	5	dB
Period	Correction / Penalty to L_{Aeq} for produce $L_{Ar,T}$		
Day and Evening Time	5 dB		
Night Time	Tonal noise from the facility should not be audible at any NSL		

The one-third octave band data (plotted and tabulated) and tonal analysis is provided in this report.

2.4 Impulsive Characteristics

This is defined in NG4 as a noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background. Normally an impulsive characteristic is determined subjectively as it is clearly audible. A noise source that attracts an impulsive characteristic will often be described as something with a thumping, banging or impact noise that is clearly audible above everything else. It is distinguished by a sharp rise in noise level.

There is no International Standard to detect impulsive sound using objective measurements. If impulsive sound occurs, the technician will identify the source and compare it to the list of impulsive sound sources in ISO 1996-1.

Table 2-3: NG4 Impulsive Noise Assessment

Period	Correction / Penalty to L_{Aeq} for produce $L_{Ar,T}$
Day and Evening Time	5 dB
Night Time	Impulsive noise from the facility should not be audible at any NSL

2.5 Extraneous Sources

The report clearly interprets the noise results and highlights whether noise from the activity or extraneous noise sources are the dominant contributors to the noise levels measured. This interpretation is based on the various noise measurements and any comments included on the dominant and/or intermittent sources of noise at the various measurement locations.

On some sites, extraneous noise sources unconnected with the activity under consideration will unduly influence the measurements. In such situations, every effort should be made to ascertain the site-specific noise level by following the approach set out in EPA guidance note NG4. Where findings remain inconclusive in this regard, it is appropriate to take into account the $L_{AF90,T}$ indicator which seeks to exclude transient noise sources such as occasional traffic, and to include all background sources contributing to the noise level at the monitoring point. For example, if a measurement location is situated near to a busy road, the $L_{AF90,T}$ indicator would provide a more accurate representation of the magnitude of all of the background sources contributing to the noise level at the monitoring point through the exclusion of contributions attributable to vehicle pass-bys. If the L_{A90} is used in this report for compliance assessment, the reasons for the use of $L_{AF90,T}$ are presented in the tables in order to ensure that its use is justified,

Local intermittent sources such as pedestrians passing the meters can be excluded where possible during the measurement. Any locations that are adjacent to regional and national roads and it was not possible to exclude these sources from the measurements effectively, then use of the L_{A90} metric can be used in the data interpretation to account for these sources, where appropriately supported by instantaneous readings.

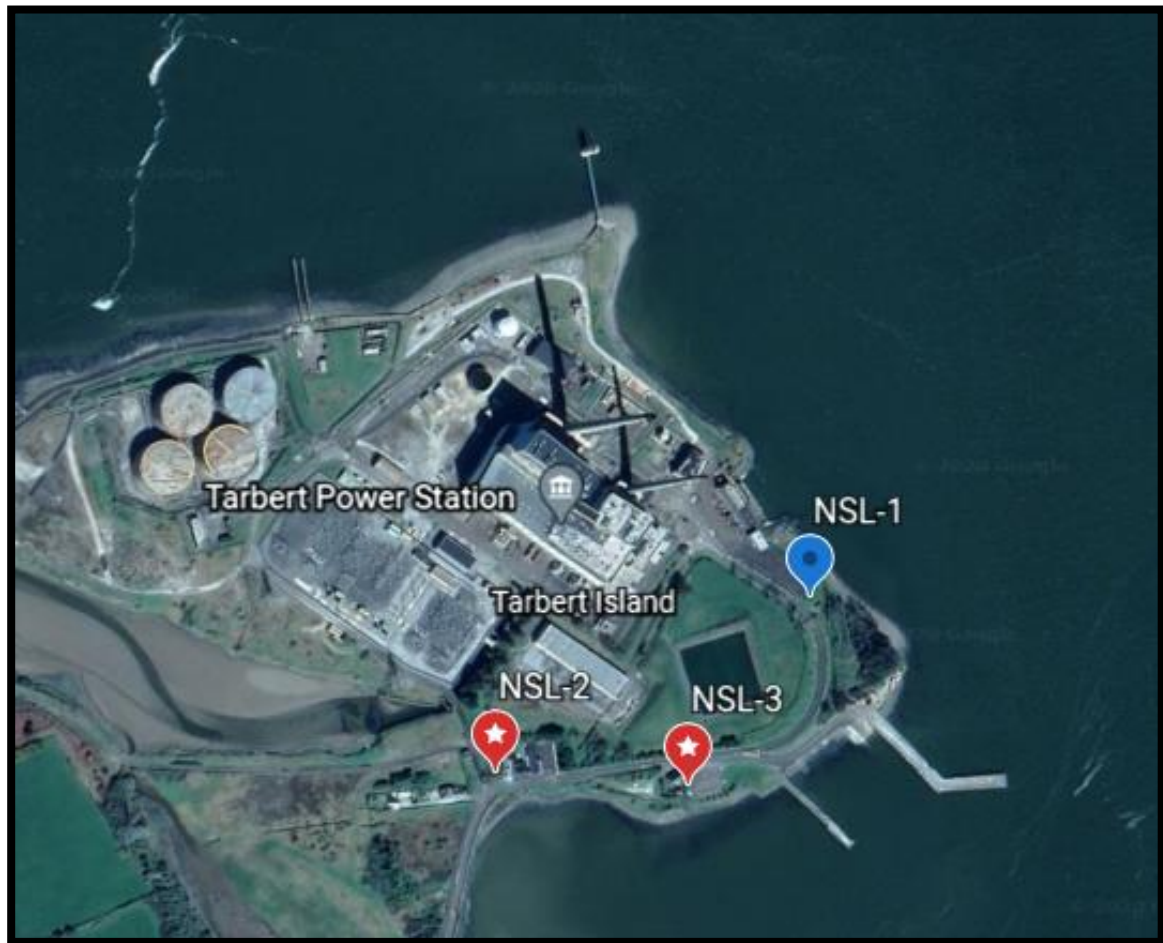
The microphone will always be located at least 1.2 m away from vegetative or trees which would generate wind-blown sound, unless otherwise noted in the report. The only reason this would not be applied is if the scenario was not possible at the agreed noise measurement location.

In all cases, the microphone will be installed in free-field conditions to remove reflection contribution, unless otherwise noted in the report.

The uncertainty in taking measurements is reduced through replication of the same equipment and microphone positioning.

3. Monitoring Locations

Figure 3-1: Location of Monitoring Points



3.1 NSL 1

3.1.1 Daytime Noise

NSL-1 is located at the car park beside the security office, southeast of the SSE Tarbert.

The main source of noise during the day was onsite traffic entering and exiting the site. The traffic was sporadic but caused an increase in noise levels. There were construction works taking place in SSE Tarbert but this was not significant during the survey. The ferry was audible crossing the Shannon as a continuous hum. This hum that got progressively more significant as the ferry got closer to the land.

3.1.2 Evening Time Noise

The main source of noise noted was a gentle hum from construction works onsite. There were no other sources of noise at this location during the evening.

3.1.3 Night Time Noise

During the nighttime survey, one SSE van exited and entered the during the monitoring period causing a peak in measurements. A very faint humming sound was audible throughout the survey from the site as construction works were taking place on site.

Table 3-1: NSL-1

Location: NSL-1	Co-ordinates: 52°35'17.6"N 9°21'37.6"W
	

3.2 NSL-2

3.2.1 Daytime Noise

Noise Sensitive Location NSL-2 is situated between a residential house and the Shannon Ferry Bar, southwest of SSE Tarbert.

The main source of noise was the traffic movements on the N67, less than 2 meters away from the noise meter. The traffic passed frequently and caused peaks in measurements. Construction works were taking place in SSE Tarbert which was audible as a continuous humming sound. One vehicle moved around the site for c 30 seconds during the survey.

3.2.2 Evening Time Noise

Infrequent movement of cars on the N67 passing the meter was the main source of noise during the evening time. SSE Tarbert was noted as a faint background hum from construction works taking place.

3.2.3 Night Time Noise

The infrequent passing of cars on the N67 caused peaks in measurements during the monitoring period. One car pulled up close to the meter and was talking to the technician carrying out the survey. SSE Tarbert was audible as a light hum as there was construction works taking place on site during the monitoring period.

Table 3-2: NSL-2

Location: NSL-2	Co-ordinates: 52°35'12.6"N 9°21'53.5"W
	

3.3 NSL-3

3.3.1 Daytime Noise

This noise sensitive location is situated next to a residential house and the ferry car park, south of the SSE Tarbert.

The main source of noise was the movement of traffic on the N67 with cars and HGV's pulling up at the car park and docking for the Kilrush ferry. Other noise sources noted at this monitoring point were people conversing near noise meter and walking near the meter. A lawnmower was also audible in operation nearby.

SSE Tarbert was not audible during the daytime survey.

3.3.2 Evening Time Noise

The main source of noise was the movement of traffic on the N67 but this was noted as sporadic.

SSE Tarbert was not audible during the evening survey.

3.3.3 Night Time Noise

The main source of noise was the movement of traffic on the N67 but this was noted as sporadic.

SSE Tarbert was not audible during the nighttime survey.

Table 3-3: NSL-3

Location: NSL-3	Co-ordinates: 52°35'12.3"N 9°21'43.6"W
	

4. Summary of Noise Measurements

Table 4-1: NSL 1 Broadband Measurements

Noise Monitoring Location: NSL 1 Noise Boundary Location 24-09-2024						
Period:	Time	Measured Noise Levels (dB re. 2 x 10 ⁻⁵ Pa)				Comments
		L _{Aeq}	L _{AFMAX}	L _{A90}	L _{A10}	
Daytime:	10:50	47	63	36	48	The main source of noise during the day was onsite traffic entering and exiting the site. The traffic was sporadic but caused an increase in noise levels. There were construction works taking place in SSE Tarbert but this was not significant during the survey. The ferry was audible crossing the Shannon as a continuous hum. This hum that got progressively more significant as the ferry got closer to the land.
	11:20	52	72	35	49	
	11:50	48	65	36	53	
Arithmetic Average (dB):		49	67	36	50	
Noise Associated with Site (dB):		49				
Daytime Criterion, dB L _{Ar,T} :		-				
Evening:	21:41	38	73	22	33	The main source of noise noted was a gentle hum from construction works onsite. There were no other sources of noise at this location during the evening.
Arithmetic Average (dB):		38	73	22	33	
Noise Associated with Site (dB):		38				
Evening Criterion, dB L _{Ar,T} :		-				
Night Time:	23:05	39	61	20	34	During the nighttime survey, one SSE van exited and entered the during the monitoring period causing a peak in measurements. A very faint humming sound was audible throughout the survey from the site as construction works were taking place on site.
	23:35	41	66	33	38	
Arithmetic Average (dB):		40	64	26	36	
Noise Associated with Site (dB):		40				
Night time Criterion, dB L _{Ar,T} :		-				
Weather Conditions:						
	Daytime:		Evening:		Night Time:	
Temperature (°C)	13		12		12	
Wind Speed (m/s)	1.1		0.6		0.6	
Wind Direction:	NW		NW		NW	
Precipitation (mm):	0		0		0	
Tonal Noise Assessment						
Daytime:				None		
Evening:				None		
Nighttime:				None		
Compliance Status – By definition of the license, this monitoring point would not be considered a noise sensitive location. The site was deemed compliant with licence requirements.						

Table 4-2: NSL 1 Tonal Noise Assessment

Band	Day	Evening	Night
6.3 Hz	47.8	39	43
8 Hz	47.1	39.5	41.8
10 Hz	47.3	38.8	40
12.5 Hz	46.3	40.8	39.2
16 Hz	47.6	41.3	38.2
20 Hz	57.5	41.6	37.4
25 Hz	51.7	43.8	39.8
31.5 Hz	51.1	47.7	45.2
40 Hz	53.5	56.8	42.3
50 Hz	56.4	43.4	41.4
63 Hz	63.1	40.5	39
80 Hz	61.5	40.7	33.9
100 Hz	49.5	38.2	35.5
125 Hz	45.2	35.2	34.3
160 Hz	45.7	33.1	31.5
200 Hz	44.8	32.2	31.6
250 Hz	42.7	32.6	29
315 Hz	41.5	33.7	29.7
400 Hz	42.2	31.4	31.1
500 Hz	41.8	30.1	32
630 Hz	41.4	29.4	30.7
800 Hz	41.2	28.2	30.1
1 kHz	38.3	28.8	32.1
1.25 kHz	37.1	26.2	30.8
1.6 kHz	36.5	26.3	28.8
2 kHz	34.8	26.8	29
2.5 kHz	31.9	24.1	27.5
3.15 kHz	32.8	22.1	27.9
4 kHz	33.1	18.6	24.6
5 kHz	29.3	16	22.5
6.3 kHz	28.5	14.7	20.8
8 kHz	28.7	14.2	18.8
10 kHz	18.2	13.8	15.9
12.5 kHz	16.9	14.8	15.4
16 kHz	18.4	17	17.6
20 kHz	21.2	20.5	21.6

Fig 4-1 NSL 1 Frequency Analysis

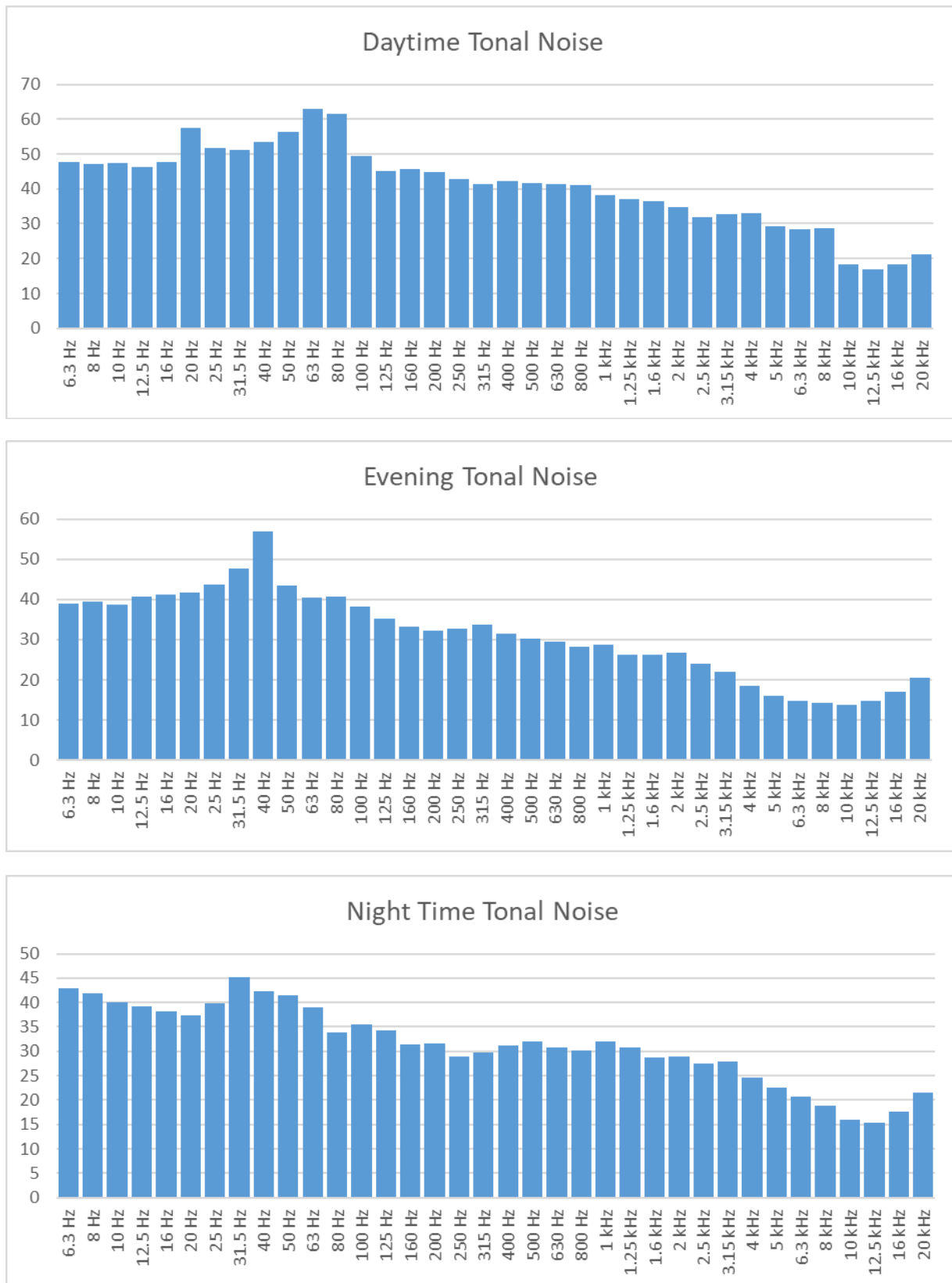


Table 4-3: NSL 2 Broadband Measurements

Noise Monitoring Location: NSL 2 Noise Sensitive Location 24-09-2024						
Period:	Time	Measured Noise Levels (dB re. 2 x 10 ⁻⁵ Pa)				Comments
		L _{Aeq}	L _{AFMAX}	L _{A90}	L _{A10}	
Daytime:	10:40	58	75	36	61	The main source of noise was the traffic movements on the N67, less than 2 meters away from the noise meter. The traffic passed frequently and caused peaks in measurements. Construction works were taking place in SSE Tarbert which was audible as a continuous humming sound. One vehicle moved around the site for c 30 seconds during the survey. L ₉₀ is used to remove traffic interference.
	11:10	59	77	38	63	
	11:40	57	74	39	61	
Arithmetic Average (dB):		58	75	38	62	
Noise Associated with Site (dB):		38				
Daytime Criterion, dB L _{Ar,T} :		55				
Evening:	22:02	48	77	28	48	Infrequent movement of cars on the N67 passing the meter was the main source of noise during the evening time. SSE Tarbert was noted as a faint background hum from construction works taking place. L ₉₀ is used to remove traffic interference.
Arithmetic Average (dB):		48	77	28	48	
Noise Associated with Site (dB):		28				
Evening Criterion, dB L _{Ar,T} :		50				
Night Time:	23:07	74	82	26	78	The infrequent passing of cars on the N67 caused peaks in measurements during the monitoring period. One car pulled up close to the meter and was talking to the technician carrying out the survey. SSE Tarbert was audible as a light hum as there was construction works taking place on site during the monitoring period. L ₉₀ is used to remove traffic interference.
	23:37	69	84	26	78	
Arithmetic Average (dB):		72	83	26	78	
Noise Associated with Site (dB):		26				
Night time Criterion, dB L _{Ar,T} :		45				
Weather Conditions:						
	Daytime:		Evening:		Night Time:	
Temperature (°C)	13		12		12	
Wind Speed (m/s)	1.1		0.6		0.6	
Wind Direction:	NW		NW		NW	
Precipitation (mm):	0		0		0	
Tonal Noise Assessment						
Daytime:				None		
Evening:				None		
Nighttime:				None		
Compliance Status – By definition of the license, this monitoring point would be considered a noise sensitive location. The site was deemed compliant with lience requirements.						

Table 4-4: NSL 2 Tonal Noise Assessment

Band	Day	Evening	Night
6.3 Hz	53.6	38.6	50.7
8 Hz	52.5	39.3	53.2
10 Hz	51.8	40.2	58.9
12.5 Hz	50.6	44.8	63.4
16 Hz	51	45.4	62.3
20 Hz	59.6	48.6	60.8
25 Hz	55.7	52.6	66.3
31.5 Hz	57.1	51	76.2
40 Hz	59.5	55.3	65
50 Hz	58.3	53.5	64.2
63 Hz	58.1	50.2	68.2
80 Hz	53.8	45.9	54.3
100 Hz	52.9	44.6	51.9
125 Hz	53.8	41.7	54.4
160 Hz	52.8	38.9	54
200 Hz	52.4	38.5	59.6
250 Hz	51.8	37.7	52.5
315 Hz	50.9	39.6	54.9
400 Hz	49.7	37.4	57.3
500 Hz	50.1	41.1	59.9
630 Hz	50.4	39.3	60.2
800 Hz	50.7	40.4	61.2
1 kHz	50.6	41.5	63.4
1.25 kHz	48.2	40	64
1.6 kHz	46.3	38	62.3
2 kHz	43.9	35.7	60.6
2.5 kHz	41.7	33.1	61.4
3.15 kHz	39.8	31.2	59.7
4 kHz	36.8	28.1	57.1
5 kHz	33.8	24.5	52.7
6.3 kHz	31.2	24.4	47.8
8 kHz	29	22.6	45.1
10 kHz	31.6	18.7	41.6
12.5 kHz	33.4	17.9	38.4
16 kHz	28.1	18.7	34
20 kHz	28.4	22.2	31.4

Fig 4-2 NSL 2 Frequency Analysis

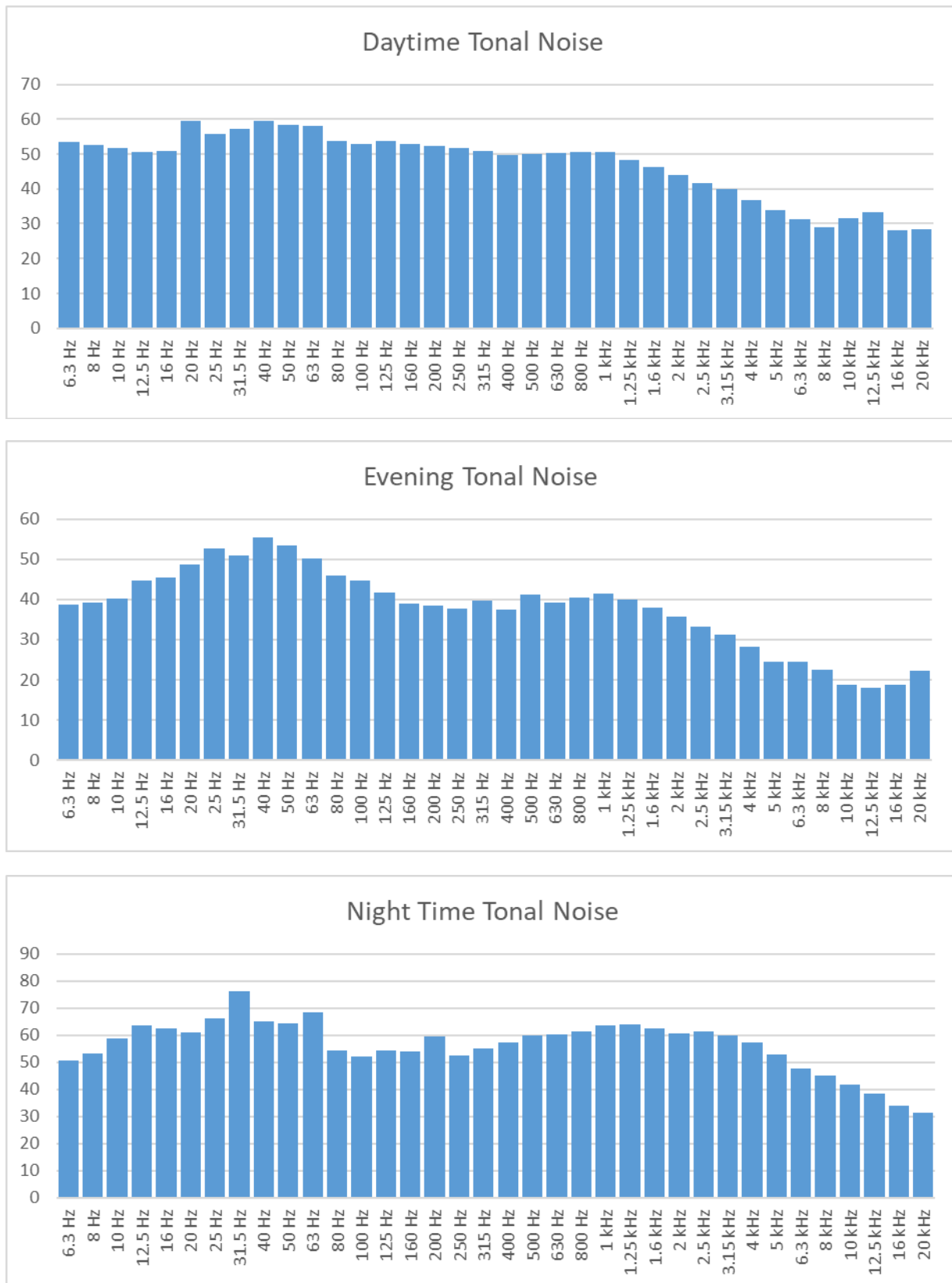


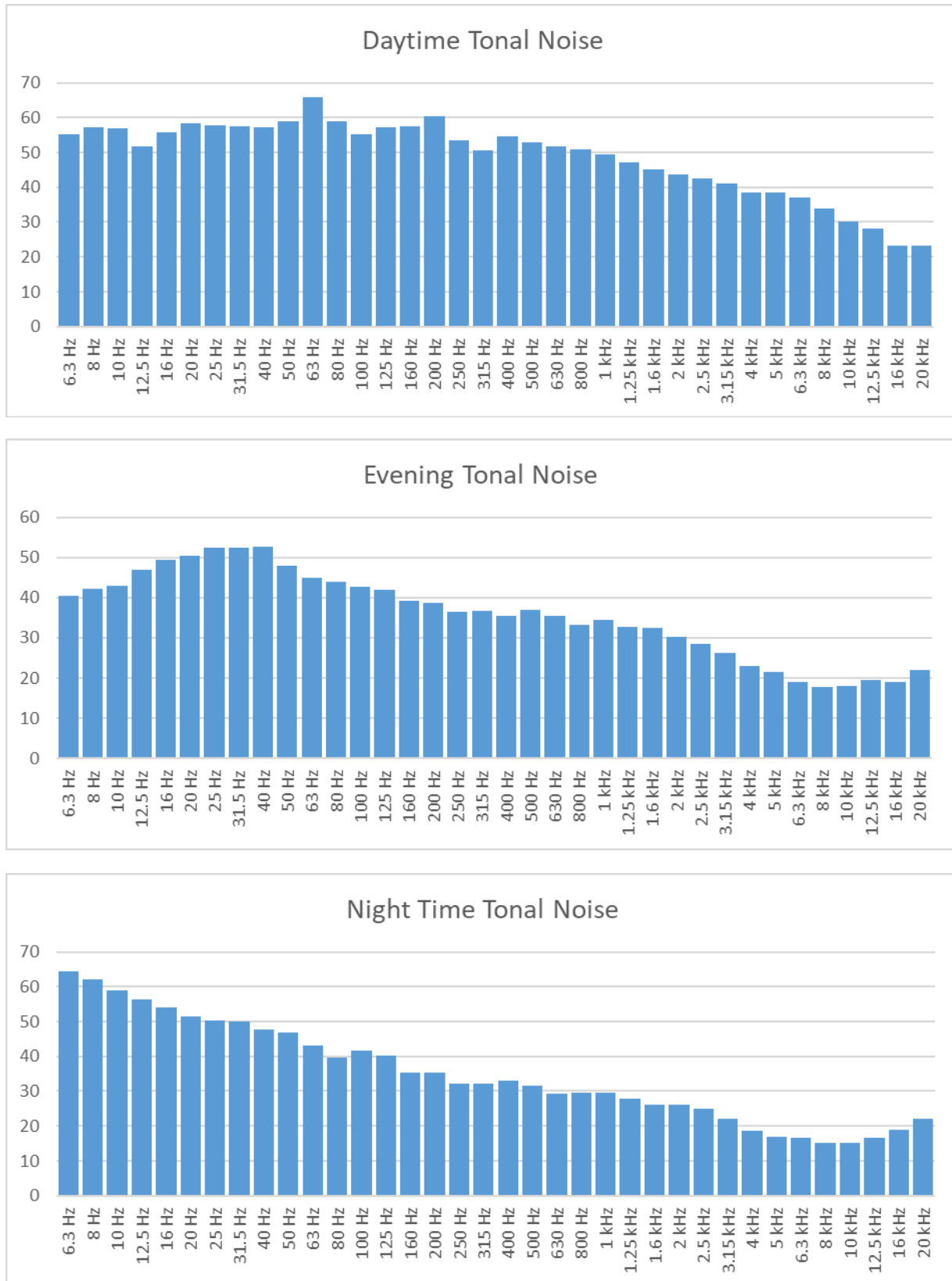
Table 4-5: NSL 3 Broadband Measurements

Noise Monitoring Location: NSL 3 Noise Sensitive Location 24-09-2024						
Period:	Time	Measured Noise Levels (dB re. 2 x 10 ⁻⁵ Pa)				Comments
		L _{Aeq}	L _{AFMAX}	L _{A90}	L _{A10}	
Daytime:	10:35	56	76	43	56	The main source of noise was the movement of traffic on the N67 with cars and HGV's pulling up at the car park and docking for the Kilrush ferry. Other noise sources noted at this monitoring point were people conversing near noise meter and walking near the meter. A lawnmower was also audible in operation nearby. SSE Tarbert was not audible during the daytime survey therefore, L ₉₀ and < symbol is used.
	11:03	63	95	40	53	
	11:35	49	63	41	51	
Arithmetic Average (dB):		56	78	41	53	
Noise Associated with Site (dB):		<41				
Daytime Criterion, dB L _{Ar,T} :		55				
Evening:	21:43	43	81	25	40	The main source of noise was the movement of traffic on the N67 but this was noted as sporadic. SSE Tarbert was not audible during the evening survey, therefore, L ₉₀ and < symbol is used.
Arithmetic Average (dB):		43	81	25	40	
Noise Associated with Site (dB):		<25				
Evening Criterion, dB L _{Ar,T} :		50				
Night Time:	23:02	41	66	24	38	The main source of noise was the movement of traffic on the N67 but this was noted as sporadic. SSE Tarbert was not audible during the nighttime survey, therefore, L ₉₀ and < symbol is used.
	23:32	35	60	27	33	
Arithmetic Average (dB):		38	63	26	36	
Noise Associated with Site (dB):		<26				
Night time Criterion, dB L _{Ar,T} :		40				
Weather Conditions:						
	Daytime:		Evening:		Night Time:	
Temperature (°C)	13		12		12	
Wind Speed (m/s)	1.1		0.6		0.6	
Wind Direction:	NW		NW		NW	
Precipitation (mm):	0		0		0	
Tonal Noise Assessment						
Daytime:				None		
Evening:				None		
Nighttime:				None		
Compliance Status – By definition of the license, this monitoring point would be considered a noise sensitive location. The site was deemed compliant with licence requirements.						

Table 4-6: NSL 3 Tonal Noise Assessment

Band	Day	Evening	Night
6.3 Hz	55.3	40.4	64.4
8 Hz	57.2	42.2	62
10 Hz	57	42.9	58.8
12.5 Hz	51.8	46.8	56.3
16 Hz	55.7	49.3	54
20 Hz	58.4	50.3	51.4
25 Hz	57.9	52.5	50.4
31.5 Hz	57.4	52.5	50
40 Hz	57.2	52.6	47.7
50 Hz	58.8	48	46.8
63 Hz	65.9	45	43
80 Hz	59	44	39.6
100 Hz	55.2	42.7	41.7
125 Hz	57.3	41.9	40.2
160 Hz	57.6	39.3	35.3
200 Hz	60.3	38.7	35.4
250 Hz	53.6	36.5	32.3
315 Hz	50.7	36.6	32.2
400 Hz	54.6	35.5	32.9
500 Hz	52.8	36.9	31.7
630 Hz	51.8	35.5	29.3
800 Hz	50.8	33.3	29.6
1 kHz	49.3	34.5	29.7
1.25 kHz	47.1	32.7	27.9
1.6 kHz	45.1	32.5	26.2
2 kHz	43.8	30.3	26
2.5 kHz	42.6	28.4	24.9
3.15 kHz	41.2	26.2	22
4 kHz	38.5	23	18.5
5 kHz	38.5	21.6	16.9
6.3 kHz	37.1	19	16.7
8 kHz	34	17.8	15.1
10 kHz	30.2	17.9	15.2
12.5 kHz	28.1	19.5	16.5
16 kHz	23.2	19.1	18.8
20 kHz	23.3	22.1	22.1

Fig 4-3 NSL 3 Frequency Analysis



5. Conclusions

Two noise sensitive locations and one boundary point were monitored for broadband and 1/3rd Octave frequency as part of this annual environmental noise survey at SSE Tarbert.

Each point was monitored for the licence defined 30-minute periods during the day, evening and night time survey's.

The findings of the survey would indicate that SSE Generation Ireland Limited are compliant with licence conditions at the noise sensitive areas. L_{A90} was used to describe noise levels from SSE at each noise sensitive location due to interference extraneous sources from traffic on the N69. The extraneous sources were in no way associated with activities in SSE Tarbert.

There was no tonal or impulsive noise determined at any monitoring location; therefore, there are no requirements to apply penalties to the broadband measurement.

Appendix I: NG4 Requirement for Noise Measurement Report:

Item	Section where this information is in the report
Manufacturer, model type and serial number of the sound level meter, calibrator and microphone used for annual survey.	Section 2
The type of windshield and other microphone attachments used.	Section 2
The date the equipment was last calibrated to a traceable standard.	Section 2
A statement of on-site calibration before and after the measurements.	Section 2
The frequency weighting networks and meter response time (i.e. fast or slow).	Section 2
A description of the measurement site and of the range of sound sources including the type of sound (continuous, intermittent, impulsive, tonal).	Section 3
Measures to exclude extraneous noise and reference to the methodologies followed throughout the survey.	Section 2
A map of the measurement site showing the locations of the measurement positions.	Section 3
Photographs illustrating the positioning of the sound level meter (recommended but optional).	Section 3
Details of the intervening ground between sources and measurement positions and the presence of barriers etc.	Section 3
The time and date of the measurement.	Section 4
A description of the meteorological conditions.	Section 4
The background noise level (where practicable).	Section 4
Details of steps taken to reduce uncertainty.	Section 2
The names of the person/s that undertook the survey and drafted the survey report.	Executive Summary.

Appendix II: Glossary of Terms

Note: Not all terms were used in the description of noise for this noise survey.

Ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
Acoustic shadow	An acoustic shadow is an area through which sound waves fail to propagate, due to topographical obstructions or disruption of the waves via phenomena such as wind currents.
Background noise	The steady existing noise level present without contribution from any intermittent sources. The A weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
Broadband	Sounds that contain energy distributed across a wide range of frequencies.
Competent person	Individual possessing a combination of technical knowledge, experience and skills as outlined in Section 2.0 and who can demonstrate both practical and theoretical competence.
Criterion noise level	The long term mean value of the noise level that must not be exceeded. This is generally stipulated in the IPPC/Waste licence and it may be applied to a noise source, a boundary of the activity or to an NSL in the vicinity of the site.
dB	Decibel. The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro pascals (20 uPa).
Facade level	The noise level at a location 1m from the facade of a building is described by the term facade level, and is subject to a higher noise level than one in an open area (free-field conditions) due to reflection effects.
Free field	These are conditions in which the radiation from sound sources is unaffected by the presence of any reflecting boundaries or the source itself. In practice, it is a field in which the effects of the boundaries are negligible over the frequency range of interest. In environmental noise, true free-field measurement conditions are seldom achieved and generally the microphone will be positioned at a height between 1.2 and 1.5 metres above ground level. To minimise the influence of reflections, measurements are generally made at least 3.5 metres from any reflecting surface other than the ground.
Hertz (Hz)	The unit of sound frequency in cycles per second.
Impulsive	A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background.
$L_{Aeq,T}$	This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources, such as traffic, on the background.
L_{AFN}	The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.

L_{Af,T}	The Rated Noise Level, equal to the L _{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and/or impulsiveness of the sound.
L_{AF10}	Refers to those A-weighted noise levels in the top 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period. It is used to determine the intermittent high noise level features of locally generated noise and usually gives an indicator of the level of road traffic. Measured using the “Fast” time weighting.
L_{AF90}	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to describe a background level. Measured using the “Fast” time weighting.
L_{AFmax}	The maximum RMS A-weighted sound pressure level occurring within a specified time period. Measured using the “Fast” time weighting.
L_{AFmin}	The minimum RMS A-weighted sound pressure level occurring within a specified time period. Measured using the “Fast” time weighting.
L_{den}	Is the 24 hour noise rating level determined by the averaging of the L _{day} with the L _{evening} plus a 5 dB penalty and the L _{night} plus a 10 dB penalty.
Low background noise	An area of low background noise is one where the existing background noise levels measured during an environmental noise survey are as follows: - o Average Daytime Background Noise Level ≤40dB L_{AF90}, and; - o Average Evening Background Noise Level ≤35dB L_{AF90}, and; - o Average Night-time Background Noise Level ≤30dB L_{AF90}.
Low frequency noise	Noise which is dominated by frequency components less than approximately 200 Hz.
L_{pA} (dB)	An ‘A-weighted decibel’ K a measure of the overall level of sound across the audible frequency range (20Hz – 20kHz) with A-frequency weighting (i.e. ‘A-weighting’) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Noise	Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a person exposed to it, or any sound that could cause actual physiological harm to a person exposed to it, or physical damage to any structure exposed to it, is known as noise.
Noise sensitive location	NSL – any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
Octave band	A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.
Rating level	See L _{Af,T} .
RMS	The RMS (Root Mean Square) value of a set of numbers is the square root of the average of their squares.

SEL (L_{AX} or L_{AE})	Sound exposure level – a measure of the A-weighted sound energy used to describe noise events such as the passing of a train or aircraft; it is the A-weighted sound pressure level if occurring over a period of 1 second, would contain the same amount of A-weighted sound energy as the event.
Sound pressure level	Sound pressure refers to the fluctuations in air pressure caused by the passage of a sound wave. It may be expressed in terms of sound pressure level at a point.
Specific noise level	A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: 'the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval ($L_{Aeq, T}$)'.
Time weighting	One of the averaging times (Fast, Slow or Impulse) used for the measurement of RMS sound pressure level in sound level meters.
Tonal	Sounds which cover a range of only a few Hz which contains a clearly audible tone, i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'. A tone is deemed to be present when the level difference between the L_{eq} at the 1/3 octave band of the tone and each adjacent 1/3 octave band is greater than or equal to 15dB for low-frequencies (25Hz to 125Hz), 8dB for middle-frequencies (160Hz to 400Hz) or 5dB for high-frequencies (500Hz to 10,000Hz).
1/3 octave analysis	Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one-third of an octave each.

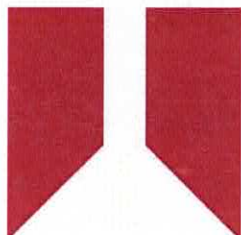
Appendix III: Calibration Certificates and Equipment Downloads

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 18 June 2024

CERTIFICATE NUMBER 216416



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

R. Woodall

Electronically signed:

Sound Calibrator : IEC 60942:2003

Instrument information

Manufacturer: Cirrus Research plc

Model: CR:514

Serial number: 97791

Class: 2

Notes:

Test summary

Date of calibration: 18 June 2024

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

As public evidence was available, from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the Class 2 requirements of IEC 60942:2003.

The manufacturer's product information indicates that this model of sound calibrator has been formally pattern approved to IEC60942_2003 Annex A to Class 2. This has been confirmed by Physikalisch-Technische Bundesanstalt (PTB).

Notes:

CERTIFICATE OF CALIBRATION

Certificate Number:

216416

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Pressure: 100.82 kPa

Temperature: 22.2 °C

Humidity: 47.7 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	1053426
Acoustic Calibrator	Bruel and Kjaer	4231	2610257
Environmental Monitor	Comet	T7510	21962628

Initial Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	94.00	94.15	94.14	94.14	94.14	0.14	±0.75	0.11 dB
Distortion (%)	< 4.00	0.24	0.31	0.21	0.25	0.25	+4.00	0.13 %
Frequency (Hz)	1000.0	1000.3	1000.2	1000.2	1000.2	0.2	±200.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

Adjusted Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	94.00	93.99	93.98	93.99	93.99	-0.01	±0.75	0.11 dB
Distortion (%)	< 4.00	0.42	0.16	0.39	0.33	0.33	+4.00	0.13 %
Frequency (Hz)	1000.0	1000.2	1000.3	1000.8	1000.5	0.5	±200.0	0.1 Hz

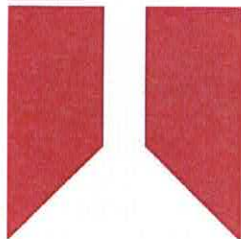
End of results

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research

DATE OF ISSUE 08 March 2024

CERTIFICATE NUMBER 210137



Cirrus Research
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

R. Thomas

Electronically signed:

Sound Level Meter : IEC 61672-3:2006

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:171B
Serial number: G061082
Class: 1
Firmware version: 2.4.1569

Notes:

Test summary

Date of calibration: 08 March 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

Periodic tests were performed in accordance with procedures from IEC 61672-3:2006.

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

210137

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 100.41 kPa	Temperature: 22.7 °C	Humidity: 39.9 %
After	Pressure: 100.34 kPa	Temperature: 22.5 °C	Humidity: 40.1 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334

Additional instrument information

Instruction manual:

Reference level range: Single range

Pattern approval: Yes

Source of pattern approval: PTB

Preamplifier

Model: MV:200F

Serial number: 9078F

Microphone

Model: MK:224

Serial number: 218148A

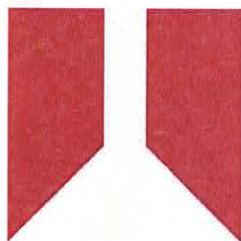
Test results summary

Test	Result
Toneburst response	Complies
Electrical noise-floor	Complies
Linearity	Complies
Electrical Frequency weightings	Complies
Frequency and time weightings at 1 kHz	Complies
C-weighted peak	Complies
Overload indication	Complies
Acoustic Frequency weightings	Complies

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **08 March 2024** CERTIFICATE NUMBER **210138**



**Cirrus Research
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom**

Page 1 of 2

Test engineer:

D.Swalwell

Electronically signed:

Microphone

Microphone capsule

Manufacturer: Cirrus Research plc

Model: MK:224

Serial Number: 218148A

Calibration procedure

Date of calibration: 08 March 2024

Open circuit: 47.8 mV/Pa

Sensitivity at 1 kHz: -26.4 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

Environmental conditions

Pressure: 100.70 kPa

Temperature: 21.0 °C

Humidity: 30.0 %

CERTIFICATE OF CALIBRATION

Certificate Number:

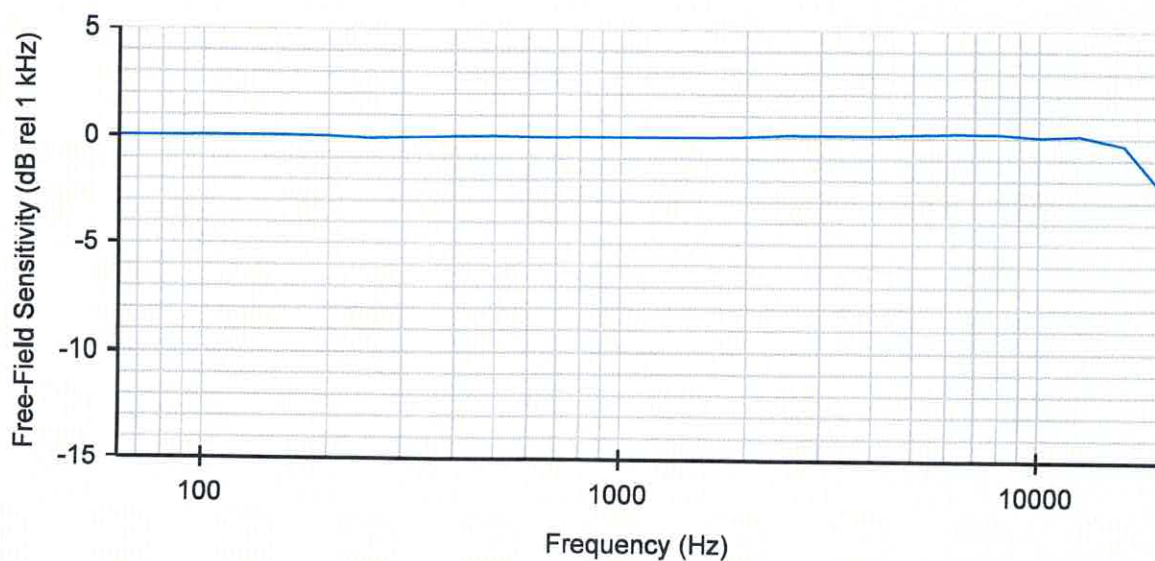
210138

Page 2 of 2

Free-Field Frequency Response : Tabular

Frequency (Hz)	Free-Field Sensitivity (dB rel 1 kHz)	Actuator Response (dB)
63	0.03	-0.15
80	0.03	-0.04
100	0.05	0.01
125	0.04	0.04
160	0.05	0.07
200	0.02	0.05
250	-0.08	-0.04
315	-0.02	-0.01
400	0.02	0.05
500	0.04	0.06
630	-0.01	0.02
800	0.01	0.01
1 000	0.00	-0.00
1 250	0.01	-0.03
1 600	0.01	-0.10
2 000	0.05	-0.15
2 500	0.14	-0.18
3 150	0.13	-0.43
4 000	0.13	-0.75
5 000	0.18	-1.16
6 300	0.23	-1.82
8 000	0.22	-2.92
10 000	0.06	-4.55
12 500	0.13	-6.37
16 000	-0.32	-8.26
20 000	-2.54	-11.64

Free-Field Frequency Response : Graphical

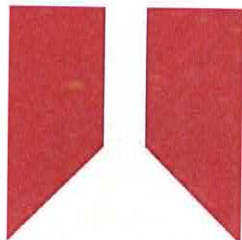


CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **08 March 2024**

CERTIFICATE NUMBER **210135**



**Cirrus Research
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom**

Page 1 of 2

Approved signatory

R.Thomas

Electronically signed:

Octave-band filter : IEC 61260:1995

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:171B
Serial number: G061082
Class: 1
Firmware version: 2.4.1569

Notes:

Test summary

Date of calibration: 08 March 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260:1995 for the environmental conditions under which the test was performed.

Notes

It provides traceability of measurement to the SI system of units and/or to units of measurement realised at a recognised national metrology institute. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

210135

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 100.41 kPa	Temperature: 22.7 °C	Humidity: 39.9 %
After	Pressure: 100.34 kPa	Temperature: 22.5 °C	Humidity: 40.1 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334

Filters information

Filter class: 1
Filter base: 2
Reference attenuation: 0.0 dB

Additional instrument information

Instruction manual:

Pattern approval: Yes

Source of pattern approval: PTB

Reference level range: Single range

Laboratory uncertainties

Requirement	Value (dB)
Relative Attenuation High	0.41
Relative Attenuation Mid	0.18
Relative Attenuation Low	0.12

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **08 March 2024** CERTIFICATE NUMBER **210136**

Cirrus Research
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

R.Thomas

Electronically signed:



Third-octave-band filter : IEC 61260:1995

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:171B
Serial number: G061082
Class: 1
Firmware version: 2.4.1569

Notes:

Test summary

Date of calibration: 08 March 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260:1995 for the environmental conditions under which the test was performed.

Notes

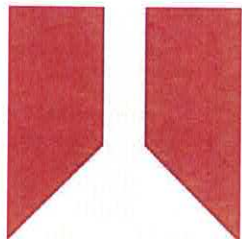
It provides traceability of measurement to the SI system of units and/or to units of measurement realised at a recognised national metrology institute. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 22 February 2024

CERTIFICATE NUMBER 209040



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

R. Woodall

Electronically signed:

Sound Level Meter : IEC 61672-3:2013

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:172B
Serial number: G061817
Class: 2
Firmware version: 3.3.3386

Notes:

Test summary

Date of calibration: 22 February 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013.

The sound level meter submitted for testing successfully completed the class 2 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to determine that the model of sound level meter fully conformed to the class 2 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

209040

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 97.25 kPa	Temperature: 22.6 °C	Humidity: 42.2 %
After	Pressure: 97.21 kPa	Temperature: 22.9 °C	Humidity: 42.7 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	350654
Attenuator	Cirrus Research	ZE:952	93890
Environmental Monitor	Comet	T7510	16966334

Additional instrument information

Instruction manual:

Reference level range: Single range

Pattern approval: No

Source of pattern approval: -

Preamplifier

Model: MV:200F

Serial number: 1932F

Microphone

Model: MK:216

Serial number: 413494B

Test results summary

Test	Result
Toneburst response	Complies
Electrical noise-floor	Complies
Linearity	Complies
Electrical Frequency weightings	Complies
Frequency and time weightings at 1 kHz	Complies
C-weighted peak	Complies
Overload indication	Complies
High level stability	Complies
Long-term stability	Complies
Acoustic Frequency weightings	Complies

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 15 February 2024 CERTIFICATE NUMBER 209041



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Test engineer:

D.Swalwell

Electronically signed:

Microphone

Microphone capsule

Manufacturer: Cirrus Research plc

Model: MK:216

Serial Number: 405168B

Calibration procedure

Date of calibration: 15 February 2024

Open circuit: 48.4 mV/Pa

Sensitivity at 1 kHz: -26.3 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

Environmental conditions

Pressure: 99.80 kPa

Temperature: 22.0 °C

Humidity: 48.0 %

CERTIFICATE OF CALIBRATION

Certificate Number:

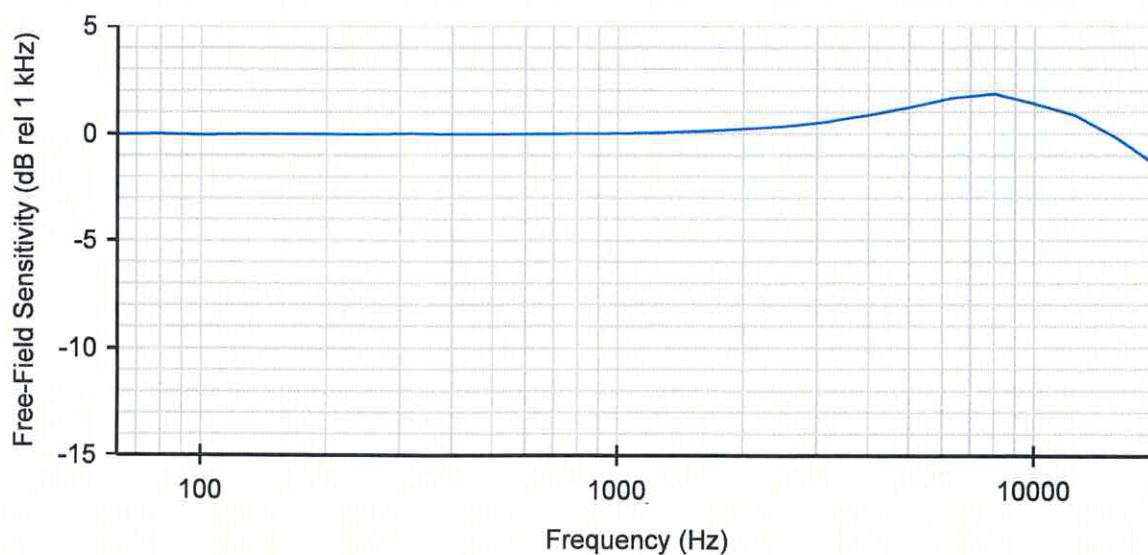
209041

Page 2 of 2

Free-Field Frequency Response : Tabular

Frequency (Hz)	Free-Field Sensitivity (dB rel 1 kHz)	Actuator Response (dB)
63	-0.03	-0.28
80	-0.01	-0.16
100	-0.06	-0.15
125	-0.03	-0.07
160	-0.02	-0.05
200	-0.03	-0.04
250	-0.04	-0.03
315	-0.00	-0.02
400	-0.02	-0.03
500	-0.02	-0.03
630	-0.02	-0.03
800	-0.01	-0.02
1 000	0.00	-0.02
1 250	0.03	-0.02
1 600	0.10	-0.01
2 000	0.21	0.01
2 500	0.33	0.03
3 150	0.54	0.03
4 000	0.86	0.04
5 000	1.22	-0.03
6 300	1.64	-0.32
8 000	1.84	-1.24
10 000	1.38	-3.32
12 500	0.85	-5.66
16 000	-0.29	-8.24
20 000	-1.61	-10.66

Free-Field Frequency Response : Graphical



CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 22 February 2024 CERTIFICATE NUMBER 209038



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
R. Woodall
Electronically signed:

Octave-band filter : IEC 61260:1995

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:172B
Serial number: G061817
Class: 2
Firmware version: 3.3.3386

Notes:

Test summary

Date of calibration: 22 February 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260 for the environmental conditions under which the test was performed.

Notes

It provides traceability of measurement to the SI system of units and/or to units of measurement realised at a recognised national metrology institute. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

209038

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 97.25 kPa	Temperature: 22.6 °C	Humidity: 42.2 %
After	Pressure: 97.21 kPa	Temperature: 22.9 °C	Humidity: 42.7 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	350654
Attenuator	Cirrus Research	ZE:952	93890
Environmental Monitor	Comet	T7510	16966334

Filters information

Filter class: 2
Filter base: 2
Reference attenuation: 0.0 dB

Additional instrument information

Instruction manual:
Pattern approval: No
Source of pattern approval: -
Reference level range: Single range

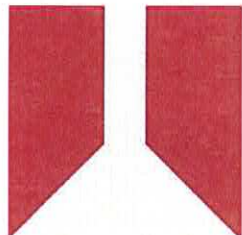
Laboratory uncertainties

Requirement	Value (dB)
Relative Attenuation High	0.41
Relative Attenuation Mid	0.18
Relative Attenuation Low	0.12

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 22 February 2024 CERTIFICATE NUMBER 209039



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

R.Woodall

Electronically signed:

Third-octave-band filter : IEC 61260:1995

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:172B
Serial number: G061817
Class: 2
Firmware version: 3.3.3386

Notes:

Test summary

Date of calibration: 22 February 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260 for the environmental conditions under which the test was performed.

Notes

It provides traceability of measurement to the SI system of units and/or to units of measurement realised at a recognised national metrology institute. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

209039

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 97.25 kPa Temperature: 22.6 °C Humidity: 42.2 %

After Pressure: 97.21 kPa Temperature: 22.9 °C Humidity: 42.7 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	350654
Attenuator	Cirrus Research	ZE:952	93890
Environmental Monitor	Comet	T7510	16966334

Filters information

Filter class: 2

Filter base: 2

Reference attenuation: 0.0 dB

Additional instrument information

Instruction manual:

Pattern approval: No

Source of pattern approval: -

Reference level range: Single range

Laboratory uncertainties

Requirement	Value (dB)
Relative Attenuation High	0.41
Relative Attenuation Mid	0.18
Relative Attenuation Low	0.12

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 26 April 2024

CERTIFICATE NUMBER 213293



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

A. Windrass

Electronically signed:

Sound Level Meter : IEC 61672-3:2013

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: CR:172B

Serial number: G078197

Class: 2

Firmware version: 3.3.3386

Test summary

Date of calibration: 26 April 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013.

The sound level meter submitted for testing successfully completed the class 2 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to determine that the model of sound level meter fully conformed to the class 2 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

213293

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 99.82 kPa	Temperature: 21.6 °C	Humidity: 37 %
After	Pressure: 99.85 kPa	Temperature: 22.1 °C	Humidity: 38.4 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	350658
Attenuator	Cirrus Research	ZE:952	93890
Environmental Monitor	Comet	T7510	16966334

Additional instrument information

Instruction manual:

Reference level range: Single range

Pattern approval: No

Source of pattern approval: -

Preamplifier

Model: MV:200F

Serial number: 5617F

Microphone

Model: MK:216

Serial number: 414290E

Test results summary

Test	Result
Toneburst response	Complies
Electrical noise-floor	Complies
Linearity	Complies
Electrical Frequency weightings	Complies
Frequency and time weightings at 1 kHz	Complies
C-weighted peak	Complies
Overload indication	Complies
High level stability	Complies
Long-term stability	Complies
Acoustic Frequency weightings	Complies

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**
DATE OF ISSUE **19 April 2024** CERTIFICATE NUMBER **213297**



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Test engineer:
D.Swalwell
Electronically signed:

Microphone

Microphone capsule

Manufacturer: Cirrus Research plc

Model: MK:216

Serial Number: 414290E

Calibration procedure

Date of calibration: 19 April 2024

Open circuit: 49.5 mV/Pa

Sensitivity at 1 kHz: -26.1 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

Environmental conditions

Pressure: 100.50 kPa

Temperature: 20.0 °C

Humidity: 48.0 %

CERTIFICATE OF CALIBRATION

Certificate Number:

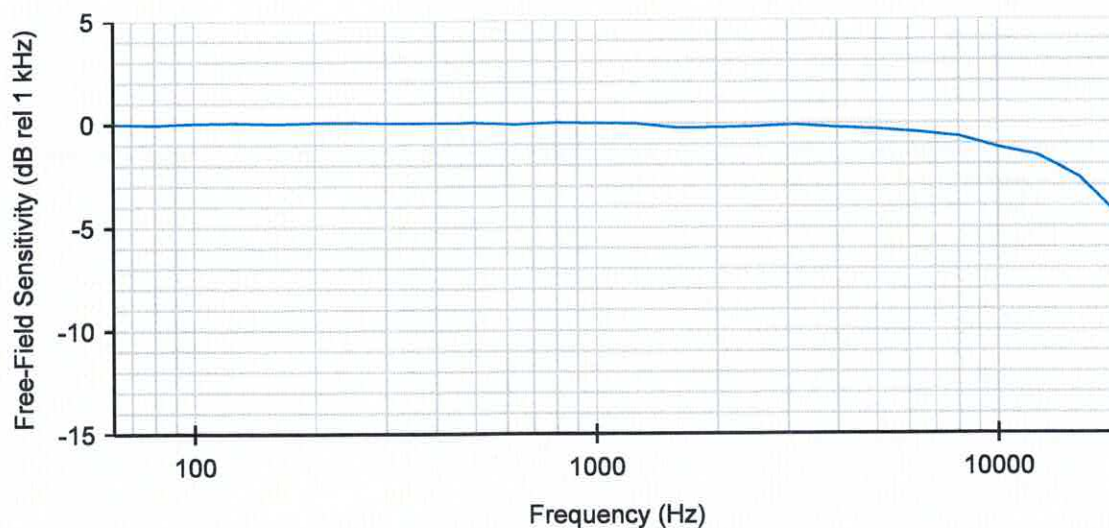
213297

Page 2 of 2

Free-Field Frequency Response : Tabular

Frequency (Hz)	Free-Field Sensitivity (dB rel 1 kHz)	Actuator Response (dB)
63	-0.01	-0.20
80	-0.06	-0.14
100	0.01	-0.03
125	0.05	0.04
160	0.00	0.02
200	0.04	0.08
250	0.05	0.09
315	0.02	0.03
400	0.01	0.04
500	0.03	0.05
630	-0.06	-0.04
800	0.04	0.04
1 000	0.00	-0.01
1 250	-0.02	-0.06
1 600	-0.25	-0.36
2 000	-0.23	-0.43
2 500	-0.18	-0.51
3 150	-0.10	-0.66
4 000	-0.24	-1.12
5 000	-0.32	-1.66
6 300	-0.48	-2.54
8 000	-0.69	-3.83
10 000	-1.22	-5.83
12 500	-1.60	-8.10
16 000	-2.64	-10.59
20 000	-4.52	-13.62

Free-Field Frequency Response : Graphical

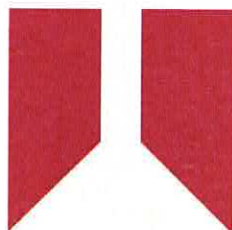


CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 26 April 2024

CERTIFICATE NUMBER 213294



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

A. Windrass

Electronically signed:

Octave-band filter : IEC 61260:1995

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: CR:172B

Serial number: G078197

Class: 2

Firmware version: 3.3.3386

Test summary

Date of calibration: 26 April 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260 for the environmental conditions under which the test was performed.

Notes

It provides traceability of measurement to the SI system of units and/or to units of measurement realised at a recognised national metrology institute. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

213294

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 99.82 kPa Temperature: 21.6 °C Humidity: 37.0 %

After Pressure: 99.85 kPa Temperature: 22.1 °C Humidity: 38.4 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	350658
Attenuator	Cirrus Research	ZE:952	93890
Environmental Monitor	Comet	T7510	16966334

Filters information

Filter class: 2

Filter base: 2

Reference attenuation: 0.0 dB

Additional instrument information

Instruction manual:

Pattern approval: No

Source of pattern approval: -

Reference level range: Single range

Laboratory uncertainties

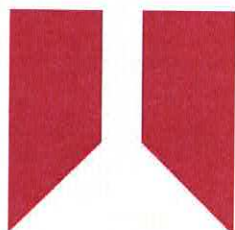
Requirement	Value (dB)
Relative Attenuation High	0.41
Relative Attenuation Mid	0.18
Relative Attenuation Low	0.12

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 26 April 2024

CERTIFICATE NUMBER 213295



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

A. Windrass

Electronically signed:

Third-octave-band filter : IEC 61260:1995

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: CR:172B

Serial number: G078197

Class: 2

Firmware version: 3.3.3386

Test summary

Date of calibration: 26 April 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260 for the environmental conditions under which the test was performed.

Notes

It provides traceability of measurement to the SI system of units and/or to units of measurement realised at a recognised national metrology institute. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

213295

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 99.82 kPa	Temperature: 21.6 °C	Humidity: 37.0 %
After	Pressure: 99.85 kPa	Temperature: 22.1 °C	Humidity: 38.4 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	350658
Attenuator	Cirrus Research	ZE:952	93890
Environmental Monitor	Comet	T7510	16966334

Filters information

Filter class: 2

Filter base: 2

Reference attenuation: 0.0 dB

Additional instrument information

Instruction manual:

Pattern approval: No

Source of pattern approval: -

Reference level range: Single range

Laboratory uncertainties

Requirement	Value (dB)
Relative Attenuation High	0.41
Relative Attenuation Mid	0.18
Relative Attenuation Low	0.12

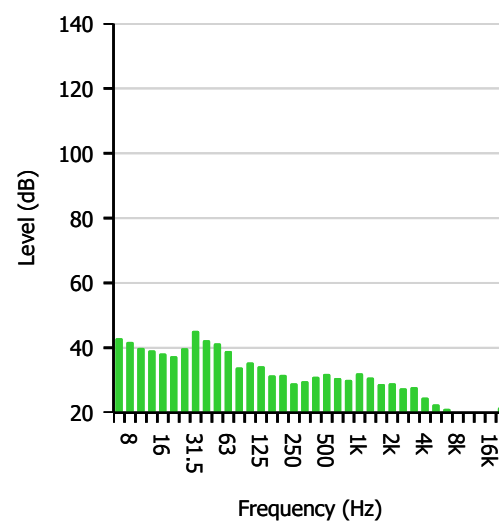
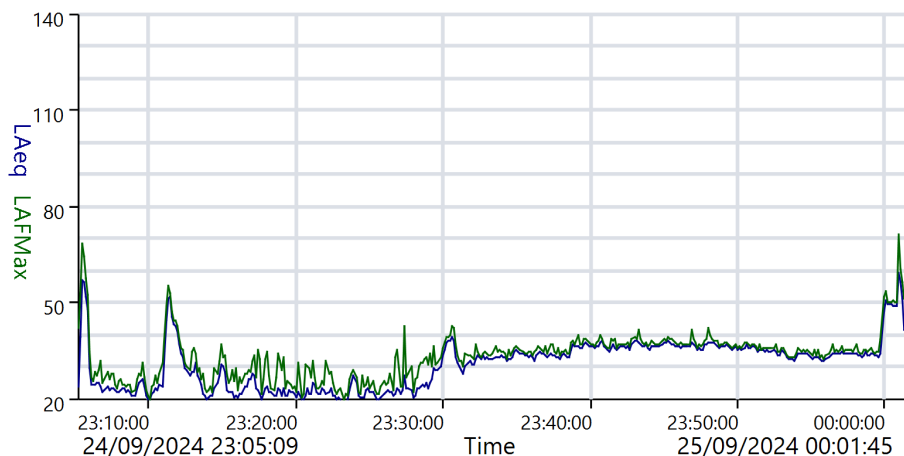
Measurement Summary Report

Name NSL-1 Night
Time 24/09/2024 23:05:09 **Place**
Duration 00:56:36 **SSE Tarbert**
Instrument G078197, CR:172B

Calibration

Before 24/09/2024 10:39 **Offset** -1.20 dB **After** 25/09/2024 15:20 **Offset** -0.93 dB

Basic Values		Statistical Levels (Ln)	
L _{Aeq}	40.1 dB	L _{AF1}	52.2 dB
L _{AE}	75.4 dB	L _{AF5}	41.0 dB
L _{AFMax}	71.2 dB	L _{AF10}	37.1 dB
		L _{AF50}	32.7 dB
		L _{AF90}	20.6 dB
		L _{AF95}	20.0 dB
		L _{AF99}	20.0 dB


ReportId

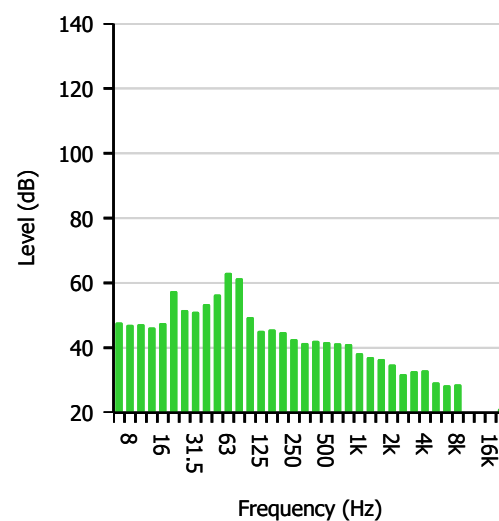
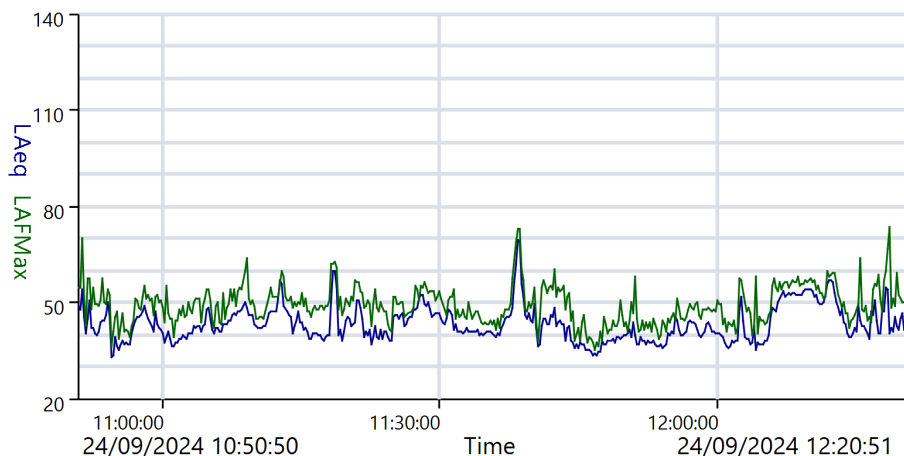

Measurement Summary Report

Name NSL-1 Day
Time 24/09/2024 10:50:50 **Place**
Duration 01:30:00 **SSE Tarbert**
Instrument G061082, CR:171B

Calibration

Before 24/09/2024 10:49 **Offset** 0.06 dB **After** 25/09/2024 15:57 **Offset** -0.10 dB

Basic Values		Statistical Levels (Ln)	
LAeq	49.5 dB	LAF1	59.6 dB
LAE	86.8 dB	LAF5	53.3 dB
LAFMax	73.2 dB	LAF10	50.5 dB
		LAF50	41.4 dB
		LAF90	35.5 dB
		LAF95	34.6 dB
		LAF99	33.0 dB


ReportId

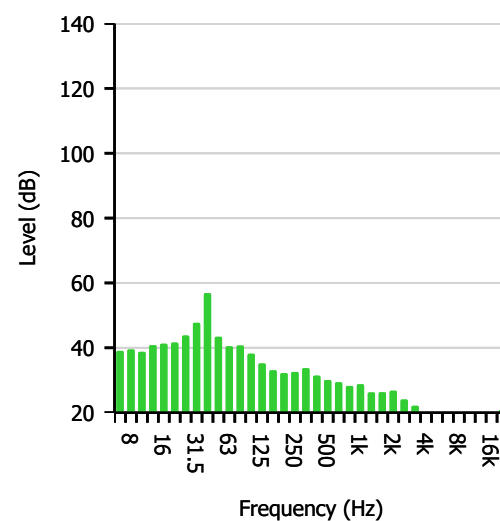
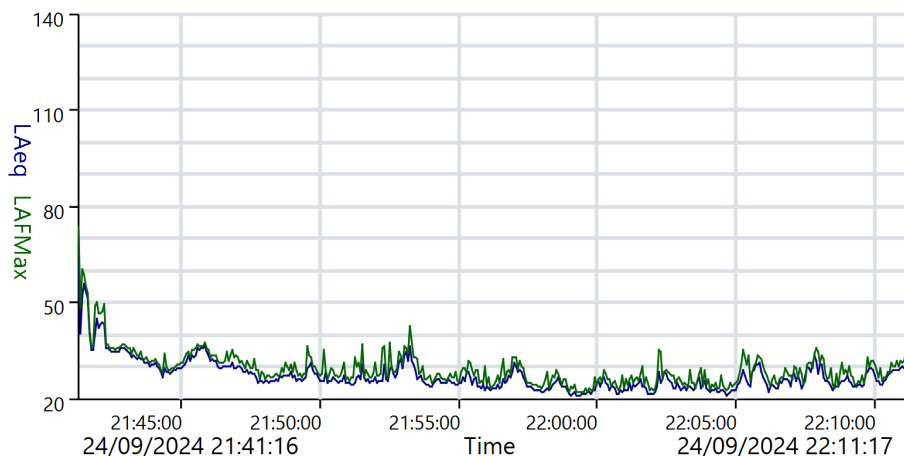

Measurement Summary Report

Name NSL-1 Evening
Time 24/09/2024 21:41:16 **Place**
Duration 00:30:00 **SSE Tarbert**
Instrument G078197, CR:172B

Calibration

Before 24/09/2024 10:39 **Offset** -1.20 dB **After** 25/09/2024 15:20 **Offset** -0.93 dB

Basic Values		Statistical Levels (Ln)	
LAeq	38.0 dB	LAF1	46.0 dB
LAE	70.6 dB	LAF5	35.3 dB
LAFMax	73.3 dB	LAF10	33.0 dB
		LAF50	25.6 dB
		LAF90	22.3 dB
		LAF95	21.6 dB
		LAF99	20.8 dB


ReportId

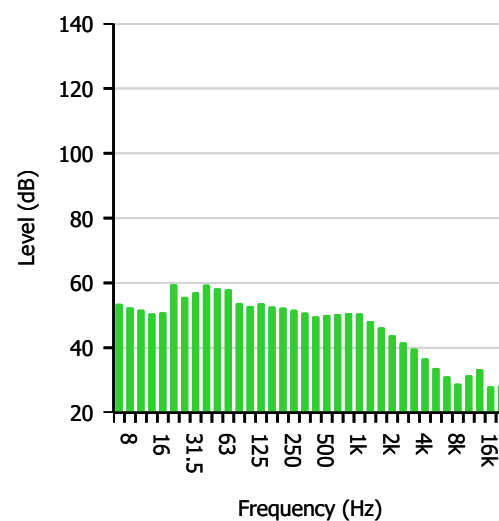
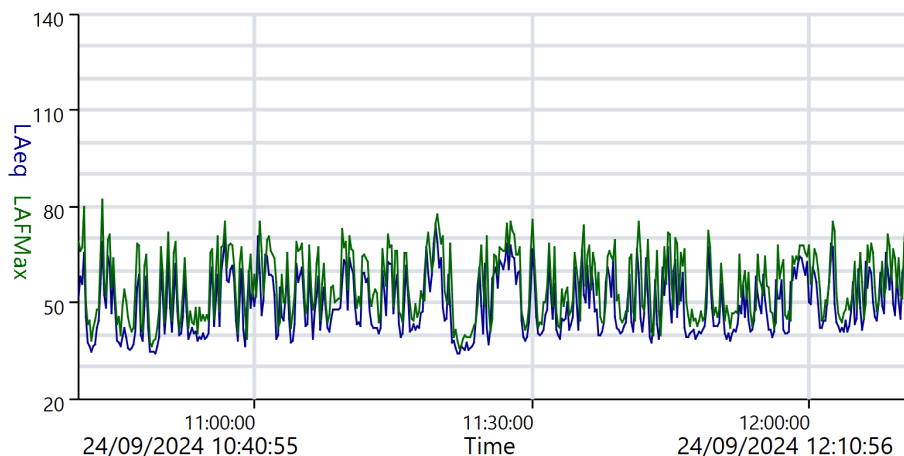

Measurement Summary Report

Name NSL-2 Day
Time 24/09/2024 10:40:55 **Place**
Duration 01:30:00 **SSE Tarbert**
Instrument G078197, CR:172B

Calibration

Before 24/09/2024 10:39 **Offset** -1.20 dB **After** 25/09/2024 15:20 **Offset** -0.93 dB

Basic Values		Statistical Levels (Ln)	
LAeq	58.0 dB	LAF1	70.1 dB
LAE	95.3 dB	LAF5	64.8 dB
LAFMax	82.0 dB	LAF10	61.8 dB
		LAF50	45.5 dB
		LAF90	37.6 dB
		LAF95	36.0 dB
		LAF99	34.0 dB



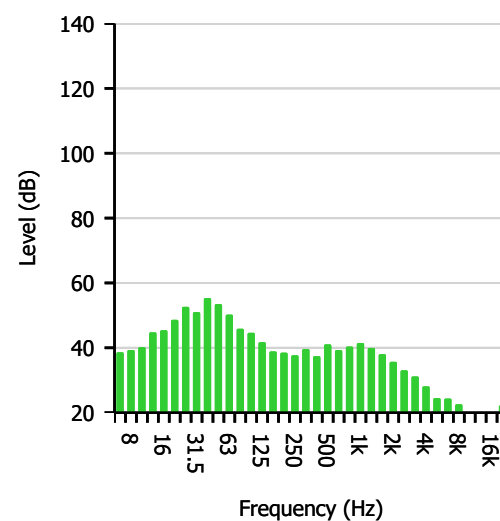
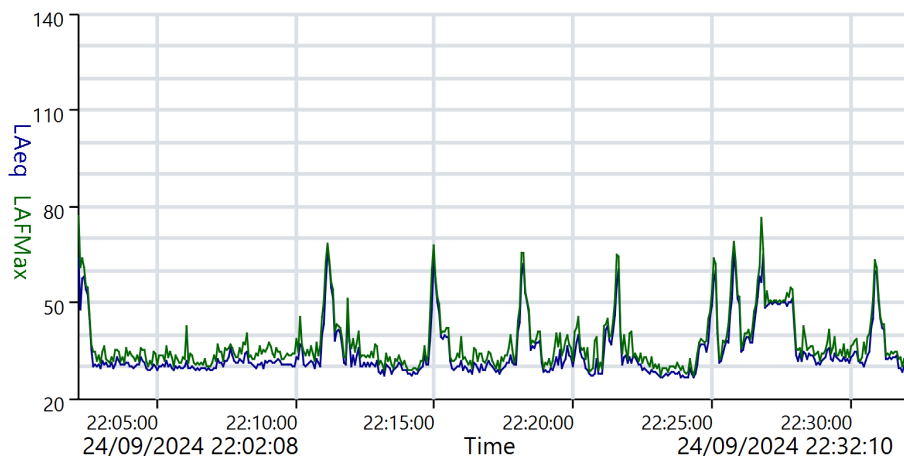
Measurement Summary Report

Name NSL-2 Evening
Time 24/09/2024 22:02:08 **Place**
Duration 00:30:00 **SSE Tarbert**
Instrument G061082, CR:171B

Calibration

Before 24/09/2024 10:49 **Offset** 0.06 dB **After** 25/09/2024 15:57 **Offset** -0.10 dB

Basic Values		Statistical Levels (Ln)	
LAeq	48.5 dB	LAF1	62.2 dB
LAE	81.1 dB	LAF5	52.1 dB
LAFMax	76.9 dB	LAF10	48.3 dB
		LAF50	31.0 dB
		LAF90	28.0 dB
		LAF95	27.4 dB
		LAF99	26.5 dB


ReportId

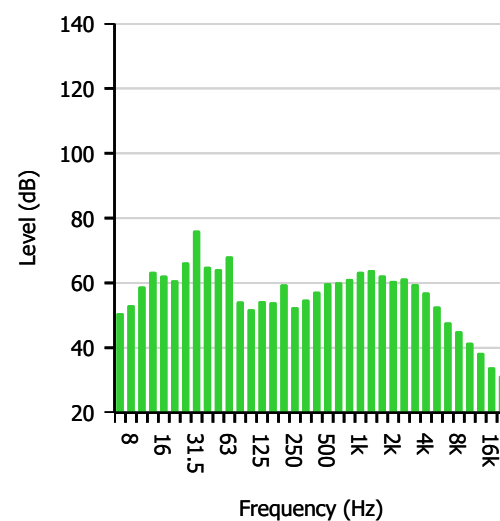
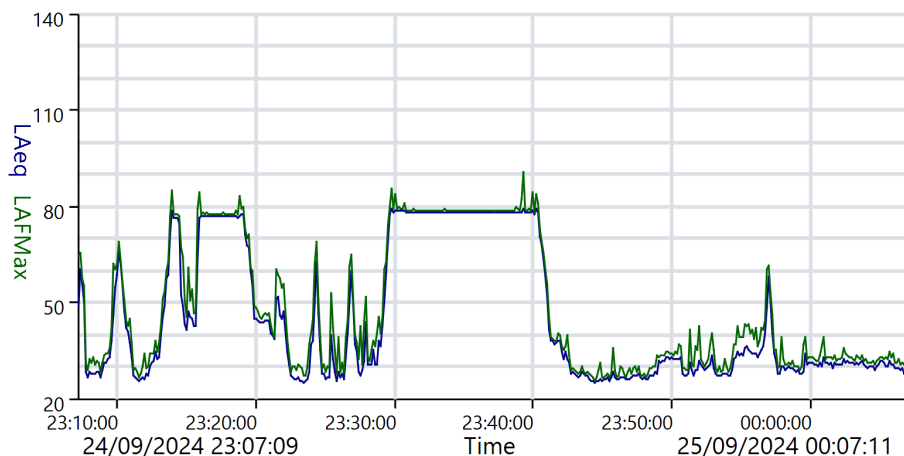

Measurement Summary Report

Name NSL-2 Night
Time 24/09/2024 23:07:09 **Place**
Duration 01:00:00 SSE Tarbert
Instrument G061082, CR:171B

Calibration

Before 24/09/2024 10:49 Offset 0.06 dB **After** 25/09/2024 15:57 Offset -0.10 dB

Basic Values		Statistical Levels (Ln)	
LAeq	71.8 dB	LAF1	78.6 dB
LAE	107.4 dB	LAF5	78.2 dB
LAFMax	90.4 dB	LAF10	78.0 dB
		LAF50	32.6 dB
		LAF90	26.3 dB
		LAF95	25.7 dB
		LAF99	25.0 dB


ReportId

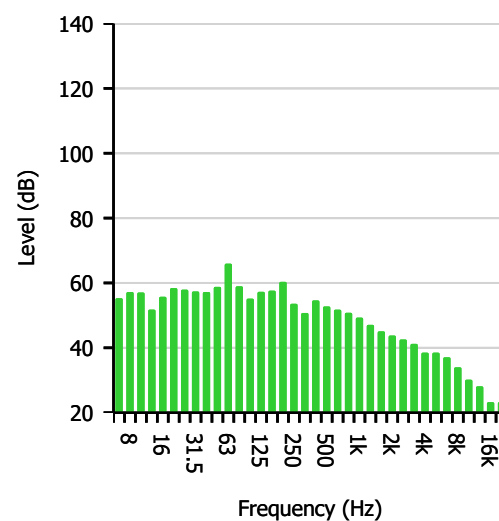
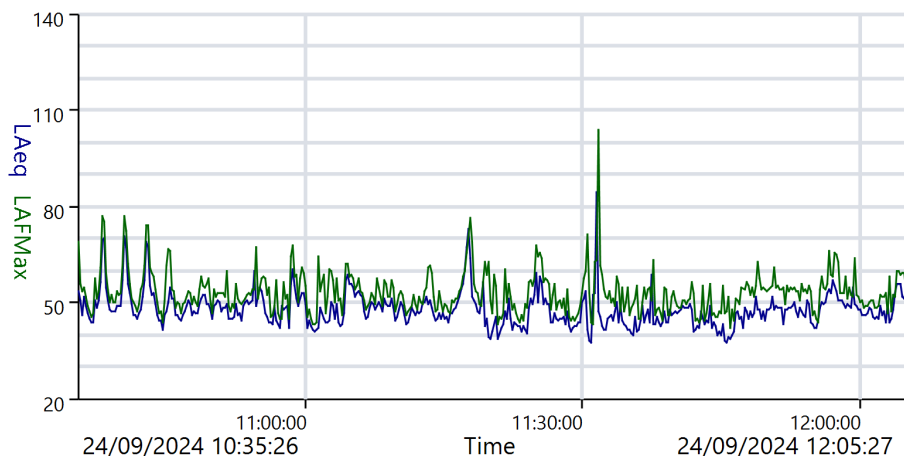

Measurement Summary Report

Name NSL-3 Day
Time 24/09/2024 10:35:26 **Place**
Duration 01:30:00 **SSE Tarbert**
Instrument G061817, CR:172B

Calibration

Before 24/09/2024 10:33 **Offset** -0.12 dB **After** 25/09/2024 15:48 **Offset** -0.13 dB

Basic Values		Statistical Levels (Ln)	
LAeq	59.2 dB	LAF1	66.7 dB
LAE	96.5 dB	LAF5	56.3 dB
LAFFMax	103.6 dB	LAF10	53.0 dB
		LAF50	46.3 dB
		LAF90	41.0 dB
		LAF95	39.5 dB
		LAF99	36.7 dB



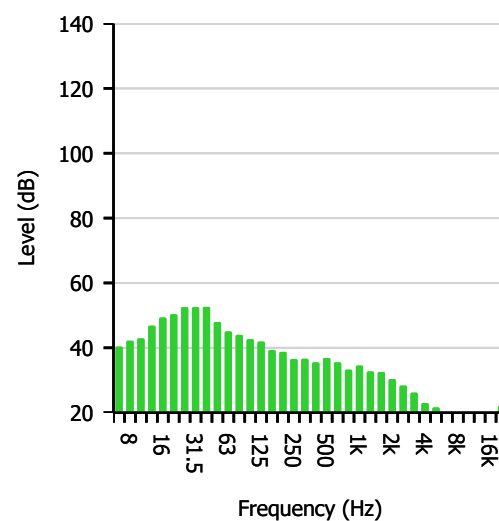
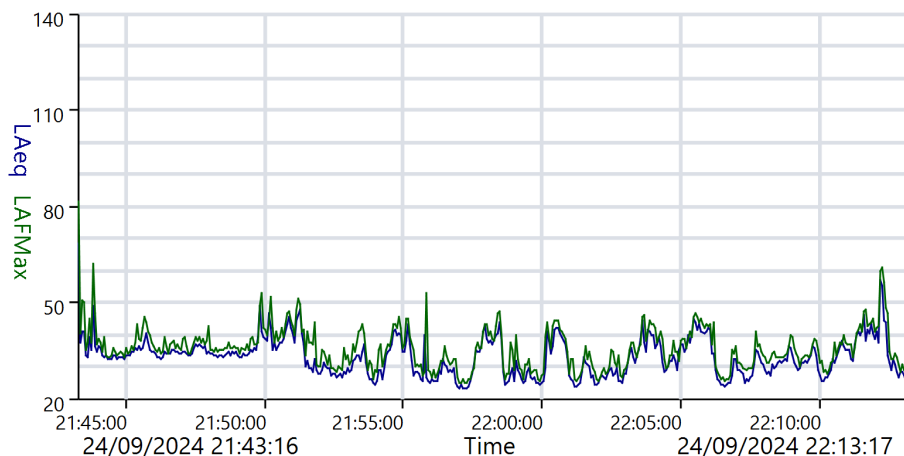
Measurement Summary Report

Name NSL-3 Evening
Time 24/09/2024 21:43:16 **Place**
Duration 00:30:00 **SSE Tarbert**
Instrument G061817, CR:172B

Calibration

Before 24/09/2024 10:33 **Offset** -0.12 dB **After** 25/09/2024 15:48 **Offset** -0.13 dB

Basic Values		Statistical Levels (Ln)	
LAeq	43.3 dB	LAF1	47.8 dB
LAE	75.8 dB	LAF5	42.4 dB
LAFMax	81.2 dB	LAF10	40.2 dB
		LAF50	32.6 dB
		LAF90	25.1 dB
		LAF95	24.3 dB
		LAF99	23.3 dB


ReportId

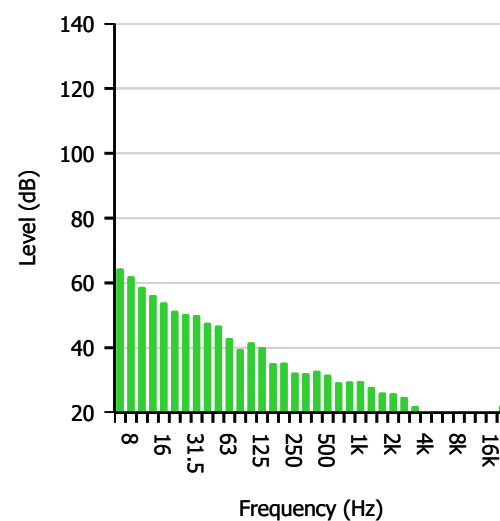
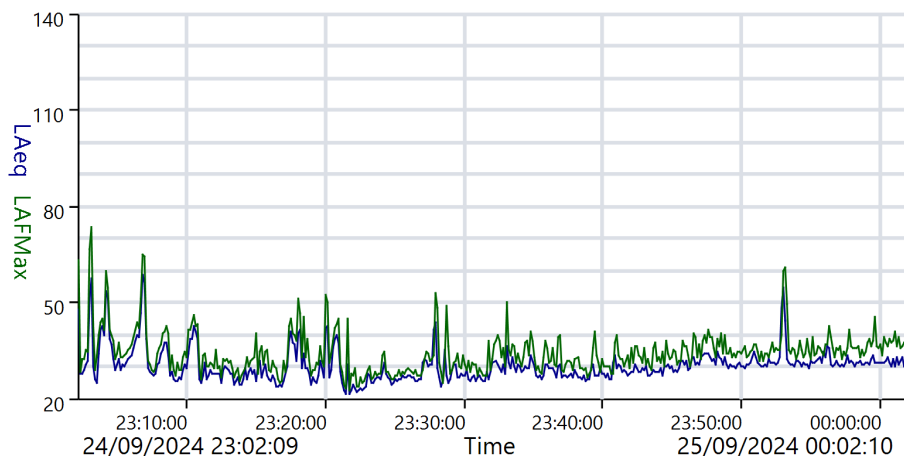

Measurement Summary Report

Name NSL-3 Night
Time 24/09/2024 23:02:09 **Place**
Duration 01:00:00 SSE Tarbert
Instrument G061817, CR:172B

Calibration

Before 24/09/2024 10:33 Offset -0.12 dB **After** 25/09/2024 15:48 Offset -0.13 dB

Basic Values		Statistical Levels (Ln)	
LAeq	38.8 dB	LAF1	48.9 dB
LAE	74.4 dB	LAF5	38.6 dB
LAFMax	73.2 dB	LAF10	34.5 dB
		LAF50	29.1 dB
		LAF90	25.2 dB
		LAF95	24.1 dB
		LAF99	21.8 dB



ReportId



