Noise Management Plan

Substantial Permit Variation

15th May 2026

Project No.: SOL_26_P069_FUJ

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Noise Management Plan

Substantial Permit Variation

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1. INTRODUCTION

Site Name	Fujifilm Belasis Avenue
Site Address	Belasis Avenue, Billingham, Stockton on Tees, TS23 1YN
Operator Name	Fujifilm Diosynth Biotechnologies Uk Limited
Permit Number	EPR/BJ8987IQ/V007

This Noise Management Plan (NMP) recognises that Fujifilm Diosynth Biotechnologies UK Limited (FDBK) are responsible for controlling the impact of noise from the Facility at Belasis Avenue and has been created for the purpose of minimising the impact of the site's activities to the surrounding area and receptors within the vicinity.This NMP has been developed in relation to the Borealis activities on site and does not address the existing operations on site.

The NMP identifies the operational activities of the site and the range of noise sources emanating from those activities. It outlines practical steps to be taken to mitigate those sources and any future actions that may require consideration.

The NMP outlines the parameters of the Environmental Permit, health and safety guidance, as well as defining responsibilities for site staff regarding staff training and site operational activities for ongoing monitoring and compliance.

The NMP specifies the correct procedure to be followed in the event of a complaint and sets out the scope of liaison between all stakeholders, principally FDBK, the Environment Agency (EA), and local residents.

The NMP is a standalone document and is included within the wider sites Environmental Management System (EMS) and a copy is held onsite. All staff will be appropriately trained in the NMP by the Site Manager. The NMP acknowledges that noise pollution incidents may occur even when the NMP is followed and that further appropriate measures, where practicable, may be required. As a standalone document the NMP will be reviewed annually as a matter of routine and at additional times to reflect proactive improvements in management techniques. In addition, it will be reviewed following any relevant complaint, including an assessment of appropriate measures implemented on site.

Environmental Permit - Noise and Vibration Conditions

There are currently no permitted conditions specifically for noise and vibration within Environmental Permit, EPR/BJ8987IQ/V007.

The site will operate in accordance with this NMP and the Noise Impact Assessment (NIA) which is provided within Appendix B.

This NMP has been produced in accordance with EA guidance "*Noise and vibration management: environmental permits*" January 2022. Additional guidance utilised in regard to Best Available Techniques (BAT) has included:

- Common Waste and Gas Management and Treatment Systems in the Chemical Sector BREF BAT Conclusions; and

- How to Comply with your Environmental Permit: Speciality Organic Chemicals EPR 4.02.

2. SITE DETAILS

2.1 Site Location

The proposed Installation is located at Belasis Avenue, Billingham, TS23 1LH (National Grid Reference: NZ 46607 22612).

The location is provided in Figure 2.1 below.

2.2 Infrastructure and Design

2.2.1 Site Installation Boundary

The proposed Installation Boundary is provided in Figure 2.2 below.

2.2.2 Site Layout and Design

Borealis consists of a three storey multi-platform biotech manufacturing facility.

Borealis consists of a 26,800m^2 (GIA) biotech manufacturing facility, comprising an array of production suites, warehouse and storage, buffer preparation and hold facilities, laboratories, and offices. Borealis includes a liquid waste treatment plant, solid waste management building, and standby generator.

Borealis has the potential for noise emissions due to the proximity of nearby receptors and external plant.

The rest of the site consists of multiple other manufacturing utilising microbial fermentation and mammalian cell culture for the manufacture of Active Pharmaceutical Ingredients for clinical and commercial products. These areas of site are surrounded by other industrial processes and are not considered sensitive to noise.

2.2.3 Drainage

The site has an existing connection (Emission Point W1) which allows the discharge of process and cooling water and condensate to controlled waters (The Tees Estuary). This emission point runs to the south of the Billingham site and is shared with CF Fertilisers and a number of other permitted installations within the locality. Emissions to water from site are monitored at the discharge point into the Billingham drain as it enters the CF Fertilisers site.

All process emissions from Borealis will initially be tankered off site from removal. Once agreed with the EA, the emissions will be discharged to sewer via the sites emission point to sewer (Emission Point S1).

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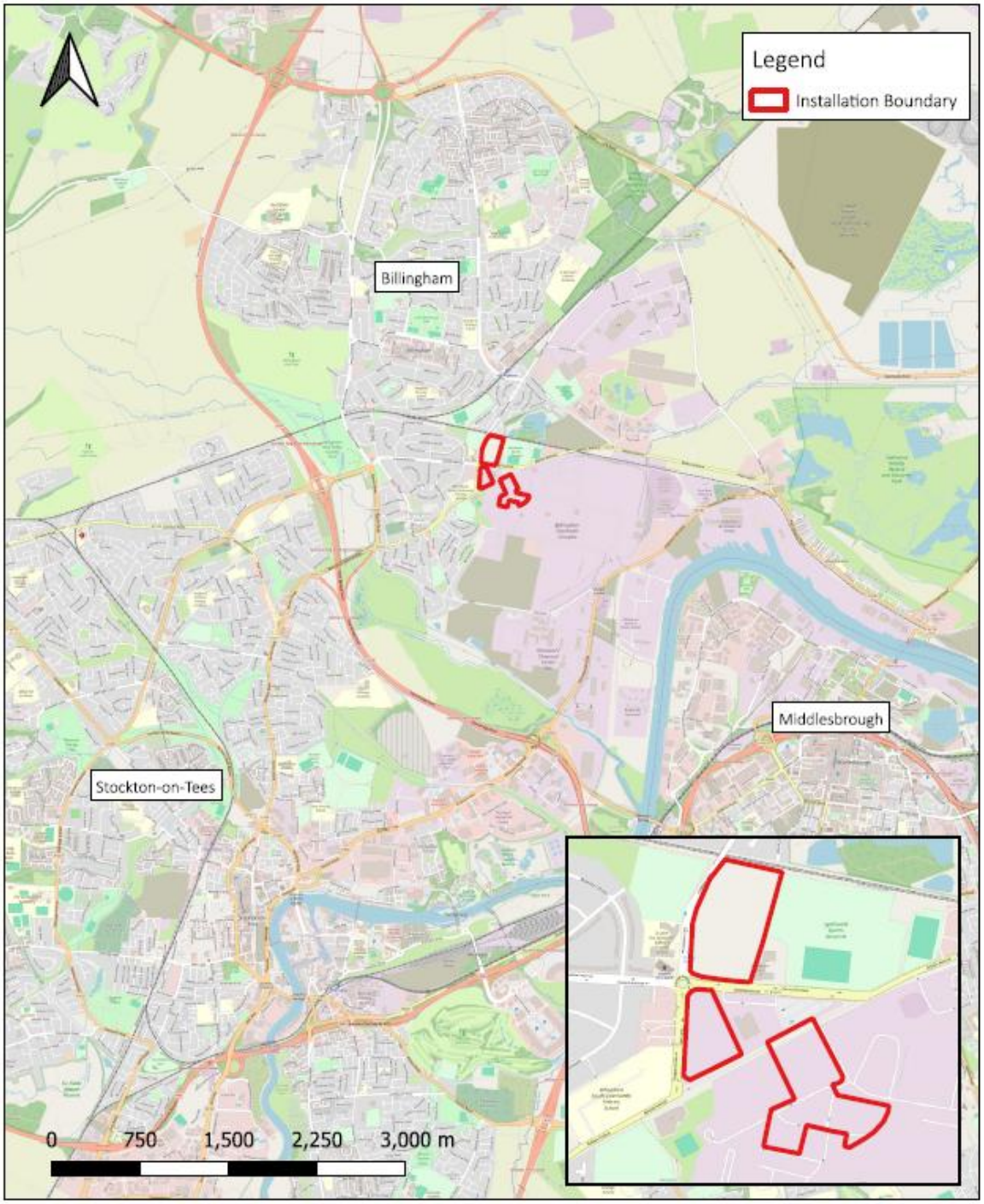


Figure 2.1 Site Location

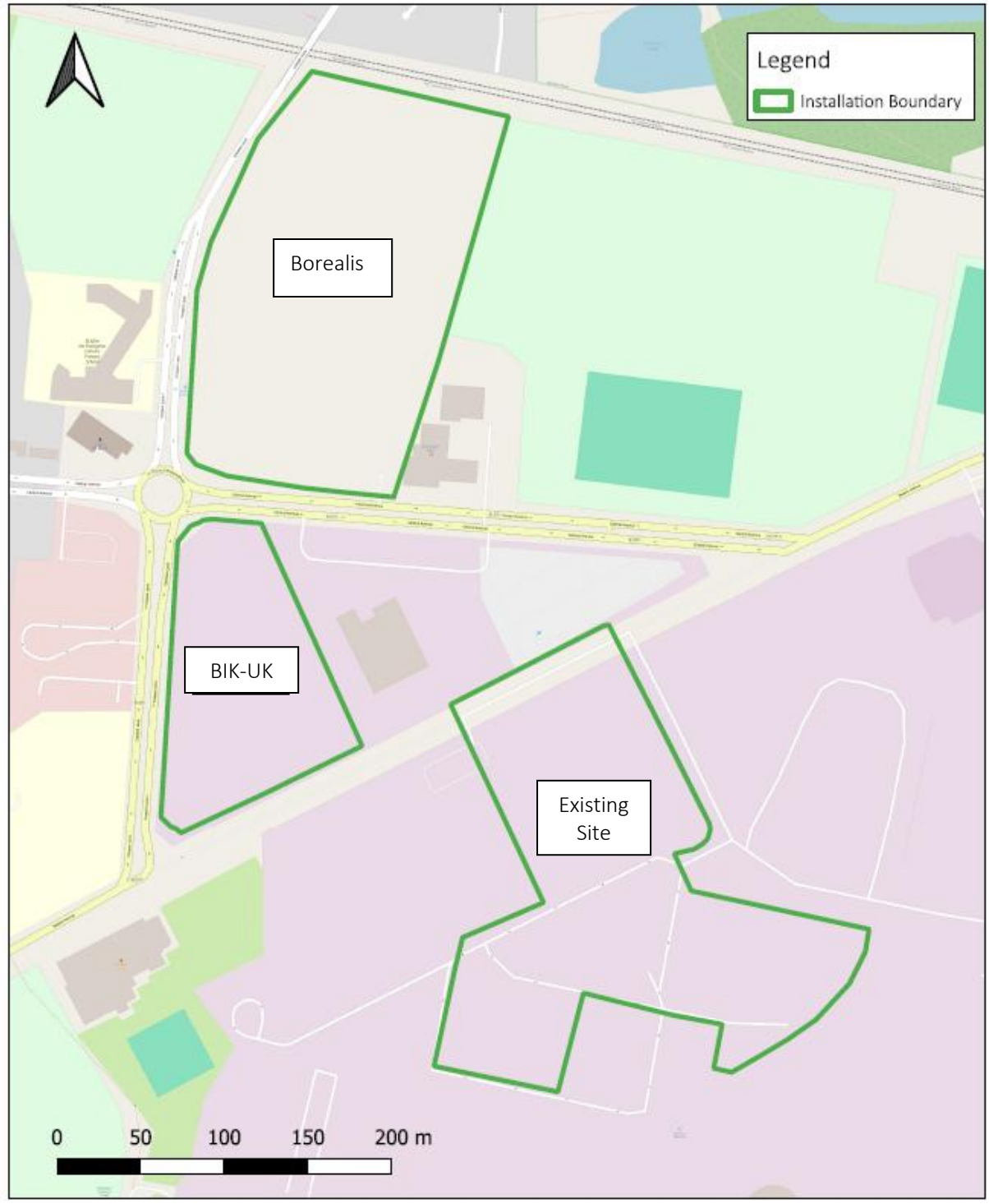


Figure 2.2 Installation Boundary

2.3 Site Context

The following sections outline the site context, including the proposed boundary and layout, surrounding site setting and any nearby sensitive receptors.

2.3.1 Site Setting

The site is located in a mixed-use landscape, comprising of a blend of industrial, commercial, residential and recreational assets, as well as prominent ecological features. Table 2.1 outlines the surrounding site setting in greater detail, including features in all four major compass points.

Table 2.1 Surrounding Site Setting

Area	Description
Area 1 – Existing Site	▪ North – The B1275 (Central Avenue) beyond which Project Borealis and the Synthonia Sports Ground. ▪ East – Other commercial activities within the Billingham Chemicals Complex. ▪ South – Other commercial activities within the Billingham Chemicals Complex. ▪ West – Other commercial activities within the Billingham Chemicals Complex.
Area 2 – BIK-UK	▪ North – The B1275 (Central Avenue) beyond which Project Borealis, the Synthonia Sports Ground, St John the Evangelist Catholic Primary School and residential properties. ▪ East – Project Newton (Offices) located outside the permitted boundary but still part of the FUJIFILM Diosynth Biotechnologies UK Limited operations. ▪ South – Other commercial activities within the Billingham Chemicals Complex. ▪ West – Cowpen Lane beyond which is Billingham South Community Primary School and residential properties.
Area 3 –Borealis	▪ North – The Stockton and Darlington railway line (Durham Coast Line) beyond which is residential housing and Charlton's Pond (Nature Reserve). ▪ East – Synthonia Sports Ground. ▪ South –The B1275 (Central Avenue) beyond which is the existing permitted area. ▪ West – Cowpen Lane beyond which is St John the Evangelist Catholic Primary School and residential properties.

2.3.2 Nearby Sensitive Receptors

The nearest residential areas to the site are on Hereford Terrace, located approximately 45m north of the Borealis site boundary. Table 2.2 and Figure 2.4 below provides the nearest noise sensitive receptors. All sensitive human receptors within 1km of the site are provided in Figure 2.5 below.

Table 2.2 Nearest Noise Sensitive Receptors

Reference	Receptor Name	Category	Distance and Direction
NSR1	1 Hereford Terrace	Residential	45m North

NSR2	13-19 Hereford Terrace	Residential	45m North
NSR3	18-24 Hereford Terrace	Residential	60m North
NSR4	21/23 Hereford Terrace	Residential	40m North
NSR5	29-35 Surrey Terrace	Residential	65m Northwest
NSR6	37-43 Surrey Terrace	Residential	67m Northwest
NSR7	141-143 Stokesley Crescent	Residential	160m West
NSR8	St John The Evangelist Catholic Church	Church	30m West
NSR9	St John The Evangelist Primary School	School	25m West

Environment Agency (EA) H1 and H5 guidance states that the potential impacts of the site should be assessed for the following habitat sites within 10km of the site:

- Special Areas of Conservations (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive;
- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive; and
- Ramsar Sites designated under the Convention of Wetlands of International Importance.

It is also stated that within 2km of the Source:

- Sites of Special Scientific Interest (SSSI) established by the 1981 Wildlife and Countryside Act;
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- Local Wildlife Sites (LWS), County Wildlife Sites (CWS) and potential wildlife sites (PWS);
- Sites of Importance for Nature Conservation (SINC); and
- Ancient Woodland.

Information from the Multi Agency Geographic Information for the Countryside (MAGIC) website (http://magic.defra.gov.uk/) has been used to obtain the above information. The identified designated areas (within the screening distances) are outlined in Table 2.3 below.

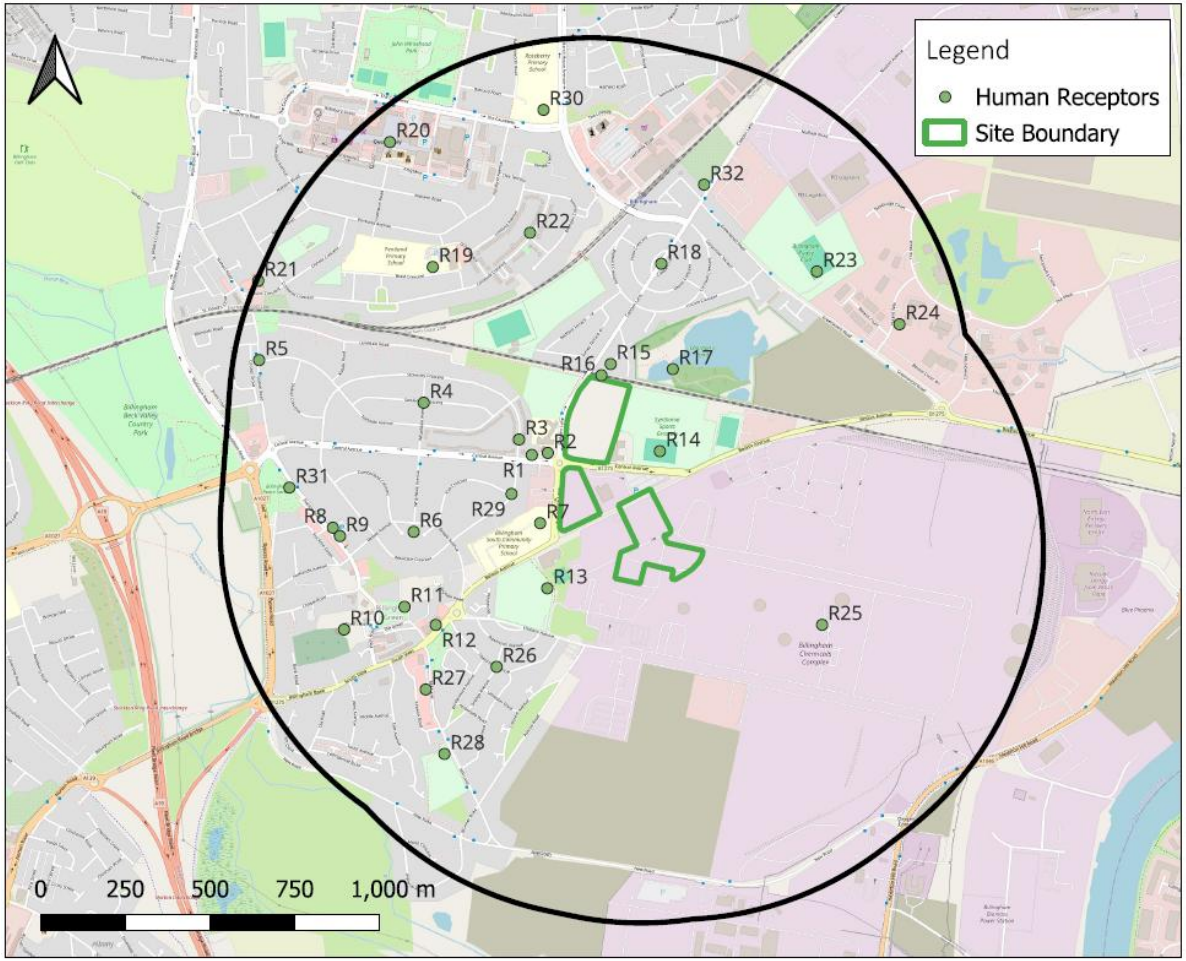
Table 2.3 Designated Sites

Designation	Screening Distance	Description and Status
Ramsar	10 km	Teesmouth And Cleveland Coast (ID: UK11068)
SPA	10 km	Teesmouth And Cleveland Coast (ID: UK9006061)
SAC	10 km	None
Marine Conservation Zone	10 km	None

Designation	Screening Distance	Description and Status
SSSI	2 km	Teesmouth And Cleveland Coast
NNR	2 km	None
LNR	2 km	Charlton's Pond – Charlton's Pond is largely made up of two waterbodies as well as woodland and open-cut grassland. The lake at the site is the largest waterbody in the Borough and includes a restricted area that was designated as a conservation area for birds in 1968. The lake and the smaller pond were originally brick clay extraction pits from the late 1800s. Cowpen Bewley Woodland Country Park – Once a waste disposal site and before that, clay was quarried here and used locally for brick making. It was transformed into a woodland park in the 1990s with the planting of around a quarter of a million trees. Billingham Beck Valley – The low-lying land frequently floods which, in combination with traditional summer hay cutting or grazing, has resulted in a whole host of wildflowers such as meadowsweet, flag iris and valerian. These areas also attract butterflies in the summer, including the meadow brown, common blue and dingy skipper.
Ancient Woodlands	2 km	None
LWS/SINCs	2 km	Air Products Reedbeds (E2 Reedbed) and Norton Bottoms (E2 Reedbed and U1 Urban Grassland).

Due to the proximity of the site to human and ecological receptors, the site could be considered to be moderately sensitive in relation to potential emissions, such as air and noise. However, numerous operational measures for the control and mitigation of emissions have been applied to site to ensure that all potential releases are prevented, therefore reducing this risk.

Figure 2.3 Noise Sensitive Receptors



Project Number: SOL_24_P121_FUJ Doc Ref: Annex A - Site Plans Map Title: Human Receptors - 1km Screening Date: 18/07/2025 Drawn by: RM Checked by: SR	Site Address: Fujifilm Diosynth Biotechnologies Ltd Belasis Avenue Billingha, Stockton on Tees TS23 1YN

1. Do not scale off this drawing
2. All dimensions to be confirmed on site
3. This drawing is copyright of Sol Environment Ltd
4. This drawing is to be read in conjunction with relevant consultant drawings and specifications
5. QMS Reference: QMS_7.5.39_TEM - Template - GIS Drawing - Horizontal v1

ID	Name
R1	Residential (Central Ave)
R2	Place of Worship (Church)
R3	Residential (Stockesley Crescent)
R4	Residential
R5	Residential
R6	Cheeky Monkeys Day Nursery
R7	Billingham South Community Primary School
R8	Place of Worship (Church)
R9	Local Amenities
R10	Place of Worship (Church)
R11	Billingham Green
R12	Local Amenities
R13	Billingham Synthonia Circket Club
R14	Synthonia Sports Ground
R15	Residential (Hereford Terrace)
R16	Railway Line
R17	Charlton's Pond
R18	Residential
R19	Pentland Primary School
R20	Billingham Town Centre
R21	Place of Worship (Church)
R22	Residential
R23	Billingham Rugby Club
R24	Belasis Hall Business Park
R25	Billingham Chemical Complex
R26	Residential
R27	Local Amenities
R28	Open Space
R29	Residential (York Cres/Weardale Cres)
R30	Roseberry Primary School
R31	Billingham Peace Garden
R32	Cowpen Lane Allotment

Figure 2.4 Sensitive Human Receptors within 1km of the site

2.3.3 Wind Direction

The estimated wind direction for the proposed site comes from a predominantly south/south westerly direction, based on historic wind direction recordings taken from the Teeside International Airport located approximately 12.5 km southwest of the site.

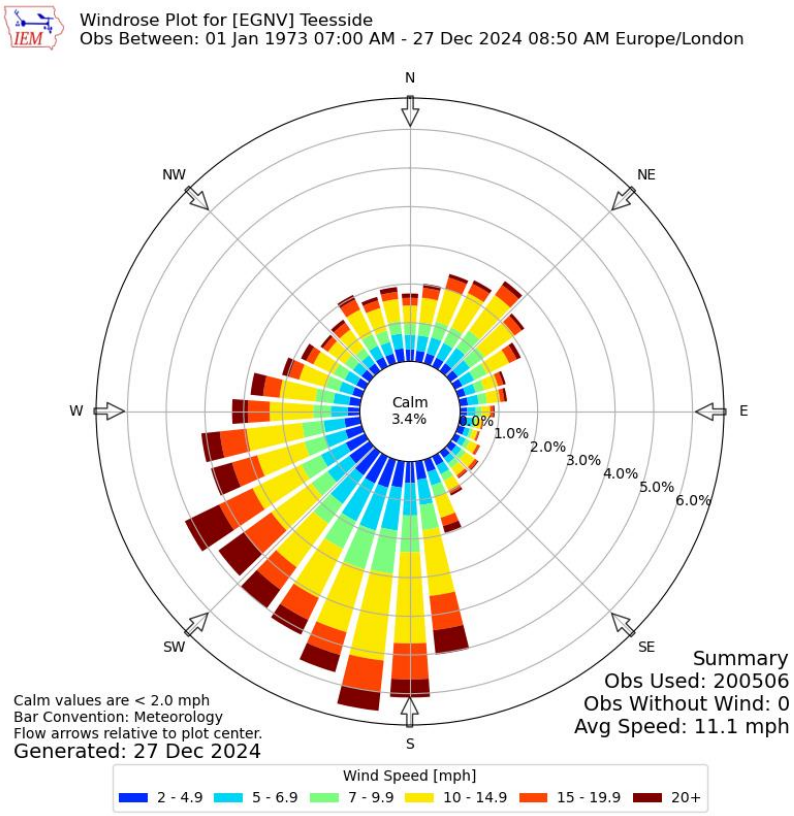


Figure 2.5 Wind Rose for Teesside International Airport (1973 – 2024)

2.3.4 Flood Risk

The site is situated within Flood Zone 1, meaning the site has a low probability of flooding from rivers, as illustrated in Figure 2.7. Flood risk increases to medium between the years 2036 and 2069. This has been accounted for in the site's Environmental and Climate Change Risk Assessment.

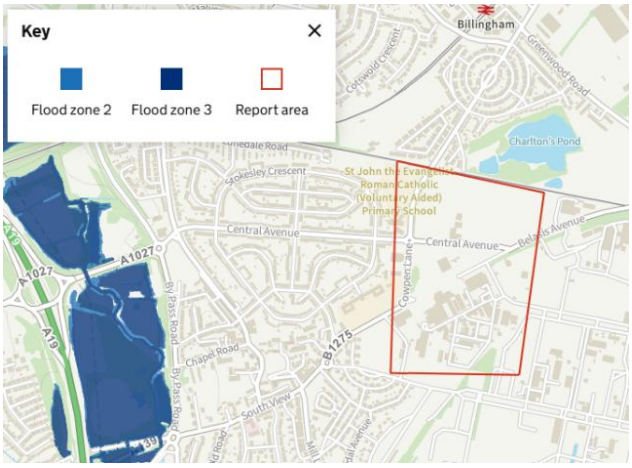


Figure 2.6 Flood Risk Map of the Proposed Site

2.3.5 Site Operational and Public Hours

The site will operate 24 hours, 7 days a week with onsite manufacturing staff typically operating 12-hour shifts that start at 0700 and 1900, respectively.

External vehicle movements associated with deliveries, dispatch and waste collections may occur throughout the operational days (0700 – 1900), although routine logistics activities will generally be scheduled during the period 0830 – 1700, Monday to Friday where practicable.

3. PROCESS DESCRIPTION

Borealis consists of a new biotech manufacturing facility, comprising of production suites, a warehouse for storage, buffer preparation and hold facilities, laboratories, and offices. The facility has an integrated materials warehouse, complete with central raw materials dispensing and solution preparation and storage.

The Borealis facility conducts similar work to the existing manufacturing facilities on site, however, expands capacity by having 2 medium scale lines (5,000 litres each) and 3 small scale lines (2,000 litres each) totalling 16,000 litres capacity. The facility improves safety through closed-process operations using single-use technology. Although Fujifilm do not plan to operate all lines initially, production at the site will be progressively phased depending on commercial demand.

The first stage of the proposed process is cell expansion. Product-producing cells will be thawed and cultivated in 250 / 500 ml shaker flasks. Over a period of around 2 days, the cell concentration is gradually increased. Once the cells reach the capacity of the flask, they are transferred into larger flasks or bioreactors, processing through 20 litre rocking bioreactors and then 50 litre and 500 litre single use bioreactors. This systematic increase allows the efficient build-up of cell biomass, preparing for the final production stage.

The cells are then transferred into a 5,000-litre bioreactor, where the final stage of cell growth occurs. Over 14 days, cell concentration peaks and product synthesis occurs. Post growth, cells are separated from the product using centrifugation and filtration, with the filtered product stored in a harvest tank, ready for downstream processing.

The first stage of downstream processing consists of initial purification. Protein A chromatography uses affinity chromatography to selectively purify the target product. Viral inactivation then deactivates potential viral contaminants in the product solution, followed by depth filtration to eliminate any precipitants. Cation exchange chromatography further purifies the product by separating molecules based on their positive charge characteristics.

The second stage of downstream processing then continues the purification process. Anion exchange chromatography enhances purity by separating molecules with negative charges. Viral filtration employs a membrane filter to remove any remaining viral particles ensuring a safe product.

The final purification and packaging stages include ultrafiltration / diafiltration to concentrate and stabilise the product by removing small impurities and integrating buffer changes. The final product is then prepared for packaging into final fill bags.

All wastewater from the process will be treated via a wastewater treatment plant is initially tankered off site for disposal. Once agreed with the Environment Agency, the effluent will be discharged to sewer (Emission Point S1). The wastewater treatment plant is restricted to treat less than 50 tonnes per day of effluent, which is non-hazardous. This is conducted via the Siemens S7 Control System which can physically restrict the capacity of the plant. It ensures that the plant operates to a defined fixed and set range of parameters.

Except for the emergency generator there are no emissions to air relating to this activity.

4. NOISE SOURCES

The following list of plant/equipment has been identified as potentially noise generating elements on site. Full details, including operational noise modelling input data and sound power levels are provided within the NIA provided within Appendix B. Figure 4.1 below illustrates the location of the potential noise generating elements on site.

Main building – Roof of Level 1, northeastern corner

- Three combined Air Source Heat Pump (ASHP) and Chilled Water Return (CHR) units, each within a Daikin "OPT76b" soundproof system.

Main building – Roof of Level 2, southeastern corner

- One Daikin RZAG-NV1 floor-mounted air conditioning unit serving the Comms Room;
- Two Daikin RZAG-NV1 floor-mounted air conditioning units serving the Cold Room; and
- AHU extract grille from stair core at L2 ceiling level.

Main building – Level 1 northern façade

- Internal Air Compressor Room, housing two Ingersoll Rand "E-Series" oil-free rotary screw compressors (model E160ne-A) for duty and standby operation;
- Transformer room;
- Low-voltage (LV) switch room; and
- Cold water distribution tanks and pump room, comprising three Grundfos "CRIE 1 -3 A-FGJ-A-E- QQE" vertical, multistage E-pumps.

Main building – Level 1 eastern façade

- Room extract exhaust grille from Cryostore; and
- Supply air grille to Cryostore.

Main building – Level 3 western façade

- Fresh air AHU intakes at L3 to facilitate L1 plant internally. This forms a singular "plenum room" along the western façade at L3 with four discrete, louvred openings.

Main building roof

- Four Panasonic R744 CO2 cooling units, serving the cold room;
- Twenty-four Daikin RZAG-NV1 floor-mounted air conditioning units, operating as 12 standby/duty pairs;
- Fourteen penthouse louvres enclosing HVAC exhausts;
- Two Daikin RZAG-NV1 floor-mounted air conditioning units, serving the data centre;
- Nitrogen safety valve exhaust;
- Vaporized Hydrogen Peroxide (VHP) HVAC exhaust;

- Water for injection (WFI) relief vent; and
- Process waste vent.

LWT building

- AHU fresh air inlet and vent / grille at ceiling level on the southern building façade, near the entrance doors;
- Roof relief vents and extract fan discharge flue at roof level, near the northern side of building;
- AHU Exhaust at roof level, near the southern side of building; and
- One Daikin Skyair R32 Alpha cooling unit at ground level against the northern building façade.

Northwest of main manufacturing building

- One diesel backup generator within a shipping container-style enclosure;
- Two firefighting water pumps – one electrical pump and one diesel-powered– located within the pump house; and
- One transformer within a GRP enclosure.

Segregated Waste Pit

- Two extract vents; and
- One relief line.

External (other)

- Heavy Goods Vehicles (HGVs) entering and exiting the site. Two HGV movements have been considered in a given hourly period, accounting for the northern and eastern turning circles, respectively.

4.1 Noise Impact Assessment Conclusion

The NIA for the site concludes:

'With respect to the typical day-to-day operations of the Site, taking account of both the objective assessment methodology and consideration of contextual factors, it is considered that the risk of adverse impact upon the nearest NSRs is low.

Based on the assessment and contextual appraisal, it is concluded that that noise from HGV movements may be audible at NSR2 and NSR4, and can slightly affect the acoustic character of the area on occasion (i.e., in the absence of other noise sources unaffiliated with the Site) but not such that there is likely to be a change in the quality of life.

Regarding the operation of the emergency systems in the northwest corner of the Site, the predicted rating level exceeds the representative background sound level by a margin of up to 20 dB(A) across NSRs 1-6; at this magnitude, the likelihood that the test process generates a significant adverse impact is high. It is understood that plant associated with the emergency systems will be tested for one hour (off-load) every fortnight and one hour (on-load) every three months, equating to 30 hours per year. Testing is to be undertaken within the period 09:00-

17:00, Monday to Friday only, with each plant item to be operational for the minimum period required to ensure normal running temperatures and pressures are achieved and to comply with regulatory requirements.'

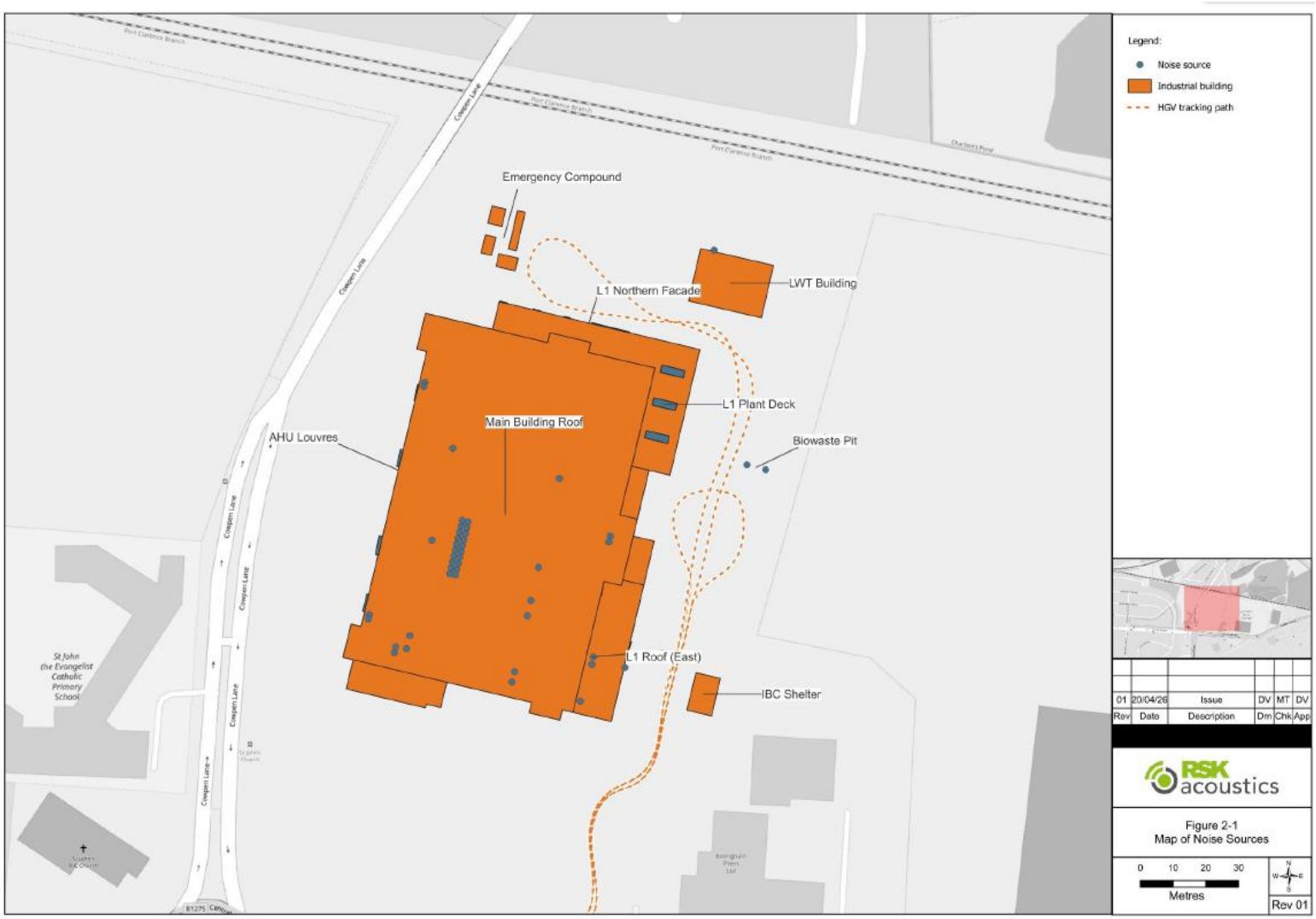


Figure 4.1 Noise Sources

5. MITIGATION MEASURES

5.1 Responsibility of the Noise Management Plan

Responsibility for the implementation of this NMP falls to the competent Borealis Operational Manager. The Site Manager is responsible for ensuring all staff are trained in the contents of this management plan and that operational procedures align with the objectives of this management plan.

5.2 Noise Impact Assessment Mitigation Requirements

All processing activities take place within fully enclosed buildings and are inherently quiet in their operation. However, further mitigation measures have been implemented on site. The mitigation measures described in the NIA are detailed below in Section 5.3, Table 5.1.

Staff receive training in all procedures relating to noise emissions and management techniques specific to their role.

All staff and contractors working on site are made aware of the contents of this NMP to ensure that all individuals present are working to reduce or eliminate potential noise emissions as far as reasonably practicable. The staff training is regularly refreshed, particularly in the event of non-compliance events or noise exceedances.

5.3 Best Available Techniques

Table 5.1 below details the noise abatement measures that have been implemented on site and how they meet BAT.

Table 5.1 Mitigation in place to achieve Best Available Techniques

Noise Source	Process Overview	Operational Frequency	Mitigation Currently Implemented	Relevant BREF/BAT Reference	Subjective contribution to Offsite Receptors	BAT Implemented	Additional Requirements
Diesel water pump	To be used in the event of a combined fire and electrical outage i.e if mains electricity is not available to power the electrical water pump.	Intermittent testing Emergency scenarios	Plant will be tested for one hour off-load every fortnight and one hour on-load every three months, equating to 30 hours per year. Testing to be undertaken within the period 09:00-17:00, Monday to Friday only. Each plant item to be operational for up to 30 minutes during testing only. [1]	BAT 23 b. operational measures	High	Yes	Discussions underway to determine test durations less than 30mins per plant item can be achieved. However this may not be practicable to ensure normal running temperatures and pressures are met.
Diesel generator	To be used in the event of an electrical outage.						
HGV movements	Use of third party HGV's for material delivery and/or collection.	Intermittent; daytime hours only	On-site HGV operations to be undertaken during the daytime only and not during the most sensitive time period. i.e., night-time.	BAT 23 b. operational measures	High	Yes	No further action required.
AHU intake louvres (L3 western façade)	Fresh air intakes for ventilation purposes serving the process rooms.	Continuous	Large plenum size reduces static pressure and subsequent turbulent airflow,	BAT 23 c. Low-noise equipment	Medium	Yes	No further action required.

			therefore reducing noise level at the point of the intake.				
Transformer room (L1 northern façade)	Electrical transformer to power the Site.	Continuous	Internal reverberant level within transformer room measured at 63 dB LAeq,T.	BAT 23 c. Low-noise equipment	Low	Yes	No further action required.
DX Cooling Unit (LWT building, northern façade)	Air conditioning outdoor unit for the LWT building.	Continuous	Daikin SkyAir Alpha series is designed for low-noise operation.	BAT 23 c. Low-noise equipment	Low	Yes	No further action required.
Biowaste Pit (East)	Extract vent for the biowaste pit.	Continuous	Biowaste pit is located to the east of the main manufacturing building (a minimum of 100 m from the nearest NSRs) and is screened by either the main manufacturing building or the LWT building.	BAT 23 a. Appropriate location of equipment and buildings	Low	Yes	No further action required.
Compressor room (L1 northern façade)	Houses compressors for temperature control.	Continuous	Ingersoll Rand E-Series compressor is designed for low noise.	BAT 23 c. Low-noise equipment	Low	Yes	No further action required.
Cold water distribution tanks and pumps (L1 northern façade)	To store, and increase pressure of, water used on site.	Continuous	Variable speed pump, allowing for quieter operation when demand is low.	BAT 23 c. Low-noise equipment	Low	Yes	No further action required.
L3 plant compound (main building roof)	Contains direct expansion (DX) cooling units, CO_2 cooling units and exhaust louvres for internal HVAC systems, in order to maintain	Continuous	External plant and flues are located away from the roof edge where practicable, to reduce line-of-sight between sources and NSRs. Equipment that displays tonal components are	BAT 23 a. Appropriate location of equipment and buildings	Low	Yes	No further action required.

	temperature control within the main manufacturing building.		oriented in such a way that they face away from NSRs.				
			Panasonic R744 units are designed for low-noise operation. Daikin SkyAir Alpha series is designed for low-noise operation.	BAT 23 c. Low-noise equipment	Yes	No further action required.	Panasonic R744 units are designed for low-noise operation. Daikin SkyAir Alpha series is designed for low-noise operation.
			Roof-mounted flues are fitted with a penthouse-style louvred enclosure to minimise the spread of noise emissions to the atmosphere.	BAT 23 d. Noise and vibration control equipment	Yes	No further action required.	Roof-mounted flues are fitted with a penthouse-style louvred enclosure to minimise the spread of noise emissions to the atmosphere.
Air source heat pump / chiller units (L1 roof plant compound)	Used to regulate temperature and humidity.	Continuous	Proprietary sound enclosures by manufacturer.	BAT 23 d. Noise and vibration control equipment	Low	Yes	No further action required.
LV switch room	Contains switchboards to distribute electrical power throughout the building. Includes fan systems for temperature control.	Continuous	Internal reverberant level within transformer room measured at 63 dB LAeq,T.	BAT 23 c. Low-noise equipment	Low	Yes	No further action required.
HVAC units (internal)	To maintain required cleanroom environmental conditions (air cleanliness,	Continuous	Equipment housed internally within the main manufacturing building.	BAT 23 a. Appropriate location of equipment	Not expected to be audible outside of	Yes	No further action required.

	pressure, temperature and humidity).			and buildings	site boundary		
Centrifuges	To separate cells/solids from liquid during harvest and clarification prior to downstream purification.	Continuous	Equipment housed internally within the main manufacturing building.	BAT 23 a. Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required.
Recirculation skids	To concentrate and filter product before fill.	Continuous	Equipment housed internally within the main manufacturing building.	BAT 23 a. Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required.
Bioreactor agitation systems	To keep cells suspended and ensure uniform conditions during growth and production.	Continuous	Equipment housed internally within the main manufacturing building.	BAT 23 a. Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required.
Shakers / rockers	To provide controlled mixing / aeration.	Continuous	Equipment housed internally within the main manufacturing building.	BAT 23 a. Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required.
Chromatography skids	Uses system pumps, valves and mixers to separate target	Continuous	Equipment housed internally within the	BAT 23 a. Appropriate	Not expected to be audible	Yes	No further action required.

	product from impurities.		main manufacturing building.	location of equipment and buildings	outside of site boundary		
General transfer pumps	To move process fluids between vessels and unit operations in a sterile manner.	Continuous	Equipment housed internally within the main manufacturing building.	BAT 23 a. Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required.

Notes

[1] Note that the calculation model assumes consistent operation for both diesel pump and generator throughout the reference interval, and no “on-time” correction is applied in the assessment for this scenario. On the basis that each item will be operating for 30 minutes only within a given hourly period, a 3 dB reduction per source can be expected.

6. MONITORING AND COMPLAINTS

A noise management program will be implemented on-site, which will consist of checks by site staff to ensure that off-site noise impacts cannot be determined at the key receptors identified in this management plan, and noise mitigation measures are adequate in preventing excessive noise.

All operational staff will be responsible for reporting any noise problems immediately to the Site Manager.

Any environmental, health or safety incident, or potential incident, is recorded through an electronic Accident, Incident Management System (AIMS).

6.1 Monitoring and Maintenance

Due to the limited potential for noise emissions from site operations, the noise monitoring on site will consist of weekly checks of all infrastructure. All plant and equipment will be inspected to ensure all are in good working order and no damage, nor wear-and-tear, will result in noise impacts at the identified sensitive receptors. Site operatives will also be vigilant for potential noise elevations throughout operations.

Planned preventative maintenance of all plant and equipment will reduce the potential for elevated noise levels from operating equipment. If any defect is identified, repairs will be undertaken immediately. The site will also regularly inspect the building fabric for signs of damage that may result in noise emissions not being effectively mitigated. Upon detection of any signs of damage, the building fabric will be repaired as soon as reasonably possible to prevent prolonged excessive noise emissions.

Any changes in activities, plant items or processes that have the potential to affect noise levels will be highlighted and investigated further.

All noise monitoring and maintenance records will form part of the company's EMS.

6.2 Neighbour Engagement

If an action is being considered that has the potential to cause temporary noise impacts (however small) outside of the normal operational procedures, then the Local EA area team will be informed in advance. Neighbours who may be affected will be contacted to advise them of the operation being undertaken, and that any increase in noise will be of a temporary nature.

In addition, the site will engage with the local community in order to mitigate against negative site perception. The site management will operate a publicly accessible website, whereby contact information is published so that the public remains informed and is provided with a means of contacting the site if necessary.

In the event of a complaint received from the public, FDBK will operate in accordance with the dedicated complaints procedure as outlined in the section 6.3 below.

6.3 Complaints

A complaints investigation procedure is in place to ensure that any noise complaints are investigated efficiently. In the event of a noise complaint on site, the following complaint procedure will be implemented, and all external communications will be logged and recorded in writing. The complaints procedure is to be conducted by the trained Borealis Operational Manager.

An Environmental Complaint Report Form will be completed as soon as the complaint is received. A copy of the form is provided within Appendix A.

When a complaint is received the following details will be logged:

- Date and time of complaint;
- Weather conditions (including wind speed/direction);
- Complainants name;
- Complainants contact details;
- Nature of complaint; and
- Additional details if required, location of complaint in proximity to the site, frequency of nuisance if necessary.

In the event of a noise complaint, operations on site will be assessed and the complaint investigated. The investigation will include:

- Identifying the noise source;
- Obtaining all operational details;
- Obtaining weather data;
- Witness logs from members of staff; and
- Consideration to any off-site contributors.

The Borealis Operational Manager will ensure that the complaint is investigated to identify the cause. To conclude the complaints procedure, direct communication with the complainant will be made to communicate the results of the investigation and actions taken as appropriate.

If the complaint is validated, it will be treated as an exceedance of the control level. The outcome of the investigation will determine the corrective actions to be implemented.

The management plan will be reviewed and updated if necessary, following every formal noise complaint to ensure its continued suitability in reducing and mitigating noise impacts on nearby receptors.

7. SUMMARY AND CONCLUSION

This NMP has been prepared in accordance with EA guidance "*Noise and Vibration Management: Environmental Permits*".

This NMP identifies all the primary sources of noise from the operations at the site and details the proposed noise prevention or minimisation measures implemented on site in accordance with appropriate measures and BAT.

This NMP will be implemented and maintained at the site as part of the company's EMS. This management plan will undergo regular reviews to ensure its continued suitability and will be reviewed following any formal noise complaints received.

This document is a "live" document and may be subject to change. In the event of any changes, all relevant staff will be informed of any necessary updates to ensure operations are conducted in accordance with this management plan to reduce noise impacts.

APPENDIX A FDBK COMPLAINTS FORM

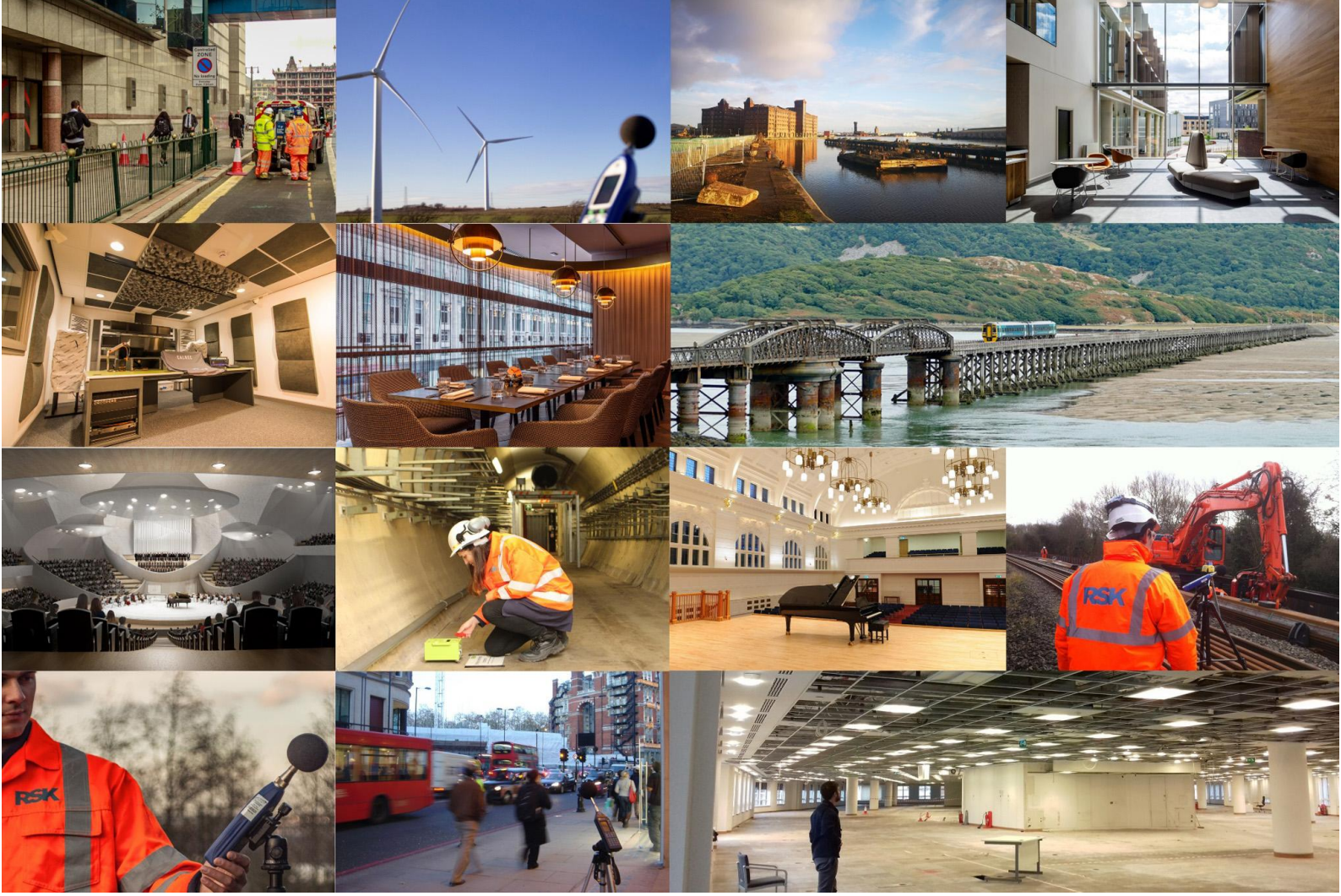
NOISE COMPLAINT REPORT FORM	
Time and date of complaint:	
Name and address of complainant:	
Telephone number of complainant:	

Date of noise:	
Time of noise:	
Location of noise, if not at above address:	
Weather conditions (i.e., dry, rain, fog, snow):	
Temperature (very warm, warm, mild, cold or degrees if known):	
Wind strength (none, light, steady, strong, gusting):	
Wind direction (e.g. from NE):	
Complainant's description of noise:	
Intensity:	
Duration (time):	
Constant or intermittent in this period:	
Does the complainant have any other comments about the noise?	
Are there any other complaints relating to the installation, or to that location? (either previously or relating to the same exposure):	
Any other relevant information:	
Do you accept that noise likely to be from your activities?	
What was happening on site at the time the noise occurred?	
Operating conditions at time the noise occurred (e.g. flow rate, pressure at inlet and pressure at outlet):	

Actions taken:

Form completed by:	Date:	Signed;

APPENDIX B FDBK NOISE IMPACT ASSESSMENT



NOISE IMPACT ASSESSMENT FOR ENVIRONMENTAL PERMIT

PROJECT BOREALIS

Fujifilm Diosynth Biotechnologies UK Ltd c/o Sol Environmental Ltd

2064003-RSKA-RP-001-(02)

RSK acoustics

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General notes

Project Name:	Project Borealis
Title:	Noise Impact Assessment for Environmental Permit
Site Location:	Central Avenue, Billingham
Permit Number:	EPR/BJ8987IQ/V007
Client:	Fujifilm Diosynth Biotechnologies UK Ltd c/o Sol Environmental Ltd
Client Contact:	Sophie Rainey
Issue Date:	23 April 2026
Report No.	2064003-RSKA-RP-001-(02)

Revision:	**Description:**	**Author(s):**	**Reviewer:**	**Date:**
01	Draft for Comment	Daniel Vallis	Matthew Thomson	20 April 2026
02	Minor Updates	Daniel Vallis	Matthew Thomson	23 April 2026

Author(s):	Daniel Vallis BSc (Hons) CEnv MIOA MIEnvSc Principal Acoustic Consultant	Technical reviewer:	Matthew Thomson BSc (Hons) MSc MIOA Associate Director
Signature:		Signature:	
Date:	22 April 2026	Date:	22 April 2026

Executive Summary

RSK Acoustics Ltd has undertaken a Noise Impact Assessment (NIA) on behalf of Fujifilm Diosynth Biotechnologies UK Ltd to support a substantial Environmental Permit variation for their operations in Billingham, Teesside. In particular, the NIA relates to Project Borealis, a new biotech manufacturing facility to the north of Central Avenue. The assessment considers noise emissions from the proposed development and their potential impact on nearby noise-sensitive receptors, in accordance with the principles of BS 4142:2014+A1:2019.

Baseline noise conditions were established from unattended noise monitoring undertaken in May 2023 at representative receptor locations, prior to construction of the development taking place. Following completion of the development, attended noise surveys were carried out in March 2026 to quantify and characterise operational plant items. These data informed a detailed noise prediction model, which was used to assess predicted noise levels at nearby receptors under three scenarios: typical daytime operation (including movement of heavy goods vehicles on site), continuous 24-hour operation of fixed plant, and a testing process of the diesel fire pump and backup generator to be used in the event of an emergency power outage and/or fire.

For typical day-to-day operations, predicted rating levels are generally below representative background sound levels, with the background level being exceeded by up to 6 dB(A) during periods in which external HGV movements are taking place. Taking account of both the objective assessment results and contextual factors, routine operation of the site is not expected to give rise to significant adverse noise impacts. Intermittent daytime HGV movements may be audible at some receptors but are unlikely to materially alter the acoustic environment or adversely affect residential amenity.

Assessment of the emergency testing scenario indicates that operation of the diesel fire pump and backup generator could result in rating levels exceeding background by up to approximately 20 dB at some nearby residential receptors. It is understood that plant associated with the emergency systems will be tested for one hour (off-load) every fortnight and one hour (on-load) every three months, equating to 30 hours per year. Testing is to be undertaken within the period 09:00-17:00, Monday to Friday only, with each plant item to be operational for the minimum period required to ensure normal running temperatures and pressures are achieved and to comply with regulatory requirements.

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1 Introduction

Instruction and objectives

1.1 RSK Acoustics Ltd ("the Consultant") has been instructed by Fujifilm Diosynth Biotechnologies UK Ltd ("the Applicant") to undertake a noise impact assessment to support an environmental permit variation application at their operational site in Billingham, Teesside.

1.2 The applicant is pursuing a Substantial Permit Variation application in relation to a series of amendments associated with both their existing operations to the south of Central Avenue and the new manufacturing facility to the north. Following discussions with the Environment Agency (EA) Permitting Officer, it was agreed that the scope of this noise impact assessment would be limited to this new facility.

Site description

1.3 The development comprises a new-build three storey multi-platform biotech manufacturing facility on the former Billingham Synthonia Football Club site, capable of manufacturing mAbs, mRNA, Viral, Plasmid and Cell & Gene Therapy products. In addition, one ancillary building is constructed to the north of the main building to house the Liquid Waste Treatment (LWT) plant. A gatehouse is to be situated to the east of the main building.

1.4 The facility is intended to operate continuously on a 24-hour basis, 365 days per year, with on-site staff typically working 12-hour shifts that start at 07:00 and 19:00, respectively.

1.5 Manufacturing operations, utilities, warehouse activities, and associated support functions will therefore be operational at all times. The facility will be staffed by an operations shift team working a continuous 24/7 shift pattern, supported by a management and administrative team working standard weekday hours.

1.6 Building services and utilities required to support the continuous manufacturing operation, including heating, ventilation, air conditioning (HVAC), lighting, and other building management systems, will operate continuously as required to maintain environmental conditions within the facility.

1.7 External vehicle movements associated with deliveries, dispatch, and waste collection may occur throughout the operational day (07:00-19:00 daily), although routine logistics activities will generally be scheduled during the period 08:30-17:00 Monday to Friday where practicable.

History of complaints

1.8 Not applicable for this assessment. The Site in question is newly built, so no complaints history exists.

Previous noise impact assessments

1.9 Not applicable for this assessment. The Site in question is newly built, so no previous noise impact assessments have been undertaken in support of an environmental permit.

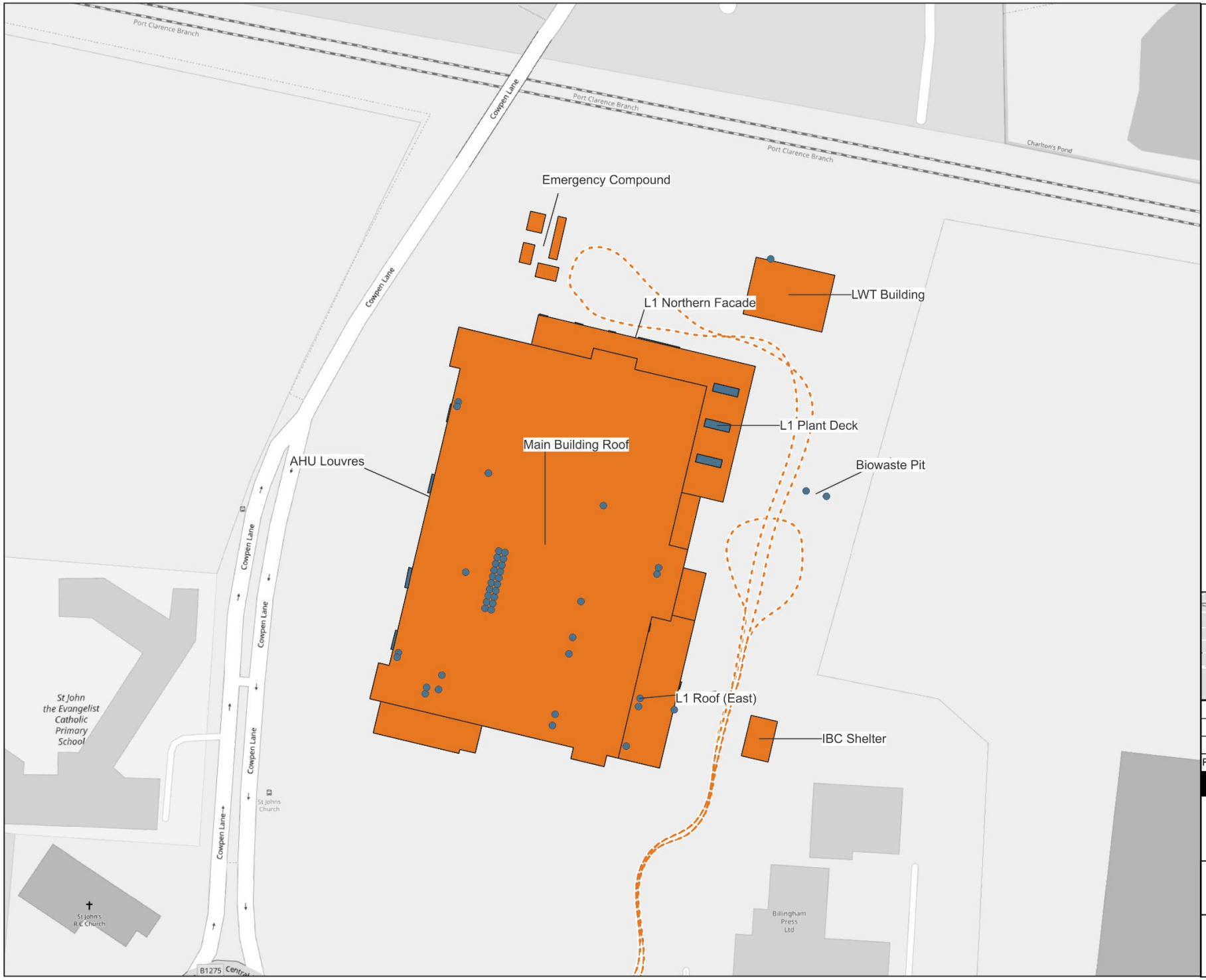
Site changes since last systematic assessment

1.10 See above.

2 Assessment Locations

Site noise sources

2.1 A map of the primary noise sources at the site for use within this assessment is shown in Figure 2-1; details of the noise sources are included in Section 5.



Legend:

- Noise source
- Industrial building
- HGV tracking path

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01	20/04/26	Issue	DV	MT	DV

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Figure 2-1
Map of Noise Sources

0 10 20 30
Metres

N W E S

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Noise-sensitive receptors

2.2 The following Noise Sensitive Receptors (NSRs) have been identified as being the closest and/or most exposed to the development site.

Table 2-1 Noise-sensitive receptors

Ref.	Name	Receptor Type	Eastings; Northings	Distance from Development
NSR1	1 Hereford Terrace	Residential	446577; 523104	45 m (North)
NSR2	13-19 Hereford Terrace	Residential	446550; 523114	45 m (North)
NSR3	18-24 Hereford Terrace	Residential	446533; 523129	60 m (North)
NSR4	21/23 Hereford Terrace	Residential	446530; 523111	40 m (North)
NSR5	29-35 Surrey Terrace	Residential	446476; 523145	65 m (NW)
NSR6	37-43 Surrey Terrace	Residential	446453; 523138	67 m (NW)
NSR7	141-143 Stokesley Crescent	Residential	446283; 523012	160 m (W)
NSR8	St John The Evangelist	Church	446374; 522881	30 m (W)
NSR9	St John The Evangelist Primary RC	School	446381; 522928	25 m (W)

Monitoring positions

Unattended monitoring

2.3 A baseline noise survey was undertaken from Thursday 04 May 2023 to Tuesday 09 May 2023, prior to construction of the development. Two unattended measurement positions (MPs), hereby referred to as MP1 and MP2, were utilised over midweek and weekend periods to obtain ambient and background noise levels at locations representative of the nearest NSRs.

2.4 Details of the MPs are shown in Table 2-2 below; photographs of the noise monitoring equipment in-situ are displayed in Table 2-3.

Table 2-2 Noise monitoring positions – unattended baseline survey

Monitoring position	Eastings; Northings	Represented NSRs
MP1	446567; 523095	NSR1 to NSR6
MP2	446378; 522982	NSR7 to NSR9

Table 2-3 Site photographs

Reference	Photographs
MP1	 
MP2	 

2.5 The measurement locations were selected with consideration to the site constraints, security of the monitoring equipment and accessibility of the position with the intention of quantifying noise from surrounding sources that form the residual acoustic environment.

2.6 Following a consultation process with the EA permitting officer in early 2026, it was agreed that no major changes to the surrounding area have taken place, such that it would have materially affected the baseline acoustic environment; on this basis, it was concluded that the measurement data and analysis undertaken in 2023 would remain valid and no further baseline survey would be required.

Attended monitoring

2.7 In addition, attended noise monitoring was undertaken on 26 March 2026 to quantify the operations associated with the Site. All measurements were undertaken at 1 m from either the plant item in question, unless otherwise noted, and for a duration of one minute. A description of each measurement location is provided in Table 2-4.

Table 2-4 Attended measurement positions and details

ID	Description
Backup generator & fire water pump area	
L620	Fire fighting water pumps - Electric pump (South)
L621	Fire fighting water pumps - Electric pump (East)
L622	Fire fighting water pumps - Electric pump (West)
L623	Fire fighting water pumps - Diesel pump (South)
L624	Fire fighting water pumps - Diesel pump (East)
L625	Fire fighting water pumps - Diesel pump (West)
L626	Diesel backup generator (West)
L627	Diesel backup generator (East)
L628	Diesel backup generator (North)
Northern Façade	
L629	Transformer room (internal)
L630	Transformer room (external - 1m from door & façade)
L631	LV Switch room (internal)
L632	LV Switch room (external - 1m from door & façade)
L633	Compressor room (internal)
L634	Compressor room (external - 1m from louvres)
Segregated Waste Pit	
L638	Extract vents & relief lines (west)
L639	Extract vents & relief lines (north)
Liquid Waste Building	
L636	Internal waste pumps
L641	Roof relief vents / extract fan discharge (10m away)
L642	Roof relief vents / extract fan discharge (5m away)
L643	AHU Exhaust
Eastern Façade	
L644	Room extract exhaust from Cryostore
Main Building - Roof	
L646	DX Cooling unit (East)
L647	DX Cooling unit (West)
L648	Penthouse louvre - HVAC exhaust (east)
L649	Penthouse louvre - HVAC exhaust (west)
L650	Penthouse louvre - HVAC exhaust (north)
L651	Penthouse louvre - HVAC exhaust (south)
L652	CO_2 cold room cooling unit (east)
L653	CO_2 cold room cooling unit (south)
L654	CO_2 cold room cooling unit (north)

ID	Description
West Façade	
L655	HVAC fresh air intake louvre (1 intake)
L658	HVAC fresh air intake louvres (2 intakes)
L1 Roof (southeast)	
L659	DX cooling unit for comms room (east)
L660	DX cooling unit to L1 cold room (east)
L1 Roof (northeast)	
L662	Air source heat pumps & chiller (south)
L663	Air source heat pumps & chiller (north)
L664	Air source heat pumps & chiller (east)

2.8 The following points are worthy of note:

- Cold water distribution tanks & pumps (L1 of main manufacturing building, northern façade). Measurements were unable to be taken as the on-site conditions meant that the equipment was not operable. Noise emissions from this room have instead been derived from manufacturer's data for the pumps installed.
- AHU fresh air inlet and vent (southern façade of LWT building). No measurements were taken as noise was inaudible at 1 m from the source, with road traffic noise remaining the dominant noise source.
- DX cooling unit to rear (northern façade of LWT building). Not measured as the unit is identical to the DX cooling units previously measured (records L646 and L647).
- Supply air to cryostore AHU and AHU extract from stair core (L1 of main manufacturing building, eastern façade). Unable to measure due to ground obstacles and limitations with the mobile elevated work platform, resulting in the surveyor not being able to measure close to the source. These sources have instead been included in the calculation model by replicating record L644 "Room extract exhaust from Cryostore".
- DX cooling to data centre (L3 roof of main manufacturing building). Not measured as the unit is identical to the DX cooling units previously measured (records L646 and L647)
- CO_2 cold room cooling unit (L3 roof of main manufacturing building)- no measurements were taken at the western façade of the unit as noise was inaudible at 1 m from the source, with road traffic noise remaining the dominant noise source
- PV Panel inverters (L3 roof of main manufacturing building). Not running due to current operational building condition.
- Nitrogen safety valve / WFI relief valve (L3 roof of main manufacturing building). Not measured as these is only used in emergency scenarios, to prevent overpressure in tanks and piping. As such, it is not possible to manufacture a scenario for the purpose of noise measurement.
- VHP - HVAC exhaust and process waste vent (L3 roof of main manufacturing building). No measurements were taken as noise was inaudible at 1 m from the source, with road traffic noise remaining the dominant noise source.

Other items

2.9 A map, covering the study area within this assessment, is provided in Figure 2-2 overleaf. This displays the Site Boundary for the activities under consideration alongside the NSRs and MPs described in the previous sections.

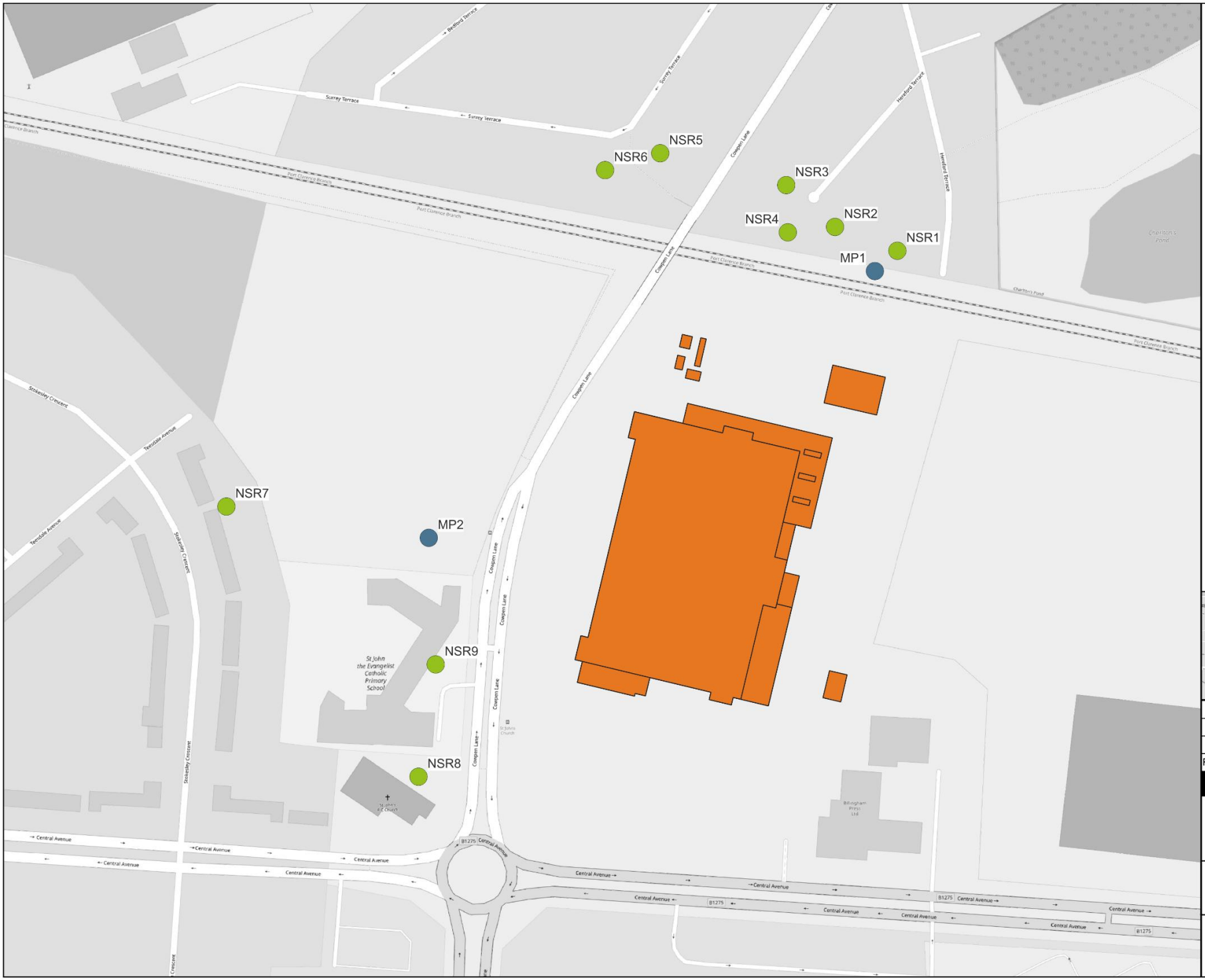
Buildings

2.10 The Site includes four discrete structures:

- The main manufacturing building;
- The liquid waste treatment (LWT) building;
- The intermediate bulk container (IBC) shelter; and
- The standby generator and pump compound.

Ground Type/Cover

2.11 The site and surrounding area are urban in nature and comprise hard ground throughout.



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01	20/04/26	Issue	DV	MT	DV

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Figure 2-2
Map of noise-sensitive properties and monitoring positions

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3 Equipment and Meteorology

Monitoring equipment

3.1 The equipment used to carry out the surveys undertaken by the Consultant is presented in Table 3-1:

Table 3-1 Noise monitoring equipment

Equipment	Type	Serial number	Calibration due
Baseline Survey – May 2023			
Class 1 Sound Level Meter	01dB FUSION	14024	15/06/23 [1]
Class 1 Sound Level Meter	01dB FUSION	14922	15/06/23 [1]
Acoustic calibrator	Rion NC-74	34615260	25/04/23 [1]
Attended Survey – March 2026			
Class 1 Sound Level Meter	Svantek SV971	111622	23/05/26
Acoustic calibrator	Rion NC-75	34391438	29/07/26
Notes [1] Equipment within calibration interval at the time of survey			

3.2 All measurements for the unattended baseline survey were undertaken with the microphone positioned away from reflecting surfaces, considered to be under free-field measurement, to the requirements of BS 7445-1:2003.

3.3 The calibration of each sound level meter was checked before and after the measurements, using the acoustic calibrator at 94 dB at 1 kHz; no significant calibration drift was noted (+/- 0.3 dB).

3.4 The sound level meters used conform to the Class 1 requirements of BS EN 61672-1: 2013 'Electroacoustics. Sound level meter, Specifications' and the calibrators used conform to the requirements of BS EN 60942: 2018 'Electroacoustics, Sound calibrators.' The equipment used has a calibration history that is traceable to a certified calibration institution.

Meteorological conditions

3.5 Weather conditions during the unattended measurement period were obtained from Wunderground (www.wunderground.com), using the weather station closest to the measuring locations (with available historical data), which was judged to be at the 'Cleveland Site' station (IBILLI48), approximately 1.4 km to the southwest of the site.

3.6 The weather information has been summarised in Table 3-2.

Table 3-2 Unattended noise survey weather conditions

Date	Temperature (°C)		Wind speed (m/s)		Prevailing wind direction	Precipitation (mm)	
	High	Low	Average	Max		Highest	Accumulation
04/05/23	13	7	2	4	ENE	1.5	2.8
05/05/23	19	8	1	3	NE	0.8	3.1
06/05/23	20	9	1	4	SW	1.3	4.6
07/05/23	19	10	1	4	NE	0.3	0.8
08/05/23	16	11	2	5	SSW	1.5	3.8
09/05/23	18	13	2	4	SW	4.6	6.4

3.7 Noise data measured during any period where notable rainfall was recorded, or any period in which average wind speeds exceeded 5 m/s has been excluded from the dataset; this is shown graphically in Figure 5-5 and Figure 5-6 further in this report.

Software used to predict noise levels

3.8 A computer noise model of the site has been produced using SoundPLAN v9.1 based on site layout information provided by the Applicant, with consideration of the positioning/orientation of all buildings and structures. Input data in the form of noise emission levels have been assigned to the proposed plant, adjusted to the geometry and nature of the operations for the Site.

3.9 The noise predictions (specific sound levels at NSRs) are based on British Standard and International Standard BS ISO 9613-2:2024 '*Attenuation of sound during propagation outdoors – Engineering method for the prediction of sound pressure levels outdoors* '.

3.10 The BS ISO 9613-2 method predicts noise levels under meteorological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

3.11 The noise prediction method described in ISO 9613 is suitable for a wide range of engineering applications where the noise level outdoors is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;
- Reflection from surfaces, and
- Screening by obstacles, barriers and buildings.

4 Methodology

British Standard (BS) 4142:2014+A1:2019

4.1 BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' describes the methods for rating and assessing noise of an industrial or commercial nature. The standard is applicable for the purpose of assessing sound from multiple sources at existing dwellings, including the following:

- Sound for industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from the premises or processes, such as that from forklift trucks, or that from train of ship movements on or around an industrial and/or commercial site.

4.2 Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment. The difference between the background noise level and the noise rating (including any penalties) is then calculated.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

4.3 As indicated above, the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. BS4142 states that:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context".

4.4 Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level;
- The character and level of the residual sound; and
- The sensitivity of the receptor and whether dwellings will already (or likely) to incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
  - façade insulation treatments;
  - ventilation and/or cooling; and
  - acoustic screening.

5 Noise Monitoring Data and Prediction

Noise survey results summary

Unattended monitoring

5.1 A summary of the measured noise levels is presented in Table 5-1 and Table 5-2. To display a summarised dataset within this section only, the following methods have been used:

- Ambient levels, dB $L_{Aeq,\,T}$, are calculated via logarithmic average of contiguous 15-minute records across the periods being assessed;
- Statistical values, dB $L_{A10,\,T}$ and $L_{A90,\,T}$, are calculated via arithmetic average of contiguous 15-minute records across the periods being assessed;
- Maximum levels, dB L_{AFMax}, are summarised as the highest individual $L_{AFmax,15min}$ recorded across each period being assessed; and
- All values have been rounded to the nearest decibel.

Table 5-1 Summary of noise measurements – UL1

Date	Time period (hh:mm)	Measured Noise Levels, dB(A)			
		$L_{Aeq,T}$	$L_{AFmax,T}$	$L_{A90,T}$	$L_{A10,T,}$
04/05/23	15:00-23:00	58	77	50	56
	23:00-07:00	52	73	47	52
05/05/23	07:00-23:00	61	82	53	61
	23:00-07:00	52	73	48	52
06/05/23	07:00-23:00	54	86	47	55
	23:00-07:00	52	80	45	52
07/05/23	07:00-23:00	60	85	45	56
	23:00-07:00	51	69	46	51
08/05/23	07:00-23:00	56	79	49	56
	23:00-07:00	54	86	46	51
09/05/23	07:00-14:45	64	90	54	63

Table 5-2 Summary of noise measurements – UL2

Date	Time period (hh:mm)	Measured Noise Levels, dB(A)			
		$L_{Aeq,T}$	$L_{AFmax,T}$	$L_{A90,T}$	$L_{A10,T,}$
04/05/23	15:00-23:00	60	87	52	62
	23:00-07:00	56	84	45	56
05/05/23	07:00-23:00	61	85	53	64
	23:00-07:00	53	71	46	55
06/05/23	07:00-23:00	58	92	47	60
	23:00-07:00	51	71	43	54
07/05/23	07:00-23:00	56	82	45	60
	23:00-07:00	51	71	44	53

Date	Time period (hh:mm)	Measured Noise Levels, dB(A)			
		$L_{Aeq,T}$	$L_{AFmax,T}$	$L_{A90,T}$	$L_{A10,T,}$
08/05/23	07:00-23:00	58	74	48	61
	23:00-07:00	54	75	44	53
09/05/23	07:00-14:15	61	89	55	64

Attended monitoring

Summaries of the attended measurements are provided in Table 5-3 below:

Table 5-3 Summary of attended measurements

ID	Start Time, hh:mm:ss	Average Level per Octave Band, dB $L_{Zeq,T}$									Sum, dB $L_{Aeq,T}$
		31.5	63	125	250	500	1k	2k	4k	8k	
L620	09:50:50	66	76	73	77	75	73	73	68	63	79
L621	09:52:04	66	68	73	71	70	67	66	63	57	73
L622	09:53:22	73	79	72	74	73	68	68	63	59	75
L623	09:56:46	81	91	87	98	92	90	88	85	80	95
L624	09:57:54	86	102	97	93	93	91	89	88	85	97
L625	09:59:10	76	81	84	86	90	84	83	80	76	91
L626	10:03:00	89	97	95	90	89	81	75	68	65	89
L627	10:04:28	88	100	95	90	86	78	75	70	65	87
L628	10:06:12	87	95	95	86	76	72	64	61	55	83
L629	10:12:34	56	56	65	66	63	58	45	42	40	63
L630	10:15:12	62	62	61	63	61	57	49	47	39	62
L631	10:20:16	59	52	51	52	54	49	51	47	39	57
L632	10:22:08	59	57	53	52	50	51	52	50	43	57
L633	10:27:12	58	58	55	58	53	46	46	41	34	55
L634	10:30:18	58	57	55	52	48	50	46	40	33	54
L635	10:46:08	64	60	60	77	62	58	55	56	59	69
L636	10:47:08	59	58	60	79	59	57	52	54	55	68
L637	10:47:12	58	56	58	63	67	63	60	57	51	69
L638	10:59:56	64	60	68	64	64	61	56	45	39	65
L639	11:01:34	64	61	72	68	67	64	59	52	43	68
L640	11:14:36	59	53	49	49	57	51	52	48	37	58
L641	12:46:44	73	59	56	56	54	52	48	40	32	57
L642	12:48:06	74	63	54	52	50	49	44	39	29	53
L643	12:49:36	70	58	55	52	51	53	48	41	34	56
L644	13:02:54	62	64	63	65	61	60	58	53	40	65
L645	13:15:48	67	62	56	51	52	48	44	39	31	53
L646	13:57:30	71	64	57	52	49	49	48	45	43	55
L647	13:59:44	70	62	57	52	49	51	45	42	39	54

ID	Start Time, hh:mm:ss	Average Level per Octave Band, dB $L_{Zeq,T}$									Sum, dB $L_{Aeq,T}$
		31.5	63	125	250	500	1k	2k	4k	8k	
L648	14:01:40	74	65	59	58	54	55	53	50	46	60
L649	14:03:12	69	60	57	54	51	54	50	47	44	58
L650	14:04:28	76	68	62	61	57	60	56	51	45	63
L651	14:12:24	60	58	55	53	53	53	50	47	41	57
L652	14:13:48	66	59	54	55	55	48	46	45	41	55
L653	14:15:06	71	65	61	54	52	49	46	43	46	55
L654	14:16:56	63	59	53	47	48	47	45	44	40	52
L655	14:25:48	71	63	63	61	62	60	55	48	40	64
L656	14:28:42	70	63	64	57	55	67	70	49	35	73
L658	14:30:18	70	64	64	58	56	58	53	43	37	61
L659	14:35:28	63	60	55	54	51	47	46	45	42	54
L660	14:37:42	65	62	55	49	50	45	44	39	34	52
L661	14:42:20	70	67	71	82	75	74	74	72	67	81
L662	14:46:30	58	56	56	49	49	44	42	41	36	51
L663	14:47:52	59	59	58	54	50	47	48	48	41	55
L664	14:49:22	60	60	54	50	49	45	42	39	34	51

Derivation of background sound levels

5.2 The methodology detailed in BS 4142: 2014+A1: 2019 provides an example of statistical analysis to determine the representative background noise level during the daytime ($L_{A90,\ 1h}$). The analysis adopts the methodologies applied within the aforementioned standard to the receptors below. Values have been chosen based on a combination of the mean, median and modal average levels, cumulative percentage contribution to the dataset and professional judgement.

5.3 The Site is expected to operate 24/7, 365 days per year. As such, background sound levels have been analysed for both daytime (07:00-23:00) and night-time (23:00-07:00) periods.

Table 5-4 Representative background sound levels at NSRs

NSR	Representative Monitoring Position	Representative Background Sound Level, dB $L_{A90, T}$	
		Daytime (07:00-23:00)	Night-time (23:00-07:00)
NSR1	MP1	45	44
NSR2			
NSR3			
NSR4			
NSR5			
NSR6			
NSR7	MP2	46	42
NSR8			N/A [1]
NSR9			
Notes [1] Not considered noise-sensitive during the night-time period			

5.4 A graphical representation of the statistical analysis is displayed below, with the highlighted column denoting the representative value chosen for the purposes of the assessment.

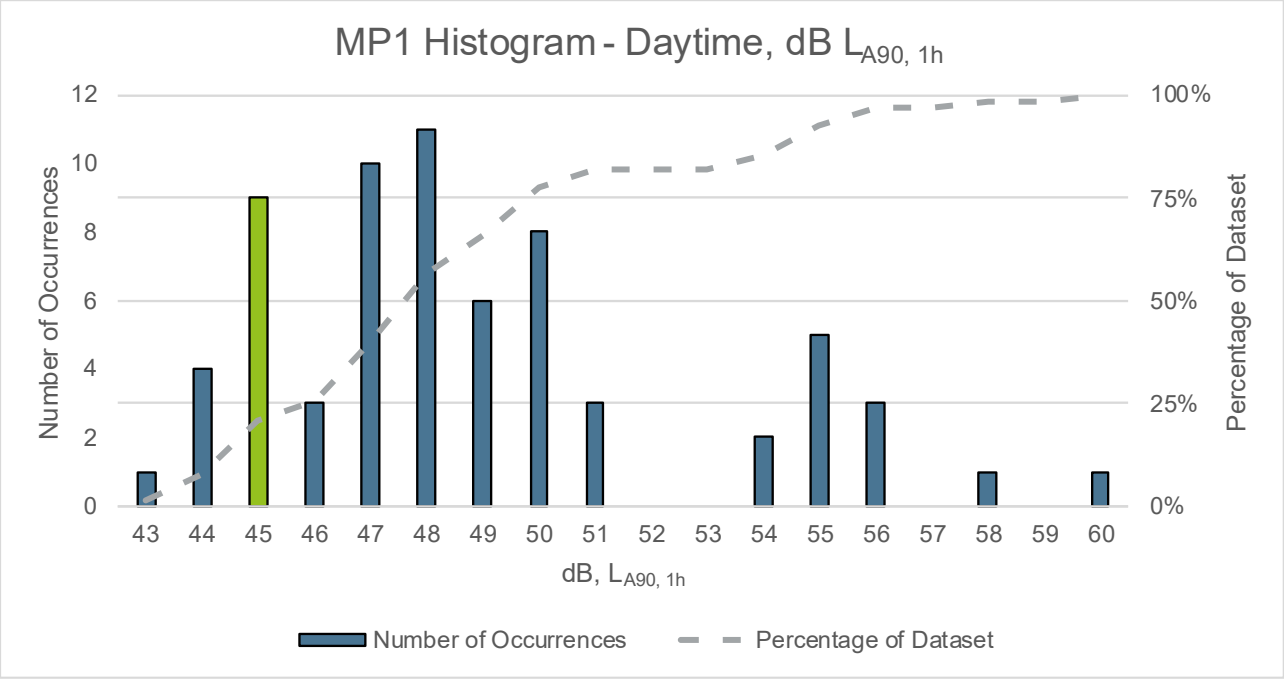

Figure 5-1 MP1 background analysis – daytime

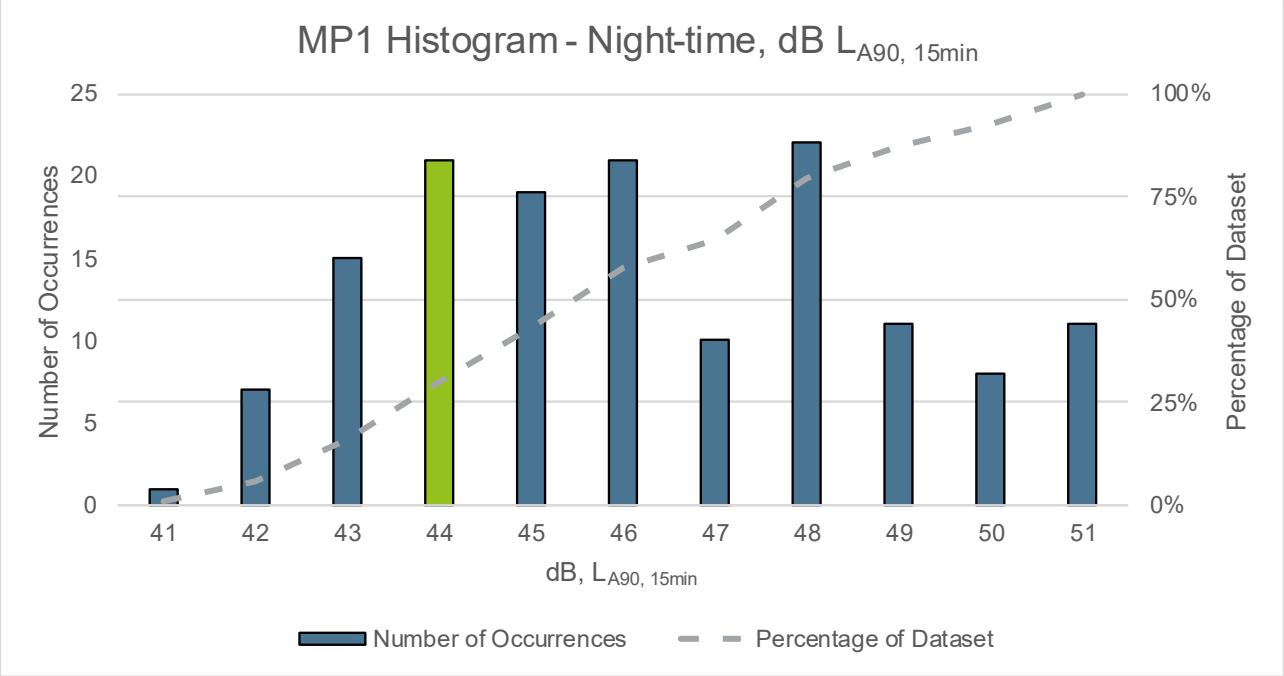

Figure 5-2 MP1 background analysis – night-time

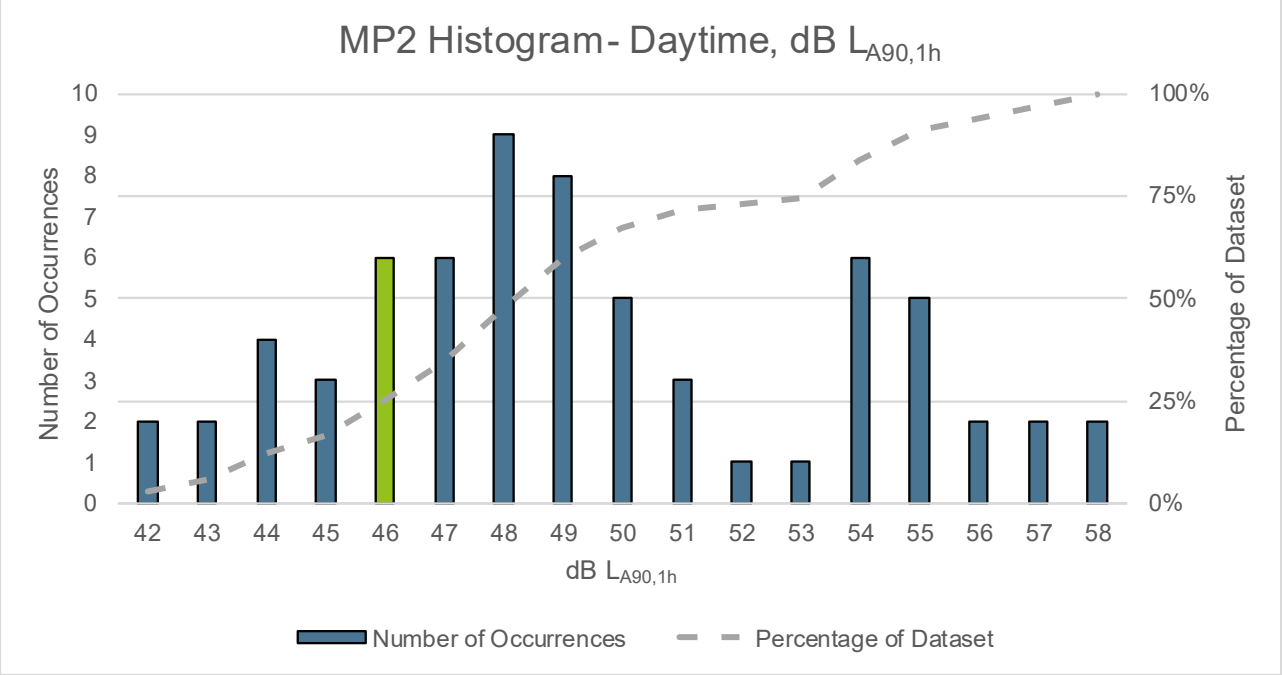

Figure 5-3 MP2 background analysis – daytime

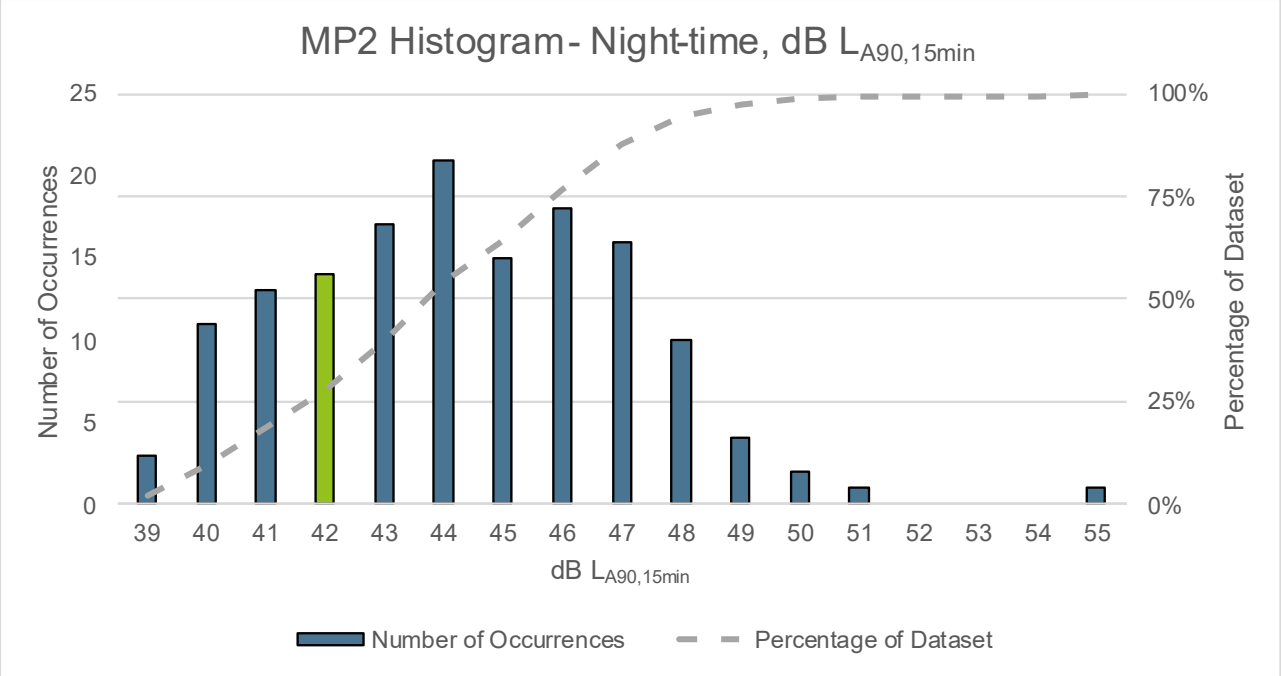

Figure 5-4 MP2 background analysis – night-time

Time histories

5.5 Graphical representations of the measured ambient and background sound levels are presented overleaf:

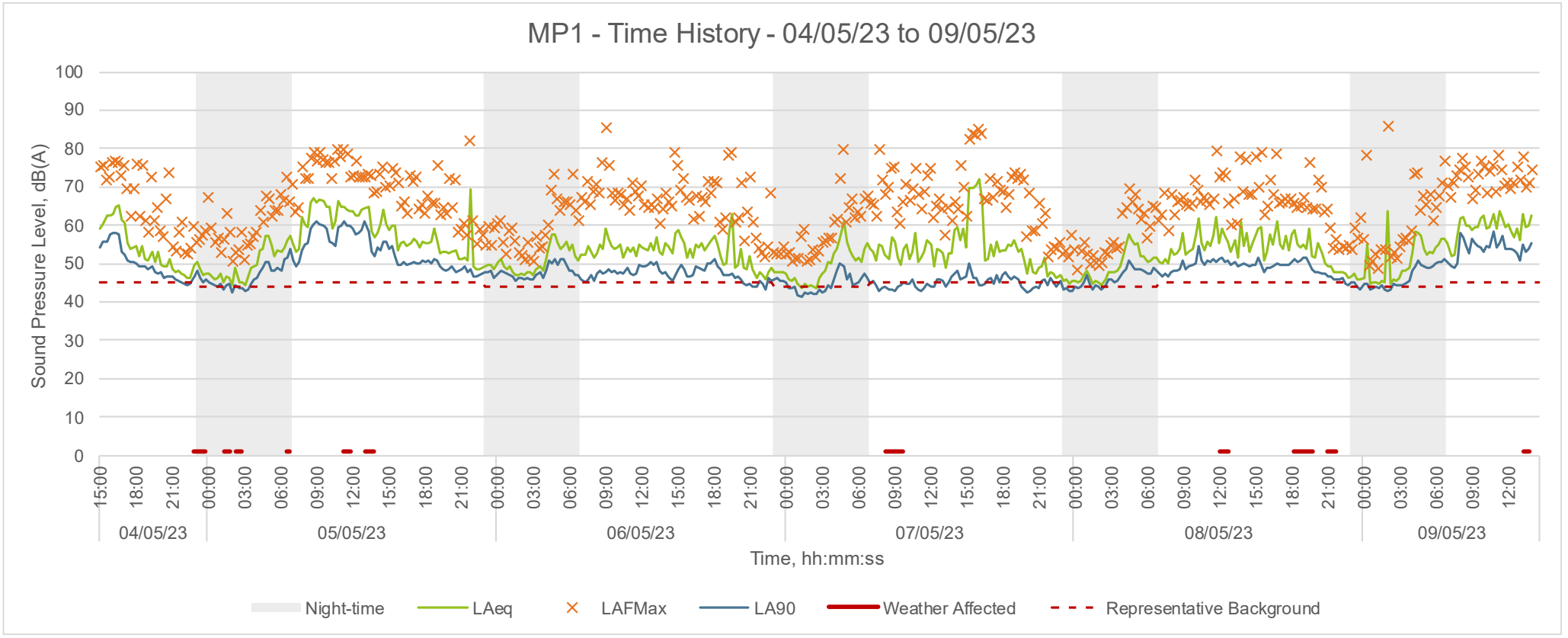

Figure 5-5 MP1 time history

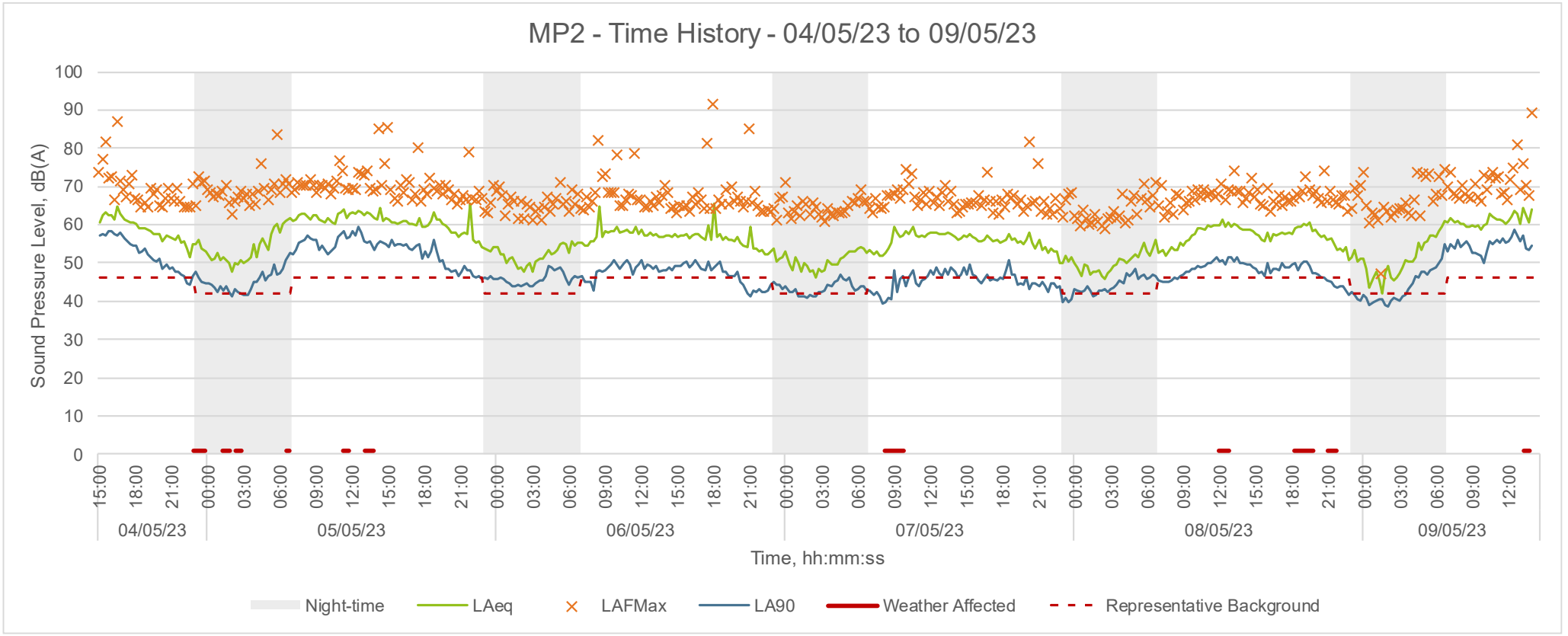

Figure 5-6 MP2 time history

Noise prediction model

5.6 The calculation model considers three individual scenarios:

1. "Daytime only" – All standard duty fixed plant is continuously operational, plus two full HGV movements entering/exiting the site via the northern and eastern turning circles;
2. "24/7" – All standard duty fixed plant is continuously operational, with no on-site vehicle movements;
3. "Emergency Test" – operation of the diesel backup generator and diesel fire pump. Continuous operation is assumed across the reference interval of one hour, to present a worst-case scenario, although it is anticipated that the units would not be operational for the full hour.

Model parameters

5.7 An overview of the modelling parameters is given in Table 5-5 below:

Table 5-5 Detailed modelling parameters

Item	Setting
Algorithms	BS ISO 9613-2:2024.
Façade Corrections	Predictions are at 1 m from a given façade, in free field conditions. No façade correction has been applied.
Ground Absorption	The site and surrounding area are noted to be predominantly hard ground. Therefore, a ground absorption coefficient of 0 has been added across the study area of the model, where: 1 = Soft Ground, 0 = Hard Ground
Meteorological Conditions	10 degrees Celsius; 70% humidity; and Wind from source to receiver.
Intervening Structures	All permanent structures on site and within the surrounding area have been incorporated into the model as "building" objects, with a reflection loss of 1.0 dB (corresponding to an absorption coefficient of 0.21). These have been obtained from the Ordnance Survey (OS) "OpenMap – Local" dataset for off-site buildings and information provided by the Applicant for structures on site. All off-site buildings have been modelled at 8.5 m in height.
Receptor Height	Ground floor receptors are set at 1.5 m above ground level (AGL); first floor receptors are 4.0 m AGL.
Source Modelling	See paragraphs 5.8 to 5.10
Terrain	Terrain data off-site has been obtained from open-source LiDAR data produced by the Department of Food, Environmental and Rural Affairs (DEFRA); 1-metre contours have been used from the survey dated 2022.
Site Layout	Digitised based on site layout provided by the Applicant

Operational source noise data

5.8 Source noise data and operational patterns have been supplied by the client. Plant items have been subdivided by locality within this section.

Main building – Roof of Level 1, northeastern corner

- Three combined Air Source Heat Pump (ASHP) and Chilled Water Return (CHR) units, each within a Daikin "OPT76b" soundproof system.

- The compound is expected to be at its highest load during winter (i.e., when -7 °C outside), or during summer (>25 °C outside), at which point there would be two units running simultaneously. A third unit is reserved as a backup only.

Main building – Roof of Level 2, southeastern corner

- One Daikin RZAG-NV1 floor-mounted air conditioning unit serving the Comms Room
- Two Daikin RZAG-NV1 floor-mounted air conditioning units serving the Cold Room
- AHU extract grille from stair core at L2 ceiling level.

Main building – Level 1 northern façade

- Internal Air Compressor Room, housing two Ingersoll Rand "E-Series" oil-free rotary screw compressors (model E160ne-A) for duty and standby operation.
- Transformer room
- Low-voltage (LV) switch room
- Cold water distribution tanks & pump room, comprising three Grundfos "CRIE 15-3 A-FGJ-A-E-HQQE" vertical, multistage E-pumps. All three pumps are assumed to be operational.

Main building – Level 1 eastern façade

- Room extract exhaust grille from Cryostore
- Supply air grille to Cryostore.

Main building – Level 3 western façade

- Fresh air AHU intakes at L3 to facilitate L1 plant internally. This forms a singular "plenum room" along the western façade at L3 with four discrete, louvred openings.
- The unused areas of the louvres are to be effectively 'blanked off' for insulation/acoustic purposes and to prevent natural ventilation.

Main building roof:

- Four Panasonic R744 CO_2 cooling units, serving the cold room
- 24 Daikin RZAG-NV1 floor-mounted air conditioning units, operating as 12 standby/duty pairs
- 14 penthouse louvres enclosing HVAC exhausts
- Two Daikin RZAG-NV1 floor-mounted air conditioning units, serving the data centre
- Nitrogen safety valve exhaust
- Vaporized Hydrogen Peroxide (VHP) HVAC exhaust
- Water for injection (WFI) relief vent.
- Process waste vent.

LWT building

- AHU fresh air inlet & vent / grille at ceiling level on the southern building façade, near the entrance doors
- Roof relief vents and extract fan discharge flue at roof level, near the northern side of building
- AHU Exhaust at roof level, near the southern side of building
- One Daikin Skyair R32 Alpha cooling unit at ground level against the northern building façade

Northwest of main manufacturing building

- One diesel backup generator within a shipping container-style enclosure
- Two firefighting water pumps– one electrical pump and one diesel-powered– located within the pump house
- One transformer within a GRP enclosure.

Segregated Waste Pit

- Two extract vents
- One relief line

External (other)

- Heavy Goods Vehicles (HGVs) entering and exiting the site. Two HGV movements have been considered in a given hourly period, accounting for the northern and eastern turning circles, respectively.

Summary

5.9 Table 5-6 details the data sources used in the noise model.

Table 5-6 Operational noise modelling input data

Plant Item	Source Type	Data Source	Notes
ASHP/CHR	5-sided area source (7.3 x 2.3 x 2.5 m)	Records L662-L664 of attended monitoring.	Power level per sqm. Manually adjusted to replicate measured level at 1m from façade.
HGV route	Moving point source	Record C2.34 of BS 5228-1.	Travelling at a speed of 10 kmh. 1 event per turning circle per hour.
DX cooling units	Point source	Record L646 of attended monitoring.	Daikin Sky Air R32 Alpha
CO_2 cooling units	Point source	Record L652 of attended monitoring.	Panasonic R744 OCU-CR1000VF8
Penthouse louvre for HVAC exhausts	Point source	Record L650 of attended monitoring.	--
Inside western plenum rooms	Internal pressure level	Record L655 of attended monitoring.	Transmissive area with dimensions relative to the louvred opening
Cryostore room extract exhaust	Point source	Record L644 of attended monitoring.	--
Segregated waste pit extract vent	Point source	Record L638 of attended monitoring.	--
LWT building, waste pumps	Internal pressure level	Record L636 of attended monitoring.	Not used – see paragraphs 5.16 to 5.25
Compressor room	Internal pressure level	Record L633 of attended monitoring.	Transmissive area with dimensions relative to the louvred opening
LV Switch room	Internal pressure level	Record L631 of attended monitoring.	Transmissive area with dimensions relative to the louvred opening
Transformer room	Internal pressure level	Record L629 of attended monitoring.	Transmissive area with dimensions relative to the louvred opening
Diesel generator - louvres	Point source	Records L626-628 of attended monitoring.	Transmissive area with dimensions relative to the louvred opening

Plant Item	Source Type	Data Source	Notes
Diesel fire pump (south - door open)	Area source (0.9 x 2.0 m)	Record L623 of attended monitoring.	Power level per sqm. Manually adjusted to replicate measured level at 1m from façade.
Diesel fire pump (eastern and western louvre)	Point source	Records L624-L625 of attended monitoring.	--
Grundfos pump (motor)	Point source	85U05413 MG112MC 50 Hz - Sound Measurement Report[1]	Motor type: MG112MC
Cold water pump room	Internal pressure level	Calculated from SoundPLAN result file RHOT0002.res	Based on 3 Grundfos pumps operating concurrently.

5.10 Table 5-7 details sound power levels used for each item of plant in octave bands.

Table 5-7 Sound power level spectra

Source	Linear sound power levels for each frequency band (dB L_{WZ})									dB L_{WA}
	31	63	125	250	500	1k	2k	4k	8k	
Daikin Sky Air R32 Alpha	79	72	65	60	57	57	56	53	51	63
Panasonic R744 OCU-CR1000VF8	74	67	62	63	63	56	54	53	49	63
Penthouse Louvre for HVAC Exhaust	84	76	70	69	65	68	64	59	52	71
Inside Western plenum rooms [1]	71	63	63	61	62	60	55	48	40	64
Extract exhaust from Cryostore	73	75	74	76	72	71	69	64	51	76
Segregated Waste Pit Extract Vent	72	69	80	76	75	72	67	60	51	77
LWT Building waste pumps [1]	59	58	60	79	59	57	52	54	55	69
Compressor room [2]	58	58	55	58	53	46	46	41	34	55
LV Switch room [2]	59	52	51	52	54	49	51	47	39	57
Transformer room [2]	56	56	65	66	63	58	45	42	40	63
Backup diesel generator - North	95	103	103	93	84	79	72	69	63	91
Backup diesel generator - West	97	105	103	98	97	89	83	76	73	97
Backup diesel generator - East	96	108	103	98	94	86	83	78	73	95

[1] https://api.grundfos.com/gpi/printing/getpdf?productnumber=85U05413&sound=true&frequency=50&languagecode=ENU&productrange=GZA&searchdomain=SALEABLE&unitsystem=4&currency=ZAR

Source	Linear sound power levels for each frequency band (dB L_{WZ})									dB L_{WA}
	31	63	125	250	500	1k	2k	4k	8k	
HGV Movements	--	101	106	106	106	102	101	96	94	108
ASHP unit (South) [3]	55	54	53	47	47	41	40	39	33	49
ASHP unit (East) [3]	59	59	53	50	48	45	42	39	34	51
ASHP unit (North) [3]	57	56	56	51	47	44	46	45	39	53
Diesel Fire Pump (South) [3]	81	91	87	98	92	90	88	85	80	95
Diesel Fire Pump (East)	94	110	105	101	101	99	97	96	93	105
Diesel Fire Pump (West)	84	89	92	94	98	92	91	88	84	99
Grundfos Pump (Motor)	--	--	62	64	66	67	64	60	54	71
Cold Water Pump Room	--	--	49	50	54	55	50	49	--	58

Notes

[1] Source measurement not used in subsequent calculation model, on account of the building façade rendering this source inaudible at the nearest NSR. Included here for completeness only.
[2] Denotes an internal, reverberant sound pressure level for use within the calculation model.
[3] Denotes a sound power level per square metre.

5.11 E. J. Rathe's publication "Note on two common problems of sound propagation" (1969) is widely cited as a series of general principles when considering how noise propagates as a result of its inherent dimensions. This is useful when determining the source 'type' to be used for a given noise emitter in modelling applications.

5.12 Three "zones" are identified: when close to the source itself, sound tends to propagate as a plane wave (approximately 0 dB per doubling of distance), with propagation behaviour akin to a point source at greater distances (6 dB per doubling of distance) becoming apparent at greater distances. Where a source may have one dimension substantially larger than the other, an intermediary "zone" is likely to occur where the source propagation behaves like a line source (3 dB per doubling of distance). The transition distances between these are considered relative to the dimensions of the source itself:

Plane wave region:

$$r \leq \frac{a}{\pi}$$

Line source region:

$$\frac{a}{\pi} < r \leq \frac{b}{\pi}$$

Point source region:

$$r > \frac{b}{\pi}$$

Where a and b are the short and long dimensions of a given source.

5.13 With this in mind: where a noise source is relatively small, such that the “plane wave region” is less than the initial measurement distance of 1 m, it has been included in the calculation model as a point source. This approach has been applied to most external plant items and small louvres.

5.14 For larger sources such as the ASHP units and larger openings, each component has been calibrated within the calculation model using a receiver array (positioned at the respective reference distance from each manufacturer’s datasheet) from each of the five emitting surfaces (horizontally and vertically) and at 1.5 m height relative to the ground level (for the non-roof sources) to achieve the reference noise levels summarised in Table 5-7.

Operational assumptions

5.15 It is understood that the site has capability to operate 24 hours per day, seven days per week. The following considerations have been made, after discussions with the client regarding operational capacity:

- One of the three ASHP/CHR units on the L1 flat roof to the northeast corner of the main building is designated as a standby unit only and would not be expected to operate unless a fault develops with the remaining units.
- Similarly, one of each pair of the roof-mounted DX cooling units (12 pairs in total) is designated as a standby unit for similar reasons.
- The standby diesel generator and fire pump to the northwest of the site would be operational in emergency situations only, except for the purposes of intermittent testing.
- External vehicle movements associated with deliveries, dispatch, and waste collection may occur throughout the operational day, defined by the application as being 07:00-19:00 each day, although routine logistics activities will generally be scheduled during standard daytime hours where practicable. The majority of activity will be planned to occur Monday to Friday between 08:30 and 17:00.

Building envelope

5.16 The development site includes two buildings which also house noise-producing equipment and processes:

- Main manufacturing building; and
- LWT building.

5.17 An appraisal of the likely noise emissions breaking out from the external façade itself, as opposed to via louvres or flues, is detailed over the following pages.

Main manufacturing building

5.18 Primarily, the external façade of the main manufacturing building comprises a metal insulated sandwich panel cladding system (NBS reference: Ss_25_20_14_54) or a triple-glazed stick curtain walling system (NBS reference: Ss_25_10_20_85). In a select number of rooms throughout the building, the separating element between internal and external spaces also includes an independent wall lining (NBS reference: Ss_25_25_45_35).

LWT Building

5.19 It is understood that the LWT building envelope comprises one layer of 140 mm concrete block (NBS reference: Pr_20_93_52_01) and Metal Insulated Sandwich Panel Cladding System (NBS reference: Ss_25_20_14_54) to the structural steelwork. On the eastern façade, the structure also incorporates a roller shutter door system (NBS reference: Ss_25_30_20_74) with a 95 mm foam-filled lath profile.

5.20 In the absence of specific acoustic performance test data for the above building elements, sound reduction indices have been derived via the ‘Insul 9.0’ modelling software by Marshall Day Acoustics.

Table 5-8 Predicted sound reduction indices per building element, dB R

Building element	Sound reduction index per octave band, dB R							R_w	C; C_{tr}
	63	125	250	500	1000	2000	4000		
Main manufacturing building									
Glazed curtain walling	29	22	31	40	47	50	59	42	-2; -7
Cladding system	18	21	25	24	26	42	50	29	-1; -3
Cladding + independent lining	16	19	36	44	45	62	64	44	-3; -10
LWT building									
Blockwork and cladding	23	45	58	60	60	84	97	64	-2; -7
Roller shutter door	13	17	21	23	20	30	43	25	-2; -3

5.21 On the basis of the above, the external façade of the main building is expected to provide a minimum acoustic attenuation of 26 dB $R_w + C_{tr}$; a minimum acoustic attenuation of 22 dB $R_w + C_{tr}$ is expected when specifically considering noise break-out from the roller shutter door of the LWT building, with the western and northern façades providing attenuation in excess of 50 dB(A).

5.22 When considering a standardised pink noise spectrum (i.e., equal energy in each octave band), this translates to a sound level reduction of:

- Main manufacturing building
  - Glazed Curtain Walling – 41 dB(A)
  - Cladding System – 29 dB(A)
  - Cladding + Independent Lining – 40 dB(A)
- LWT building
  - Blockwork and Cladding – 55 dB(A)
  - Roller Shutter Door – 24 dB(A)

5.23 Internal production areas that are positioned along the northern or western façades of either building (i.e., with direct line-of-sight to at least one NSR) are observed as being unused, “fallow areas” for future expansion, low-noise spaces such as the “Solution Prep” laboratory or otherwise contain louvred openings that are already included in the calculation model.

5.24 As such, noise emanating from the building fabric itself is expected to have a minimal effect on the cumulative level at the nearest sensitive receptors and is therefore not considered further within this report.

5.25 It is also noted that the roller shutter door and other door sets associated with the LWT building are positioned to face away from the NSRs, with the northern and western facades comprising the blockwork and cladding structure.

Predicted specific sound level

5.26 The results of the modelling exercise are shown in Table 5-9 overleaf.

Table 5-9 Operational noise modelling output

NSR	Scenario	Specific Sound Level, dB L_S	Main Contributor	Sound Level of Main Contributor, dB L_S
NSR1	Daytime only	44	HGV Movements	43
	24/7	29	DX Cooling Unit (LWT building)	23
	Emergency test	59	Diesel Fire Pump	58
NSR2	Daytime only	47	HGV Movements	47
	24/7	29	Transformer Room louvre	23
	Emergency test	56	Diesel Fire Pump	53
NSR3	Daytime only	42	HGV Movements	42
	24/7	26	Transformer Room louvre	23
	Emergency test	61	Diesel Fire Pump	61
NSR4	Daytime only	48	HGV Movements	48
	24/7	30	Transformer Room louvre	25
	Emergency test	61	Diesel Fire Pump	59
NSR5	Daytime only	38	HGV Movements	38
	24/7	28	Western façade louvre	23
	Emergency test	55	Diesel Fire Pump	53
NSR6	Daytime only	42	HGV Movements	42
	24/7	31	Western façade louvre	25
	Emergency test	62	Diesel Fire Pump	61
NSR7	Daytime only	33	HGV Movements	33
	24/7	29	Western façade louvre	22
	Emergency test	55	Diesel Fire Pump	51
NSR8	Daytime only	43	HGV Movements	40
	24/7	33 [1]	Western façade louvre	28
	Emergency test	40	Diesel Fire Pump	40
NSR9	Daytime only	56	HGV Movements	53
	24/7	37 [1]	Western façade louvre	31
	Emergency test	48	Diesel Fire Pump	48

Notes

[1] Not considered noise-sensitive during the night-time period.

Subjective descriptions of the specific and residual sound

5.27 During the attended segments of the baseline noise monitoring in 2023, the acoustic environment across the site was observed to comprise predominantly vehicle noise along Cowpen Lane, with birdsong and ducks from the nearby park audible during quiet nulls of traffic.

5.28 It was noted that the railway line is situated immediately to the south of the residential properties along Hereford Terrace; no passing trains occurred while in attendance, although it was anticipated that this would form a key feature of the acoustic environment in the area.

5.29 Mobile plant was observed and heard on the development site whilst initial groundworks were being completed. However, it was noted that this was an atypical characteristic of the acoustic environment and efforts were made to exclude portions of the dataset in which this adversely affected baseline levels.

5.30 Based on the calculation model outputs presented in Table 5-9, the highest individual contributors to the specific sound level, in the absence of the emergency systems tests, are typically the external HGV movements during a delivery or collection process.

5.31 During the night-time, or any period in which no HGVs are on site, the main contributors are:

- **NSRs 1-4** – Noise emanating from the transformer room (L1, northern façade) via the louvred opening or the external DX cooling unit positioned at the rear (north) of the LWT building.
- **NSRs 5-9** – airflow from the plenum rooms along the western façade.

6 Noise Impact Assessment

Determination of rating levels

6.1 According to BS 4142, where certain features of the specific sound level can increase the significance of impact of a sound level, a character correction is applied to provide a rating level. The characteristics of a sound that are likely to cause an increase in the significance of impact are tonality, impulsivity, intermittency or other characteristic features such as an identifiable 'hiss'.

Tonality

6.2 Where such information is available, one methodology prescribed within BS 4142 compares the linear sound pressure level (dB $L_{Zeq,T}$) in 1/3-octave bands with the corresponding levels in each adjacent 1/3-octave bands (immediately above and below the band in question). If the 1/3-octave band of interest exceeds the sound pressure levels of both adjacent bands by a constant level difference, it is considered that the sound would be classified as 'tonal' and a 6 dB penalty be applied to the specific sound level.

6.3 The level differences between adjacent one-third-octave bands that identify a tone are:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in middle-frequency one-third-octave bands (160 Hz to 400 Hz);
- 5 dB in high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

6.4 The attended measurements undertaken in March 2026 uncovered the following sources with tonal components, as defined by the aforementioned methodology, in the near field:

- Transformer room (internal) – tone at 100 Hz
- Internal waste pumps (internal, LWT building) – tones at 200 Hz and 8 kHz
- CO_2 cold room cooling unit (southern face) – tone at 8 kHz.

6.5 However, it is worth highlighting that the standard specifies that consideration of a tonality correction should be assessed at the point of the receptor, not at the source. When considering the frequency spectrum of the cumulative total from all duty-operation sources at each NSR, no tone is observed at any frequency from 25 Hz to 10 kHz.

6.6 It is noted that Table 5-9 shows the transformer room as being the main contributor to the specific sound level at NSRs 2, 3 and 4, in the absence of the HGV movements . Notwithstanding, the level at these receptors from said source is shown to be no greater than 25 dB(A) at an external position 1 m from the façade and is markedly below the residual level at MP1.

6.7 It is therefore concluded that the site is unlikely to be tonal in character during operation and, as such, no correction has been applied.

Impulsivity and intermittency

6.8 The character of the sound and the operational regime from the fixed plant items will generally be of a low level and constant, with no rapid change in the level or character of noise. It is therefore considered unnecessary to apply an impulsivity correction. Due to the nature of the installation, it is considered that the plant items will not have identifiable on/off conditions, with items operating at varying loads relative to both the internal and external ambient temperature.

6.9 Noise emissions from the HGV movements are expected to be fleeting in nature, owing to both the expectation of switching engines on and off and to the fact that the vehicles would be travelling either in the direct of, or away from, a given NSR.

6.10 With respect to NSRs 5-9, it is anticipated that this process would not be inherently distinguishable from the typical use of Cowpen Lane and Central Avenue and, therefore, it is considered unnecessary to apply a correction.

6.11 However, it is noted that NSRs 1-4 are located within a cul-de-sac, where the prominence of such vehicle movements along the local road network may be less obvious. On this basis, it is deemed appropriate to apply a +3dB character correction specifically for the on-site HGV movements at these NSRs.

6.12 Therefore, the rating levels at each NSR are as follows:

Table 6-1 Derivation of rating level at NSRs

NSR	Scenario	Specific sound level, dB L_S	Background sound level, dB $L_{A90,T}$	Character corrections, dB	Rating level, dB $L_{Ar,Tr}$
NSR1	Daytime only	44	45	3	47
	24/7	29	44	0	29
	Emergency test	59	45	+3	62
NSR2	Daytime only	47	45	3	50
	24/7	29	44	0	29
	Emergency test	56	45	+3	59
NSR3	Daytime only	42	45	3	45
	24/7	26	44	0	26
	Emergency test	61	45	+3	64
NSR4	Daytime only	48	45	3	51
	24/7	30	44	0	30
	Emergency test	61	45	+3	64
NSR5	Daytime only	38	45	0	38
	24/7	28	44	0	28
	Emergency test	55	45	+3	58
NSR6	Daytime only	42	45	0	42
	24/7	31	44	0	31
	Emergency test	62	45	+3	65
NSR7	Daytime only	33	46	0	33
	24/7	29	42	0	29
	Emergency test	55	46	+3	58
NSR8	Daytime only	43	46	0	43
	24/7	33 [1]	42	0	33
	Emergency test	40	46	+3	43
NSR9	Daytime only	56	46	0	46
	24/7	37 [1]	42	0	37
	Emergency test	48	46	+3	51

Notes

[1] NSR not considered to be noise-sensitive at night.

Operational assessment

6.13 An assessment of predicted rating levels, against the representative background sound level at each of the receptors assessed, is summarised below:

Table 6-2 Assessment of noise impact

NSR	Scenario	Rating level, $L_{Ar,Tr}$	Background sound level, dB $L_{A90,T}$	Excess over background, dB
NSR1	Daytime only	47	45	+2
	24/7	29	44	-15
	Emergency test	62	45	+17
NSR2	Daytime only	50	45	+5
	24/7	29	44	-15
	Emergency test	59	45	+14
NSR3	Daytime only	45	45	+0
	24/7	26	44	-18
	Emergency test	64	45	+19
NSR4	Daytime only	51	45	+6
	24/7	30	44	-14
	Emergency test	64	45	+19
NSR5	Daytime only	38	45	-7
	24/7	28	44	-16
	Emergency test	58	45	+13
NSR6	Daytime only	42	45	-3
	24/7	31	44	-13
	Emergency test	65	45	+20
NSR7	Daytime only	33	46	-13
	24/7	29	42	-13
	Emergency test	58	46	+12
NSR8	Daytime only	43	46	-3
	24/7	33 [1]	46 [1]	-13
	Emergency test	43	46	-3
NSR9	Daytime only	46	46	+0
	24/7	37 [1]	46 [1]	-9
	Emergency test	51	46	+5

Notes

[1] NSR not considered to be noise-sensitive at night.

6.14 BS 4142 states:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Contextual considerations

Absolute level of sound

6.15 Measurement data from the unattended baseline survey indicates that levels range between approximately 50 and 60 dB(A) for both the residual (dB $L_{Aeq,T}$) and background (dB $L_{A90,T}$) sound levels during the daytime, and between approximately 40 and 50 dB(A) for the night-time.

6.16 Similarly, the rating level at each NSR ranges from 38 to 51 dB $L_{AR,Tr}$ during the daytime (standard duty operation), and between 26 and 31 dB $L_{AR,Tr}$ during the night-time.

6.17 With this in mind, the absolute value of background and rating levels is unlikely to form a key contextual factor in determining the magnitude of noise impact.

Character and level of residual sound

6.18 With particular consideration to the magnitude of noise impact from on-site HGV movements, it is noted that the residual sound was characterised by the on-site consultant to be primarily due to road traffic along the local road network unaffiliated with the Site.

6.19 Figure 6-1 presents a comparison of the new ambient level, as an energetic sum of the specific sound level at NSR4 and the measured residual level at MP2, against the existing residual level. A column chart (degree of change) is overlaid to display the level difference between the two. The graph illustrates the levels and degree of change in 15-minute profiles.

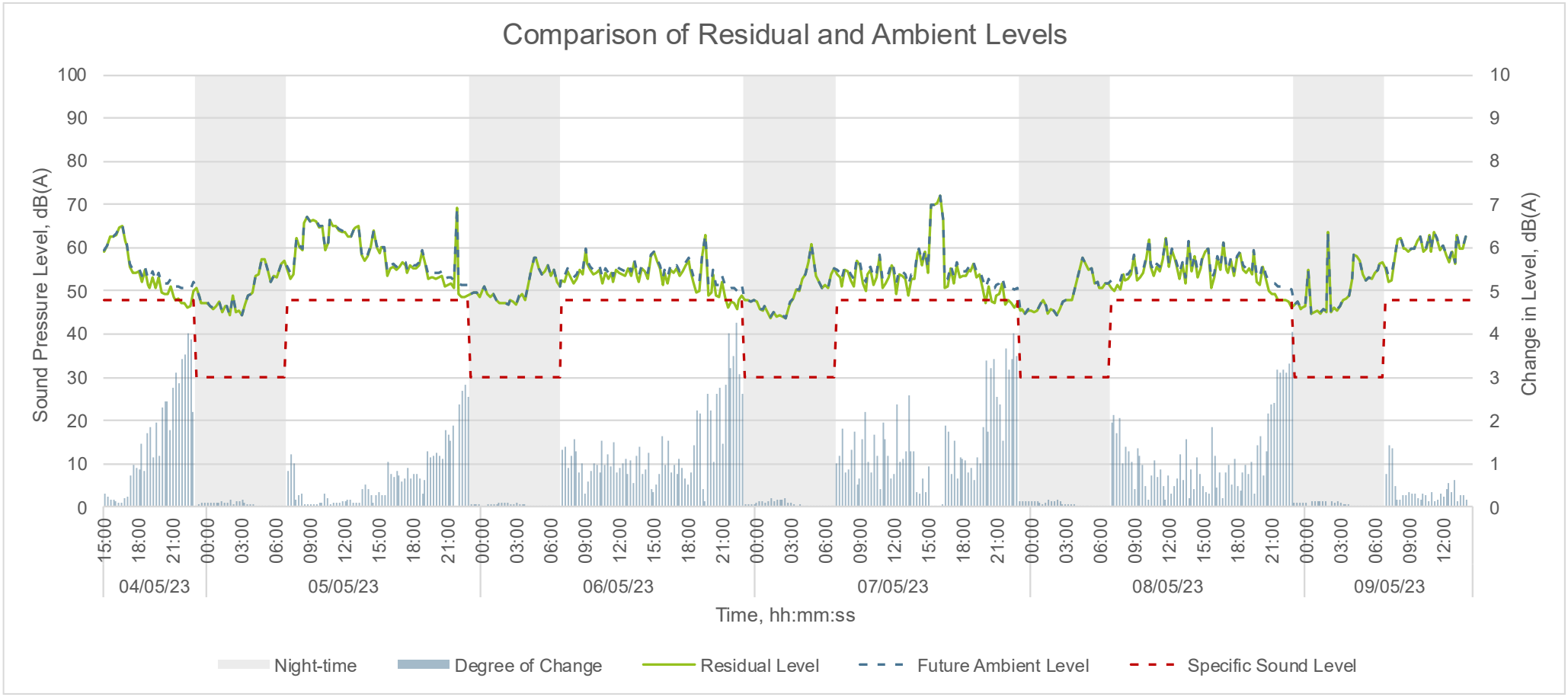

Figure 6-1 Comparison of residual and ambient levels at NSR4 / MP1

6.20 The Institute of Environmental Management and Assessment (IEMA) "*Guidelines for Environmental Noise Impact Assessment, Version 1.2*" (November 2014) suggests the following effect descriptors when comparing ambient sound levels of similar characteristics:

- **Very Substantial** – Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
- **Substantial** – Greater than 5 dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise
- **Moderate** – A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB L_{Aeq} change in sound level at a receptor of some sensitivity
- **Slight** – A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
- **None/Not Significant** – Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

6.21 In relation to this exercise, it is considered that all NSRs considered within this report are classified as "high" sensitivity. As such, an increase in ambient level of no greater than 2.9 dB L_{Aeq} is considered appropriate to estimate the level of significance in the context of this site.

6.22 Based on the above and the information presented in Figure 6-1, it is suggested that an increase in ambient level of 3 dB or greater would be expected only after 21:00. On the basis that HGV movements are expected to remain outside this period, it is therefore considered that noise levels generated by such movements would not be significant in the context of the existing noise sources impacting the environment at these NSRs.

Summary

6.23 With respect to the typical day-to-day operations of the Site, taking account of both the objective assessment methodology and consideration of contextual factors, it is considered that the risk of adverse impact upon the nearest NSRs is low.

6.24 Regarding the operation of the emergency systems in the northwest corner of the Site, the predicted rating level exceeds the representative background sound level by a margin of up to 20 dB(A) across NSRs 1-6; at this magnitude, the likelihood that the test process generates a significant adverse impact is high. Depending on the regularity and duration of the tests, it is considered that further action may be required.

7 Noise Control and Further Action

7.1 In addition to the noise impact assessment, an assessment is required to demonstrate that best available techniques (BAT) have been included as part of project proposals. The BAT assessment has been undertaken in accordance with BAT reference documents (BREFs) in respect of operations taking place at the Site.

BAT reference documents

7.2 The appropriate BREF for this Site is *"Best Available Techniques (BAT) Reference Document for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector"*, 2016 (Industrial Emissions Directive 2010/75/EU. Code: CWW).

7.3 Section 4.5.6 of the BREF document sets out the best available techniques for the control of noise and vibration during the operations. Table BAT 23 from the BREF is replicated below. In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given below:

Table 7-1 BAT noise and vibration (BAT 23)

Technique		Description	Applicability
a.	Appropriate location of equipment and buildings	Increasing the distance between the emitter and the receiver and using buildings as noise screens.	For existing plants, the relocation of equipment may be restricted by a lack of space or excessive costs.
b.	Operational measures	This includes: ▪ Improved inspection and maintenance of equipment. ▪ Closing of doors and windows of enclosed areas, if possible. ▪ Equipment operation by experienced staff. ▪ Avoidance of noisy activities at night, if possible. ▪ Provisions for noise control during maintenance activities.	Generally applicable.
c.	Low-noise equipment	This includes low-noise compressors, pumps and flares.	Applicable only when the equipment is new or replaced.
d.	Noise-control equipment	This includes: ▪ Noise-reducers ▪ Equipment insulation ▪ Enclosure of noisy equipment ▪ Soundproofing of buildings	Applicability may be restricted due to space requirements (for existing plants), health, and safety issues.
e.	Noise abatement	Inserting obstacles between emitters and receivers (e.g. protection walls, embankments and buildings).	Applicable only to existing plants, since the design of new plants should make this technique unnecessary. For existing plants, the insertion of obstacles may be restricted by a lack of space.

7.4 As per the BREF document, applicability is restricted to cases where a noise or vibration nuisance at sensitive receptors is expected and/or has been substantiated, and/or a source is distinctly audible at or beyond the development boundary (i.e. where a significant or adverse effect is determined). This does not conclude that

all sources audible beyond the development boundary require to be controlled, but should be considered as part of the BAT assessment.

BAT Assessment

7.5 Table 7-2 details the noise abatement measures that have been implemented as part of the embedded mitigation for each piece of equipment that is a significant noise source, alongside the relevant BREF/ BAT reference as per above.

Table 7-2 BAT assessment

Noise Source	Process Overview	Operational Frequency	Mitigation Currently Implemented	Relevant BREF/BAT Ref.	Subjective Contribution to Off-site Receptors	BAT Implemented – Yes/No?	Additional actions to be taken to meet BAT and timescales
Diesel water pump	To be used in the event of a combined fire and electrical outage i.e., if mains electricity is not available to power the electrical water pump	Intermittent testing Emergency scenarios	Plant will be tested for one hour off-load every fortnight and one hour on-load every three months, equating to 30 hours per year. Testing to be undertaken within the period 09:00-17:00, Monday to Friday only. Each plant item to be operational for up to 30 minutes during testing only. [1]	**BAT 23** **b.** Operational measures	High	Yes	Discussions are underway to determine if test durations less than 30 minutes per plant item can be achieved. However, this may not be practicable to ensure normal running temperatures and pressures are met.
Diesel generator	To be used in the event of an electrical outage						
HGV movements	Use of third-party HGVs for material delivery and/or collection	Intermittent; daytime hours only	On-site HGV operations to be undertaken during the daytime only and not during the most sensitive time period. i.e., night-time.	**BAT 23** **b.** Operational measures	High	Yes	No further action required

Noise Source	Process Overview	Operational Frequency	Mitigation Currently Implemented	Relevant BREF/BAT Ref.	Subjective Contribution to Off-site Receptors	BAT Implemented – Yes/No?	Additional actions to be taken to meet BAT and timescales
AHU intake louvres (L3 western façade)	Fresh air intakes for ventilation purposes serving the process rooms	Continuous	Large plenum size reduces static pressure and subsequent turbulent airflow, therefore reducing noise level at the point of the intake.	**BAT 23** **c.** Low-noise equipment	Medium	Yes	No further action required
Transformer room (L1 northern façade)	Electrical transformer to power the Site	Continuous	Internal reverberant level within transformer room measured at 63 dB $L_{Aeq,T}$	**BAT 23** **c.** Low-noise equipment	Low	Yes	No further action required
DX Cooling Unit (LWT building, northern façade)	Air conditioning outdoor unit for the LWT building.	Continuous	Daikin SkyAir Alpha series is designed for low-noise operation	**BAT 23** **c.** Low-noise equipment	Low	Yes	No further action required
Biowaste Pit (East)	Extract vent for the biowaste pit	Continuous	Biowaste pit is located to the east of the main manufacturing building (a minimum of 100 m from the nearest NSRs) and is screened by either the main manufacturing building or the LWT building.	**BAT 23** **a.** Appropriate location of equipment and buildings	Low	Yes	No further action required
Compressor room (L1 northern façade)	Houses compressors for temperature control	Continuous	Ingersoll Rand E-Series compressor is designed for low noise.	**BAT 23** **c.** Low-noise equipment	Low	Yes	No further action required

Noise Source	Process Overview	Operational Frequency	Mitigation Currently Implemented	Relevant BREF/BAT Ref.	Subjective Contribution to Off-site Receptors	BAT Implemented – Yes/No?	Additional actions to be taken to meet BAT and timescales
Cold water distribution tanks & pumps (L1 northern façade)	To store, and increase pressure of, water used on site.	Continuous	Variable speed pump, allowing for quieter operation when demand is low.	**BAT 23** **c.** Low-noise equipment	Low	Yes	No further action required
L3 plant compound (main building roof)	Contains direct expansion (DX) cooling units, CO_2 cooling units and exhaust louvres for internal HVAC systems, in order to maintain temperature control within the main manufacturing building.	Continuous	External plant and flues are located away from the roof edge where practicable, to reduce line-of-sight between sources and NSRs. Equipment that displays tonal components are oriented in such a way that they face away from NSRs	**BAT 23** **a.** Appropriate location of equipment and buildings	Low	Yes	No further action required
			Panasonic R744 units are designed for low-noise operation. Daikin SkyAir Alpha series is designed for low-noise operation.	**BAT 23** **c.** Low-noise equipment		Yes	No further action required
			Roof-mounted flues are fitted with a penthouse-style louvred enclosure to minimise the spread of noise emissions to the atmosphere	**BAT 23** **d.** Noise and vibration control equipment		Yes	No further action required

Noise Source	Process Overview	Operational Frequency	Mitigation Currently Implemented	Relevant BREF/BAT Ref.	Subjective Contribution to Off-site Receptors	BAT Implemented – Yes/No?	Additional actions to be taken to meet BAT and timescales
Air source heat pump / chiller units (L1 roof plant compound)	Used to regulate temperature and humidity.	Continuous	Proprietary sound enclosures by manufacturer	**BAT 23** **d.** Noise and vibration control equipment	Low	Yes	No further action required
LV switch room	Contains switchboards to distribute electrical power throughout the building. Includes fan systems for temperature control.	Continuous	Internal reverberant level within transformer room measured at 63 dB $L_{Aeq,T}$	**BAT 23** **c.** Low-noise equipment	Low	Yes	No further action required
HVAC units (internal)	To maintain required cleanroom environmental conditions (air cleanliness, pressure, temperature and humidity).	Continuous	Equipment housed internally within the main manufacturing building.	**BAT 23** **a.** Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required
Centrifuges	To separate cells/solids from liquid during harvest and clarification prior to downstream purification.	Continuous	Equipment housed internally within the main manufacturing building.	**BAT 23** **a.** Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required
Recirculation skids	To concentrate and filter product before fill.	Continuous	Equipment housed internally within the main manufacturing building.	**BAT 23** **a.** Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required
Bioreactor agitation systems	To keep cells suspended and ensure uniform conditions during growth and production.	Continuous	Equipment housed internally within the main manufacturing building.	**BAT 23** **a.** Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required

Noise Source	Process Overview	Operational Frequency	Mitigation Currently Implemented	Relevant BREF/BAT Ref.	Subjective Contribution to Off-site Receptors	BAT Implemented – Yes/No?	Additional actions to be taken to meet BAT and timescales
Shakers / rockers	To provide controlled mixing / aeration.	Continuous	Equipment housed internally within the main manufacturing building.	**BAT 23** **a.** Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required
Chromatography skids	Uses system pumps, valves and mixers to separate target product from impurities.	Continuous	Equipment housed internally within the main manufacturing building.	**BAT 23** **a.** Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required
General transfer pumps	To move process fluids between vessels and unit operations in a sterile manner.	Continuous	Equipment housed internally within the main manufacturing building.	**BAT 23** **a.** Appropriate location of equipment and buildings	Not expected to be audible outside of site boundary	Yes	No further action required

Notes

[1] Note that the calculation model assumes consistent operation for both diesel pump and generator throughout the reference interval, and no “on-time” correction is applied in the assessment for this scenario. On the basis that each item will be operating for 30 minutes only within a given hourly period, a 3 dB reduction per source can be expected.

8 Uncertainty

8.1 BS 4142:2014+A1: 2019 requires that the assessment considers the level of uncertainty in the data and associated calculations. Consideration of the uncertainty can enable a more informed decision regarding the likely significance of impact, within the context of assessment.

8.2 It is accepted that uncertainty may arise from all levels of measurement and assessment and reasonably practicable steps have been made at all stages with the aim of reducing uncertainty.

8.3 The following factors have been noted in this appraisal of uncertainty within the assessment:

- Background sound level measurements have been obtained over a duration of six days to characterise the existing residual environment during the intended operational hours of the proposed development.
- Background sound level measurements were undertaken alongside a weather station, located 1.3 km southeast of the Site, to confirm conditions throughout the survey duration were conducive for noise monitoring; periods in which this was not the case have been excluded from the analysis.
- Background sound level measurements have been taken within land belonging to an NSR, considered to be most representative of the properties assessed while accounting for logistical challenges and security risks during the survey.
- Operational noise levels have been derived from on-site test data collected by RSKA, with each measurement undertaken over a sufficient duration to ensure a typical operating pattern.
- Where individual noise sources could not be measured directly, efforts have been made to utilise manufacturer's datasheets or the use of similar plant items to provide an estimate of noise emissions within the calculation model.
- Use of monitoring equipment in accordance with Section 5 of BS 4142:2014+A1:2019, using Class 1 instrumentation.
- Measurement procedures followed in accordance with Section 6 of BS 4142:2014+A1:2019 with precautions taken to minimise interference.
- The assessment has given consideration to a full operational scenario, with all plant items concurrently; Representative background levels obtained during those relevant assessment periods have been utilised to inform the assessment.
- With respect to the testing of the emergency systems (specifically, the diesel fire pump and diesel generator), the regularity of the test process is not known at this time, nor is the duration of the test. On this basis, the assessment assumes continuous operation over a given reference interval with no on-time correction.
- Specific sound levels have been calculated to the requirements of BS ISO 9613-2:2024, which is the widely accepted procedure for the calculation of sound propagation (including favourable wind conditions from source to receiver).
- Where point sources have been included within the model, these behave isotropically i.e., traveling equally in all directions with no consideration of directivity.
- The Insul software package, as a prediction tool, quotes a typical uncertainty in the resultant R_W metric of ±3 dB.
- The survey and assessment have been undertaken by suitability qualified acousticians who are members of the Institute of Acoustics (IOA).

9 Conclusions and Next Steps

9.1 RSK Acoustics Ltd (“The Consultant”) has been instructed by Fujfilm Diosynth Biotechnologies Ltd (“The Client”) to undertake a noise impact assessment to support an environmental permit variation application at their operational site in Billingham, Teesside. The variation considers the introduction of a new manufacturing facility to the north of Central Avenue.

9.2 An unattended monitoring exercise was undertaken by RSKA between 04 and 09 May 2023, prior to the Site being constructed, to understand the prevailing level and characteristics of the residual acoustic environment. Upon completion of the development, attended noise monitoring was undertaken on 26 March 2026 to quantify the noise emissions associated with the Site’s operation.

9.3 A computer noise model of the site has been produced using SoundPLAN v9.1 based on site layout information passed on by the client, with consideration of the positioning/orientation of all buildings and structures. The model predictions realise the noise propagation of any plant noise in isolation at the nearest sensitive receptors to the site, taking terrain and local topographical features into consideration.

9.4 Input data in the form of noise emission levels has been assigned to the proposed plant, adjusted to the geometry and nature of the Site’s operations.

9.5 BS 4142 states that:

- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

9.6 With respect to the typical day-to-day operations of the Site, taking account of both the objective assessment methodology and consideration of contextual factors, it is considered that the risk of adverse impact upon the nearest NSRs is low.

9.7 Based on the assessment and contextual appraisal, it is concluded that that noise from HGV movements may be audible at NSR2 and NSR4, and can slightly affect the acoustic character of the area on occasion (i.e., in the absence of other noise sources unaffiliated with the Site) but not such that there is likely to be a change in the quality of life.

9.8 Regarding the operation of the emergency systems in the northwest corner of the Site, the predicted rating level exceeds the representative background sound level by a margin of up to 20 dB(A) across NSRs 1-6; at this magnitude, the likelihood that the test process generates a significant adverse impact is high.

9.9 It is understood that plant associated with the emergency systems will be tested for one hour (off-load) every fortnight and one hour (on-load) every three months, equating to 30 hours per year. Testing is to be undertaken within the period 09:00-17:00, Monday to Friday only, with each plant item to be operational for the minimum period required to ensure normal running temperatures and pressures are achieved and to comply with regulatory requirements.

Glossary of Terminology

Term	Definition
Ambient sound	The total sound at a given place, usually a composite of sounds from many sources near and far.
Background sound, $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval.
dB	Decibel. Scale for expressing sound pressure level. It is defined as 20 times the logarithm of the ratio between the root mean square pressure of the sound field and a reference pressure i.e. $2x10^{-5}$ Pascal.
dB(A)	A-weighted decibel. This provides a measure of the overall level of sound across the audible spectrum with a frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies. Example sound levels include: 140 dB(A) Threshold of pain 120 dB(A) Threshold of feeling 100 dB(A) Loud nightclub 80 dB(A) Traffic at busy roadside 60 dB(A) Normal speech level at 1m 40 dB(A) Quiet office 20 dB(A) Broadcasting studio 0 dB(A) Median hearing threshold (1000 Hz)
Frequency	The repetition rate of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted as kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20kHz.
$L_{Aeq,T}$	This is defined as the notional steady sound level over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
Specific sound level, $L_{AS,T}$	Sound pressure level produced by the source being assessed at the assessment location.
Rating level, $L_{AR,Tr}$	Specific sound level of a source plus any adjustment for the characteristic features of the sound.
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

References

British Standard 4142: 2014+A1:2019, ‘Methods of rating industrial and commercial sound’ British Standards Institution.

British Standard 7445-1: 2003, ‘Description and measurement of environmental noise – Part 1: Guide to quantities and procedures’. British Standards Institution.

BS ISO 9613-2:2024 ‘Attenuation of sound during propagation outdoors’. British Standards Institution.

‘Guidelines for Environmental Noise Impact Assessment’ (2014). Institute of Environmental Management & Assessment.

Credentials

This report has been prepared and reviewed by the following RSKA staff who hold a relevant degree in acoustics, more than three years relevant experience (within the past five years) and corporate membership to the Institute of Acoustics.

Prepared by:	Daniel Vallis BSc (Hons) CEnv MIOA MIEnvSc
Position Held:	Principal Acoustic Consultant
Qualifications:	BSc (Hons) Music Technology, Institute of Acoustics (IOA) Diploma in Acoustics and Noise Control, Chartered Environmentalist.
Affiliations:	Corporate Member of the IOA (MIOA), Full Member of the Institution of Environmental Sciences (MIEnvSc).
	Acoustics Experience: >11 years.

Reviewed by:	Matthew Thomson BSc (Hons) MSc MIOA
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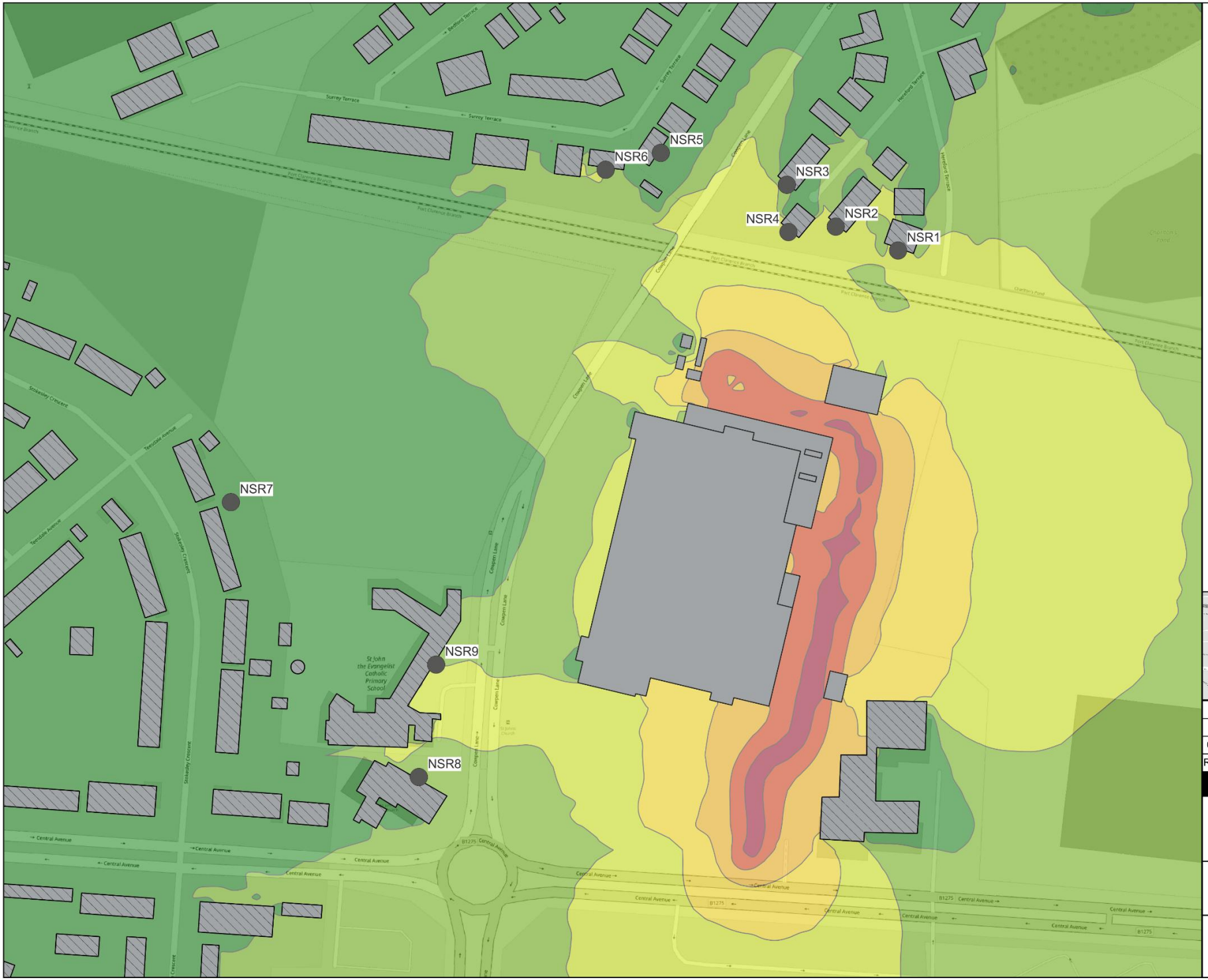
Qualifications:	BSc (Hons) Music Technology
	MSc Acoustics and Music Technology.
Affiliations:	Corporate Member of the Institute of Acoustics (MIOA).
	Acoustics Experience: >11 years.

Noise Contour Maps

Noise contour maps for each operating scenario, at ground floor and first floor level, are shown overleaf:



Legend:

- Receiver

Intervening Structures

- Existing Buildings
- Industrial building

Noise Contour, dB LS

- <35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- >60

Rev	Date	Description	Drn	Chk	App
01	20/04/26	Issue	DV	MT	DV

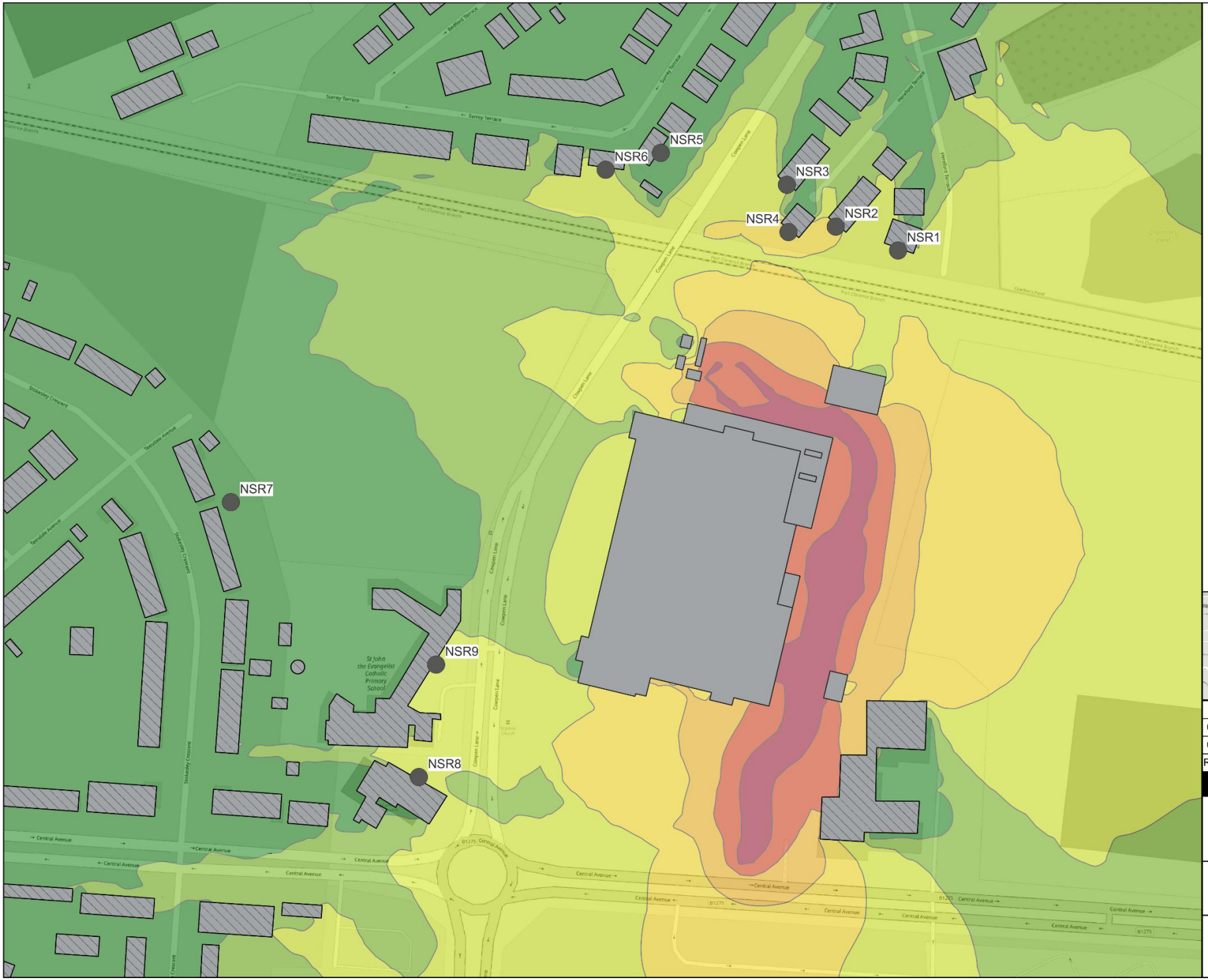
RSK acoustics

Figure A-1
Noise contour map, dB L_S
Daytime only; ground floor

0 20 40 60
Metres

N W E S

Rev 01



Legend:

- Receiver

Intervening Structures

- Existing Buildings
- Industrial building

Noise Contour, dB LS

- <35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- >60

Rev	Date	Description	Drn	Chk	App
02	22/04/26	Minor Updates	DV	MT	DV
01	20/04/26	Issue	DV	MT	DV

RSK acoustics

Figure A-2
Noise contour map, dB L_S
Daytime only; first floor

0 20 40 60
Metres

N W E S

Rev 02

Legend:

- Receiver

Intervening Structures

- Existing Buildings
- Industrial building

Noise Contour, dB LS

- <35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55

Rev	Date	Description	Drn	Chk	App
02	22/04/26	Minor Updates	DV	MT	DV
01	20/04/26	Issue	DV	MT	DV

RSK acoustics

Figure A-3
Noise contour map, dB L_S
24/7; ground floor

0 20 40 60
Metres

N W E S

Rev 02

Legend:

- Receiver

Intervening Structures

- Existing Buildings
- Industrial building

Noise Contour, dB LS

- <35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60

Rev	Date	Description	Drn	Chk	App
02	22/04/26	Minor Updates	DV	MT	DV
01	20/04/26	Issue	DV	MT	DV

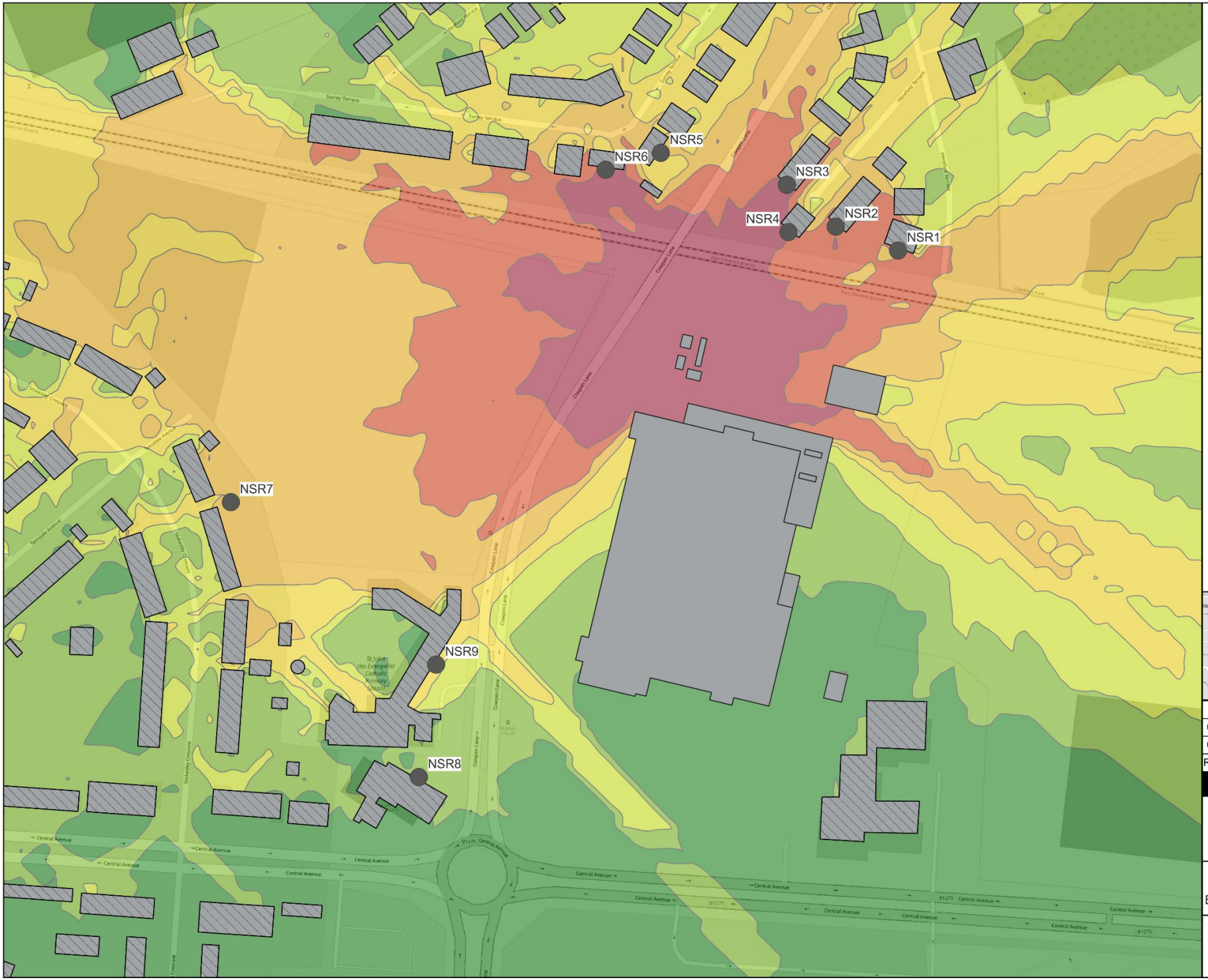
RSK acoustics

Figure A-4
Noise contour map, dB L_S
24/7; first floor

0 20 40 60
Metres

N W E S

Rev 02



Legend:

- Receiver

Intervening Structures

- Existing Buildings
- Industrial building

Noise Contour, dB LS

- <35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- >60

Rev	Date	Description	Drn	Chk	App
02	22/04/26	Minor Updates	DV	MT	DV
01	20/04/26	Issue	DV	MT	DV

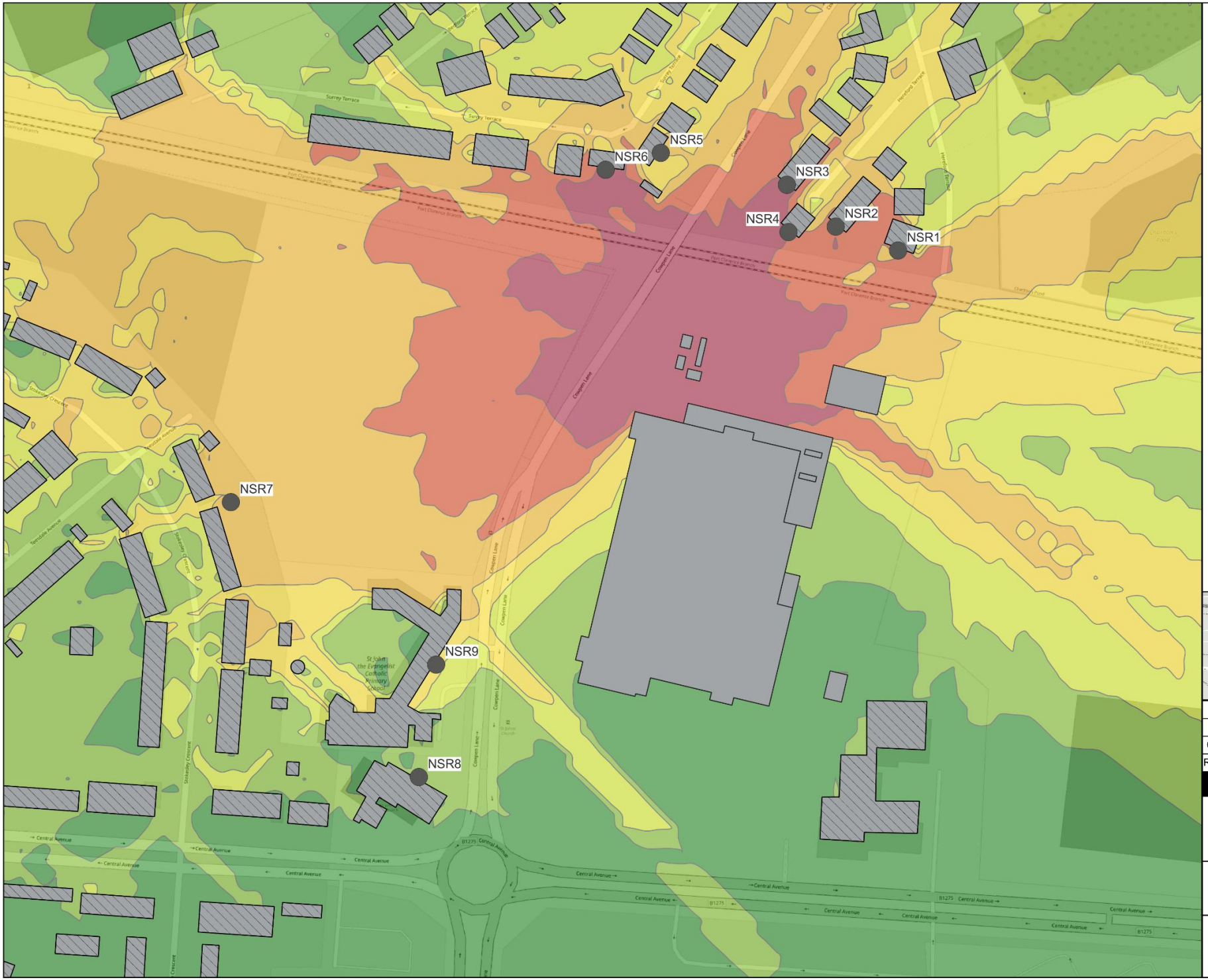
RSK acoustics

Figure A-5
Noise contour map, dB L_S
Emergency Systems test; ground floor

0 20 40 60
Metres

N W E S

Rev 02



Legend:

- Receiver

Intervening Structures

- Existing Buildings
- Industrial building

Contours

- <35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- >60

Rev	Date	Description	Drn	Chk	App
01	22/04/26	Issue	DV	MT	DV

RSK acoustics

Figure A-6
Noise contour map, dB L_S
Emergency Systems test; first floor

0 20 40 60
Metres

N W E S

Rev 01

RSK acoustics

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RISQS Verified