Air Quality Assessment

Substantial Permit Variation

31st March 2026

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Air Quality Assessment

Substantial Permit Variation

Amanda Gair
Technical Director

Sophie Rainey
Senior Environmental Permit Manager

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NON-TECHNICAL SUMMARY

Sol Environment Ltd has been commissioned to undertake an assessment of the likely local air quality impacts arising from the proposed replacement of boilers at the Fujifilm Diosynth Biotechnologies Limited's facility to the southeast of Billingham. The two existing boilers (referred to as Danks and Babcock) both emit via a 15.6 m stack and are located within the existing boiler house and their use will be discontinued when the new boilers are operational. The new boilers (two Clayton SEG-504 units) will be located within the same building but emissions will be via a new stack with a height of 20 m located at the existing stack location. The total thermal input of the new boilers is 10.114MW. The existing boilers have a total stated thermal input of 21.8 MW however due to being derated the actual thermal capacity is significantly below the quoted thermal capacity and <20 MWth. The proposed new boilers will meet the definition of a new 'Medium Combustion Plant'.

Detailed dispersion modelling has been undertaken to determine potential air quality impacts arising from the operation of the new boilers. In addition, a comparison of predicted concentrations with the existing boilers is provided.

Maximum predicted concentrations are compared with the relevant Air Quality Assessment Levels (AQALs) for the protection of health. The significance of the impacts has been assessed using criteria provided in the Environment Agency's Risk Assessment Guidance.

The predicted annual mean and hourly mean NO_2 concentrations are well below the relevant AQAL at all of the nearby sensitive receptors and the impact of the proposed new boilers on annual mean concentrations is considered to be not significant or the air quality assessment level likely to be met, in accordance with the Environment Agency's Risk Assessment Guidance.

The impact of the emissions from the new boilers on nearby habitat sites has also been determined. The impact of emissions on habitats was assessed as not significant when compared with existing background conditions and relevant critical levels and critical loads.

The difference in predicted concentrations between the existing boilers and the new boilers is small relative to the air quality assessment level (less than 0.23 $\mu g/m^3$) at sensitive receptor locations with predicted concentrations slightly lower for the new boilers due to the higher stack and lower emission concentration. For habitat sites the difference between existing and new boilers is negligible and less than 0.1% of the critical level or critical load.

1. INTRODUCTION

Sol Environment Ltd has been commissioned to undertake an assessment of the likely local air quality impacts arising from the proposed replacement of boilers at the Fujifilm Diosynth Biotechnologies Limited's facility to the southeast of Billingham. The two existing boilers (referred to as Danks and Babcock) both emit via a 15.6 m stack and are located within the existing boiler house and their use will be discontinued when the new boilers are operational. The new boilers (two Clayton SEG-504 units) will be located within the same building but emissions will be via a new stack with a height of 20 m located at the existing stack location. The total thermal input of the new boilers is 10.114 MW. The existing boilers have a total stated thermal input of 21.8 MW however due to being derated the actual thermal capacity is significantly below the quoted thermal capacity and <20 MWth. The proposed new boilers will meet the definition of a new 'Medium Combustion Plant'.

Detailed dispersion modelling has been undertaken to determine potential air quality impacts arising from the operation of the new boilers. In addition, a comparison of predicted concentrations with the existing boilers is provided.

Maximum predicted concentrations are compared with the relevant Air Quality Assessment Levels (AQALs) for the protection of health. The significance of the impacts has been assessed using criteria provided in the Environment Agency's Risk Assessment Guidance[1].

The facility is located within an industrial area to the southeast of Billingham, Stockton-on-Tees. The nearest residential receptor is located approximately 420 m to the west of the facility. The site Location is presented in Figure 1.1. The facility is located within the administrative area of Stockton-on-Tees Borough Council (SoTBC).

This report presents the findings of a dispersion modelling assessment to determine the impact of the installation on air quality at sensitive human and habitat receptors in the surrounding area.

The assessment has been undertaken in accordance with guidance provided by the Environment Agency for dispersion modelling assessments for specified generators[2]. A glossary of common air quality terminology is provided in Appendix A.

1 https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

2 https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

Figure 1.1 - Site Location

2. LEGISLATION AND POLICY

2.1 The European Directive on Ambient Air and Cleaner Air for Europe

European Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008, sets legally-binding Europe-wide limit values for the protection of public health and sensitive habitats. The Directive streamlines the European Union's air quality legislation by replacing four of the five existing Air Quality Directives within a single, integrated instrument.

The pollutants included are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter of less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), particulate matter of less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$), lead (Pb), carbon monoxide (CO), benzene, ozone (O^3), polycyclic aromatic hydrocarbons (PAHs), cadmium (Cd), arsenic (As), nickel (Ni) and mercury (Hg).

2.2 Air Quality Strategy 2023

The Air Quality Strategy[3] is the government's strategic framework for local authorities and other partners. It sets out their powers, responsibilities, and further actions the government expects them to take. It sets out a framework to enable local authorities to deliver for their communities and contribute to the government's long-term air quality goals, including ambitious new targets for fine particulate matter ($PM_{2.5}$).

It fulfils the statutory requirement of the Environment Act 1995 as amended by the Environment Act 2021 to publish an Air Quality Strategy setting out air quality standards, objectives, and measures for improving ambient air quality every 5 years. It does not replicate or replace other air quality guidance documents relevant to local authorities.

The government's national-level air quality regulations for concentrations consist of the Air Quality Standards Regulations 2010, which set limits for several pollutants, including nitrogen oxides, particulate matter, and others. In addition, under the Environment Act 2021, the government has set two new legally-binding long-term targets to reduce concentrations of fine particulate matter, $PM_{2.5}$.

The two new targets are an annual mean concentration of 10 µg/m^3 and a reduction in average population exposure by 35% by 2040, compared to a 2018 baseline. These targets are designed to help drive reductions in the worst PM2.5 hotspots across the country, whilst ensuring nationwide action to improve air quality for everyone.

There are also interim targets for each long-term target in the Environmental Improvement Plan which will promote early action and improvement. These are an annual mean $PM_{2.5}$ concentration of 12 µg/m^3 by January 2028 and a 22% reduction in average population exposure by January 2028 compared to a 2018 baseline.

2.3 Air Quality (England) Regulations

Many of the objectives in the AQS were made statutory in England with the Air Quality (England) Regulations 2000[4] and the Air Quality (England) (Amendment) Regulations 2002[5] (the Regulations) for the purpose of Local Air Quality Management (LAQM).

3 Air Quality Strategy, Framework for Local Authority Delivery, Department for Environment, Food and Rural Affairs (2023)
4 The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928
5 The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043

The Air Quality Standards Regulations 2010[6] (as amended) have adopted into UK law the limit values required by EU Directive 2008/50/EC[7] and came into force on the 10th June 2010. These regulations prescribe the 'relevant period' (referred to in Part I2V of the Environment Act 1995) that local authorities must consider in their review of the future quality of air within their area. The regulations also set out the air quality objectives to be achieved by the end of the 'relevant period'.

Ozone is not included in the Regulations as, due to its trans-boundary nature, mitigation measures must be implemented at a national level rather than at a local authority level.

The relevant air quality objectives for the pollutants considered in the assessment are presented in Appendix B.

2.4 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[8] sets two legally binding environmental targets for air quality relating to the reduction of levels of fine particulate matter ($PM_{2.5}$) in ambient air: one with the purpose of reducing $PM_{2.5}$ in locations where concentrations are highest, the annual mean concentration target ("AMCT"); and a second with the purpose of reducing average exposure across the country, the population exposure reduction target ("PERT"). This instrument establishes for each target the level to be achieved and the date for its achievement, as well as making provision about monitoring, measurement, and calculation to assess whether the targets are met.

This instrument satisfies the requirement in section 1(2) of the Environment Act 2021 ("the Environment Act") for government to set at least one target in the priority area of air quality and section 2 of the Environment Act to set a target in respect of the annual mean level of $PM_{2.5}$ in ambient air.

2.5 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 also requires local authorities to periodically review and assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA).

For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their Review and Assessment work[9]. This guidance, referred to in this chapter as LAQM.TG(22), has been used where appropriate in the assessment.

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6 The Air Quality Standards Regulations 2010 – Statutory Instrument 2010 No. 1001

7 Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008, on ambient air quality and cleaner air for Europe

8 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 - Statutory Instrument 2023 No. 96

9 Department for Environment, Food and Rural Affairs (DEFRA), (2022): Part IV The Environment Act 1995 Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(22).

2.6 Medium Combustion Plant Directive (MCPD)

The Medium Combustion Plant Directive (2015/2193) came into force on 18th December 2015 and regulates pollutant emissions from the combustion of fuels in plants with a rated thermal input equal to or greater than 1 MWth and less than 50 MWth.

It regulates emissions of SO_2, NO_x and dust into the air with the aim of reducing those emissions and the risks to human health and the environment they may cause. It also lays down rules to monitor emissions of carbon monoxide (CO).

It fills the regulatory gap at EU level between large combustion plants (> 50 MWth), covered under the Industrial Emissions Directive (IED) and smaller appliances (heaters and boilers <1 MWth) covered by the Ecodesign Directive.

The Medium Combustion Plant is implemented through the Environmental Permitting Regulations (EPR).

The design and operation of all new Medium Combustion Plants must ensure compliance with emission limit values (ELVs) set out in the MCPD; these ELVs are summarised in Table 2.1 and 2.2. Different limits apply to existing MCP facilities.

Table 2.1 - MCPD Emission Limits for MCP other than Engines and Gas Turbines (mg/Nm^3)

Pollutant	Emission Limit (Dry gas at 273.15K, 101.3mb and 3% O2)					
	Solid Biomass	Other Solid Fuels	Gas Oil	Liquid Fuels Other Than Gas Oil	Natural Gas	Gaseous Fuels Other Than Natural Gas
SO_2	200(1)	400	-	350(2)	-	35(3)(4)
NO_x	300(5)	300(5)	200	300(6)	100	200
Dust	20(7)	20(7)	-	20(8)	-	

(1) The value does not apply in the case of plants firing exclusively woody solid biomass.
(2) Until 1 January 2025, 1 700 mg/Nm^3 in the case of plants which are part of SIS or MIS.
(3) 400 mg/Nm^3 in the case of low calorific gases from coke ovens, and 200 mg/Nm^3 in the case of low calorific gases from blast furnaces, in the iron and steel industry.
(4) 100 mg/Nm^3 in the case of biogas.
(5) 500 mg/Nm^3 in the case of plants with a total rated thermal input equal to or greater than 1 MW and less than or equal to 5 MW.
(6) Until 1 January 2025, 450 mg/Nm^3 when firing heavy fuel oil containing between 0,2 % and 0,3 % N and 360 mg/Nm^3 when firing heavy fuel oil containing less than 0,2 % N in the case of plants which are part of SIS or MIS.
(7) 50 mg/Nm^3 in the case of plants with a total rated thermal input equal to or greater than 1 MW and less than or equal to 5 MW; 30 mg/Nm^3 in the case of plants with a total rated thermal input greater than 5 MW and less than or equal to 20 MW.
(8) 50 mg/Nm^3 in the case of plants with a total rated thermal input equal to or greater than 1 MW and less than or equal to 5

Table 2.2 - MCPD Emission Limits for MCP for Engines and Gas Turbines (mg/Nm³)

Pollutant	Emission Limit (Dry gas at 273.15K, 101.3mb and 15% O2)				
		Gas Oil	Liquid Fuels Other Than Gas Oil	Natural Gas	Gaseous Fuels Other Than Natural Gas
SO_2	Engines and gas turbines	-	120(9)	-	15(10)
NO_x	Engines	190(11)	190(11)(12)	95(13)	190
	Gas turbines	75	75(14)	50	75
Dust	Engines and gas turbines	-	10(15)(16)	-	-

(9) Until 1 January 2025, 590 mg/Nm³ for diesel engines which are part of SIS or MIS
(10) 40 mg/Nm³ in the case of biogas
(11) 225 mg/Nm³ for dual fuel engines in liquid mode.
(12) 225 mg/Nm³ for diesel engines with a total rated thermal input less than or equal to 20 MW with ≤ 1 200 rpm
(13) 190 mg/Nm³ for dual fuel engines in gas mode.
(14) Until 1 January 2025, 550 mg/Nm³ for plants which are part of SIS or MIS.
(15) Until 1 January 2025, 75 mg/Nm³ for diesel engines which are part of SIS or MIS
(16) 20 mg/Nm³ in the case of plants with a total rated thermal input equal to or greater than 1 MW and less than or equal to 5 MW

3. METHODOLOGY

3.1 Scope of the Assessment

The scope of the assessment has been determined in the following way:

- review of air quality data for the area surrounding the site, including data from the Defra Air Quality Information Resource (UK-AIR);
- desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality; and
- review and modelling of emissions data which has been used as an input to the UK Atmospheric Dispersion Modelling System (ADMS).

The assessment comprises a review of emission parameters for the existing and new boiler plant and dispersion modelling to predict ground-level concentrations of pollutants at sensitive human and habitat receptor locations. Predicted concentrations are compared with relevant air quality assessment levels for the protection of health and critical levels/ loads for the protection of sensitive ecosystems and vegetation.

3.2 Dispersion Model Parameters

3.2.1 Emission Concentrations

The predicted impact of the facility on local air quality has been undertaken using the UK ADMS dispersion model (Version 6.0).

MCPD emission limits have been assumed for the purposes of the modelling assessment for the new boilers and an emission concentration for the oxides of nitrogen (NO_x) of 100 mg/Nm^3 has been assumed (at 3% oxygen). For the existing boilers, an emission concentration of 165 mg/Nm^3 has been assumed based on five emissions monitoring reports (three for the Babcock boilers and two for the Danks boilers) carried out in 2024 and 2025. As an existing MCP facility the emission limit value would be 200 mg/Nm^3 but adopting actual emissions ensures the benefit of the new boilers is not overestimated when compared to the existing boilers. It is assumed that both the existing and new boilers operate continuously at these emission concentrations. The existing boilers will be decommissioned before the new boilers become operational and the existing and new boilers will not operate together.

A summary of the input parameters for the existing and new boilers is presented in Appendix C. These have been derived from information provided by Fujifilm Diosynth Biotechnologies Ltd.

3.2.2 Meteorological Data

Dispersion modelling has been undertaken using five years (2018-2022) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions. Data from the meteorological station at Durham Tees Valley Airport, approximately 14 km to the west-southwest of the site have been used for this assessment.

Wind roses for each year of meteorological data are presented in Appendix D.

3.2.3 Topography

The presence of elevated terrain can significantly affect the dispersion of pollutants by increasing turbulence and reducing the distance between the plume centre line and the ground level. The terrain within the immediate vicinity of the site is relatively flat but, for completeness, the topography of the area surrounding the site has been included in the dispersion model.

3.2.4 Building Downwash / Entrainment

The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to a phenomenon called downwash. This occurs when a building distorts the wind flow, creating zones of increased turbulence. Increased turbulence causes the plume to come to ground earlier than otherwise would be the case and results in higher ground level concentrations closer to the stack.

Downwash effects are only significant where building heights are greater than 30 to 40% of the emission release height. The downwash structures also need to be sufficiently close for their influence to be significant. Therefore, buildings within 5L of the facility have been included in the model (where L is the minimum of the building height or maximum projected width). A summary of the buildings and structures that have been included in the model is presented in Table 3.1. Buildings B8 to B11 are only included in the cumulative modelling with the emergency diesel generators over 1 MWth.

Table 3.1 - Building Downwash Structures

Building	Easting	Northing	Height (m)	Length (m)	Width (m)	Angle (°)
B1 Boiler house	446677	522635	9.0	16.3	11.5	62
B2 Building MF5	446617	522671	21.8	16.9	29.5	62
B3 Building R	446583	522616	18.0	17.2	58.0	62
B4 Building MCC	446685	522592	13.1	27.8	42.7	62
B5 Building MF1/2 upper	446665	522701	21.8	31.6	43.5	62
B6 Building MF1/2 lower	446637	522685	13.2	32.4	47.6	62
B7 Building MF6 (new only)	446645	522647	15.0	56.0	26.0	62
B8 Building Diesel 7 m	446746	522559	7	28	50	98
B9 Building Diesel 13 m	446782	522559	13	30	14	98
B10 Building Diesel 6 m	446778	522543	6	25	14	98
B11 Building North	446499	522974	20	82	120	105

3.2.5 Nitric Oxide to NO_2 Conversion

Oxides of nitrogen (NO_x) emitted to atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as ozone (O_3).

A conversion ratio of 70% NO_x:NO_2 has been assumed for comparison of predicted concentrations with the long-term objectives for NO_2. A conversion ratio of 35% has been utilised for the assessment of short-term impacts, as recommended by Environment Agency guidance .

3.3 Sensitive Human Receptors

LAQM.TG(22) describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations 'where members of the public are regularly present' should be considered. At such locations, members of the public will be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes

For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standard (i.e. 15-minute mean or 1-hour mean) may be relevant. In a school, or adjacent to a private dwelling, however; where exposure may be for longer periods, comparison with long-term (such as 24-hour mean or annual mean) standards may be most appropriate. In general terms, concentrations associated with long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

The locations of the discrete human sensitive receptors selected for the assessment are presented in Table 3.2 and Figure 3.1. Receptors R13 and R14 have been included for the cumulative modelling with the emergency diesel generators over 1 MWth as one of the diesel generators is located to the north of the site close to residential locations.

Table 3.2 - Human Health Receptors

ID	Receptor	Type	Easting	Northing
R1	School	Education	446375	522900
R2	Central Avenue	Residential	446332	522864
R3	School	Education	446277	522724
R4	Weardale Crescent	Residential	446305	522656
R5	Cricket Pavilion	Leisure	446380	522462
R6	Monksfield	Residential	446215	522450
R7	Rawlinson Avenue	Residential	446321	522335
R8	Bowling Club	Leisure	446407	522508
R9	Sports Ground	Leisure	446706	522832
R10	Greenwood Road	Residential	447113	523240
R11	Cafe Technology Park	Commercial	447698	523074
R12	Hereford Terrace	Residential	446581	523109
R13	Hereford Terrace	Residential	446531	523113
R14	Nursery	Education	446599	523178

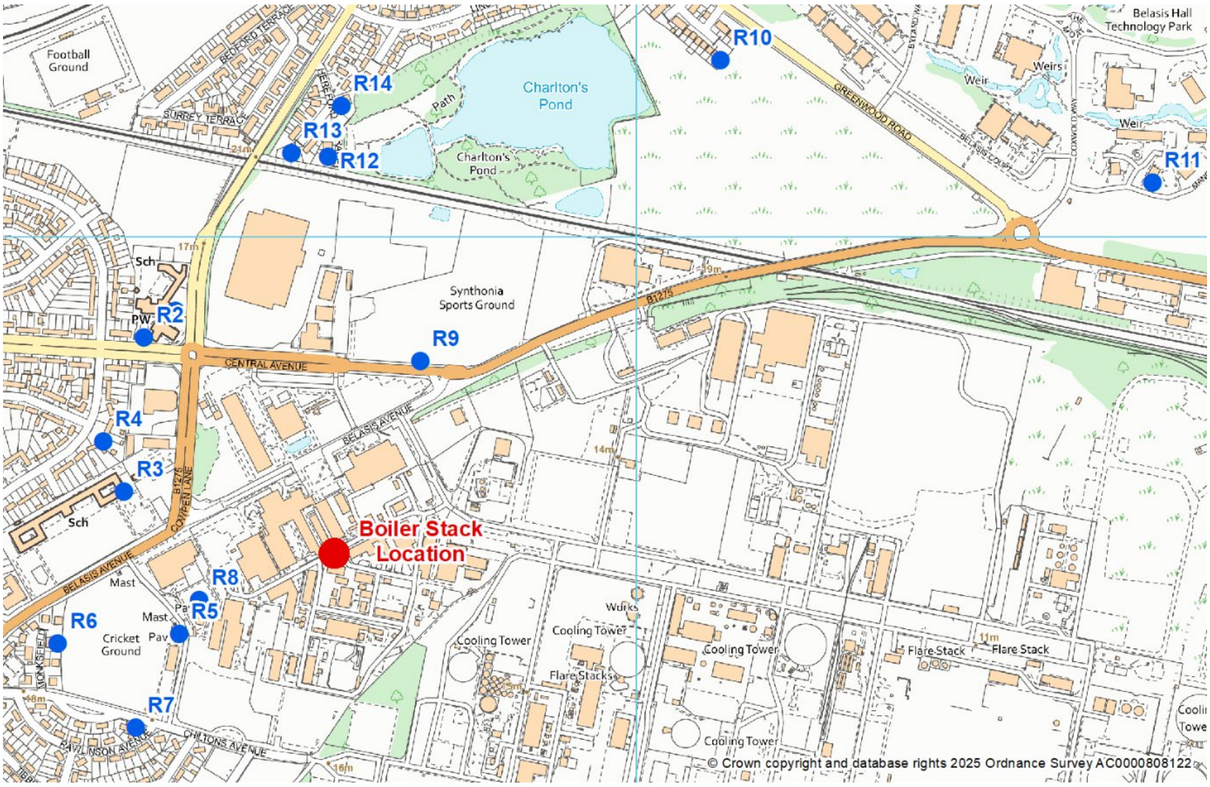


Figure 3.1 - Sensitive Human Health Receptor Locations

Concentrations are also predicted across a grid of 3 km by 3 km with a 30 m grid resolution. For all receptors, concentrations are predicted at ground level.

3.4 Sensitive Habitat Receptors

The Environment Agency's Risk Assessment Guidance states that the impact of emissions to air on vegetation and ecosystems should be assessed for the following habitat sites within 10 km of the source:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive [10;]
- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive [11]; and
- Ramsar Sites designated under the Convention on Wetlands of International Importance [12].

Within 2 km 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);

10 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

11 Council Directive 79/409/EEC on the conservation of wild birds

12 Ramsar (1971), The Convention of Wetlands of International Importance especially as Waterfowl Habitat.

- local wildlife sites (Sites of Interest for Nature Conservation, SINC and Sites of Local Interest for Nature Conservation, SLINC); and
- ancient woodland.

However, the habitat screening for MCPD installations of between 10 and 20 MWth is 2.5 km for European sites and 2 km for SSSI. Habitat receptor designations and locations relevant to the assessment are presented in Table 3.3. The location of the habitats is provided in Figure 3.2.

Table 3.3 - Sensitive Habitat Receptors

Receptor	Sensitive Habitats
H1. Teesmouth & Cleveland Coast SPA and SSSI	Coastal dune grasslands (grey dunes) and calcareous grassland
H2. Teesmouth & Cleveland Coast SPA, SSSI and proposed Ramsar site	Coastal dune grasslands (grey dunes) and calcareous grassland

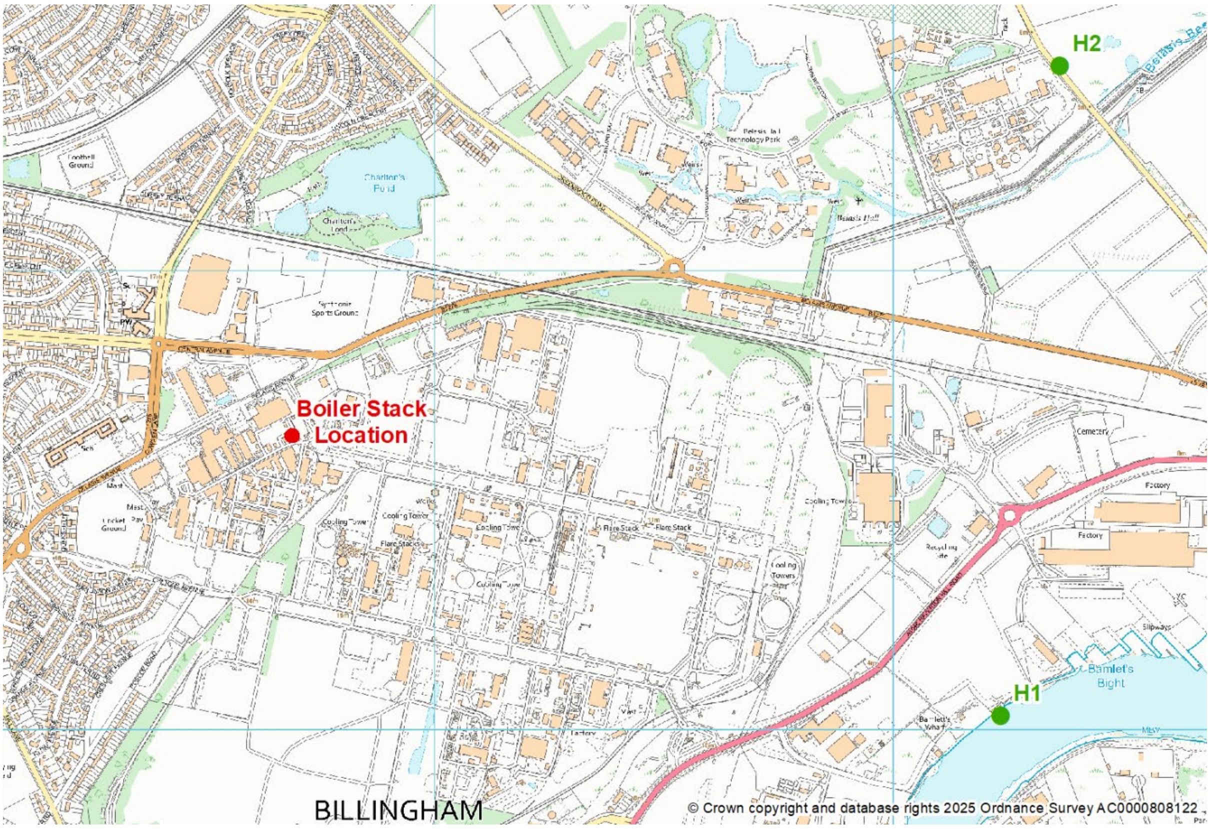


Figure 3.2 - Sensitive Habitat Receptor Locations

The modelled ground level pollutant concentrations are used to predict deposition rates, using typical deposition velocities as recommended in the relevant guidance[13]. A summary of typical NO_2 dry deposition velocities is presented in Table 3.4.

13 AQTAG06. Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air.

Table 3.4 - Dry Deposition Velocities (m/s)

Pollutant	Grassland	Woodland
Nitrogen Dioxide (NO_2)	0.0015	0.0030

Advice provided in the relevant guidance indicates that it can be assumed that the wet deposition rates are not significant within the distances considered within the modelling. Therefore, wet deposition has not been considered within this assessment.

The predicted nitrogen deposition rates assume a 100% NO_X: NO_2 conversion. This represents a worst-case for the assessment since nitric oxide (NO) has a lower deposition velocity than NO_2 and consequently results in lower deposition rates.

Predicted ground level concentrations and acidification / deposition rates are compared with relevant critical levels and critical loads for the protection of sensitive ecosystems and vegetation (see Appendix E).

3.5 Significance Criteria

3.5.1 Human Health Impacts

The Environment Agency has developed criteria for assessing the significance of an impact compared with relevant air quality standards and background air quality[14]. A process contribution (PC) is considered not significant if:

- The long-term PC < 1% of the long-term air quality standard.
- The short-term PC < 10% of the short-term air quality standard.

Below 1% of the long-term air quality standard, the impact of a development is unlikely to be significant compared with background air quality.

If the screening criteria are not met, the process contribution should be considered in combination with relevant ambient background pollutant concentrations. The impact is likely to be not significant if:

- The long-term PC + background concentration < 70% of the air quality standard.
- The short-term PC < 20% (air quality standard – short-term background concentration), where the short-term background concentration is assumed to be twice the long-term background concentration.

3.5.2 Habitat Impacts

The Environment Agency has developed criteria for assessing impacts at SPAs, SACs, Ramsar sites and SSSIs, compared with the relevant EAL and background air quality.

Stage 1

A process contribution (PC) is considered not significant if:

- The long term PC < 1% of the long-term EAL.

14 https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

- The short term PC < 10% of the short-term EAL.

Stage 2

If the Stage 1 screening criteria are not met, the PC should be considered in combination with relevant ambient background pollutant concentrations. The air quality standards are likely to be met if:

- The long term PC + background concentration < 70% of the EAL.

Where relevant, for local nature sites (SINCs, SLINCs, NNRs, LNRs and ancient woodland), a process contribution (PC) is considered not significant if:

- The long term PC < 100% of the long-term EAL.
- The short term PC < 100% of the short-term EAL.

4. BASELINE CONDITIONS

4.1 Review and Assessment of Air Quality

Stockton-on-Tees Borough Council (SoTBC) carry out frequent review and assessments of air quality within the area and produce Annual Status Reports in accordance with the requirements of Defra. SoTBC do not currently have any declared Air Quality Management Areas (AQMAs).

4.2 Measured Concentrations

SoTBC undertake automatic air quality monitoring of NO2 at three locations. The nearest is an Automatic Urban and Rural Network (AURN) monitoring location in Billingham, (refer AQ3 on Figure 4.1). This is an industrial monitoring site and likely to be representative of air quality around the Fujifilm site.

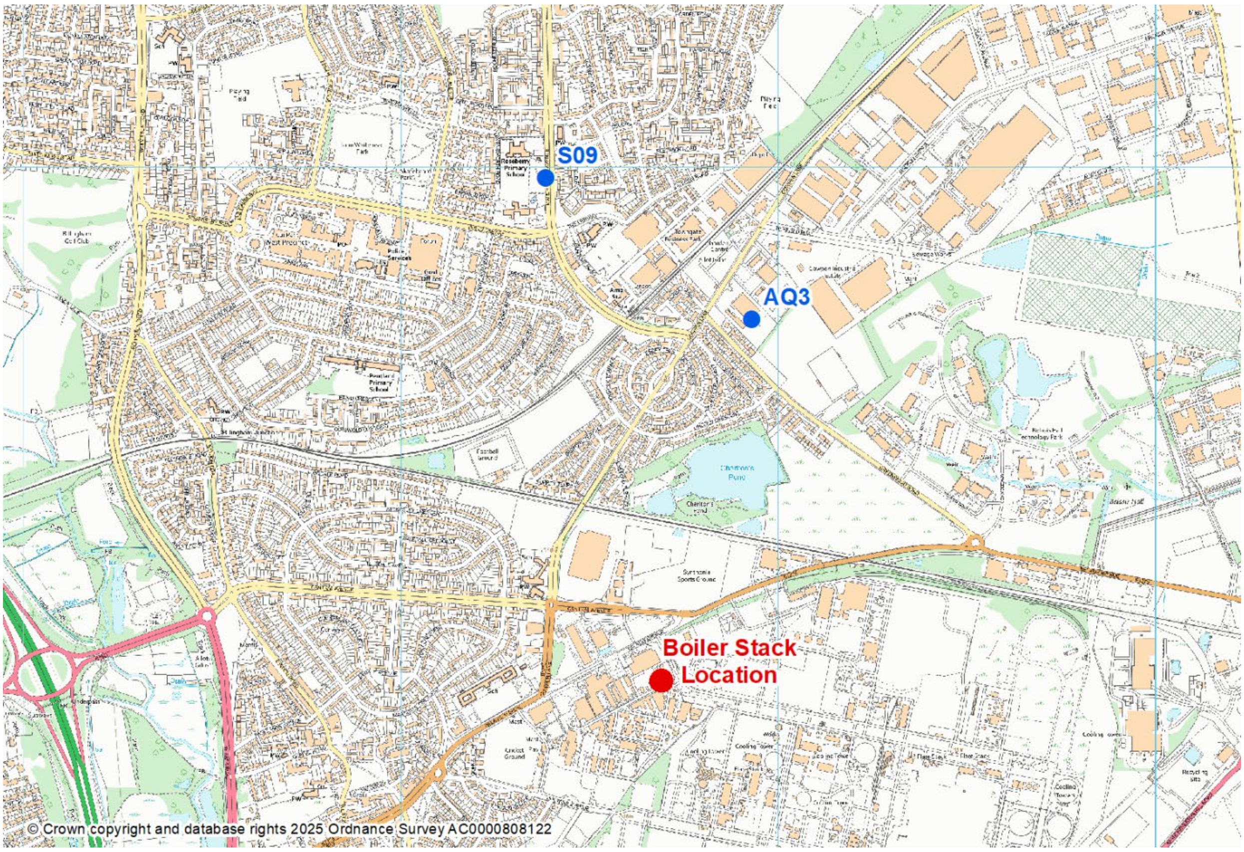


Figure 4.1 - Monitoring Locations within 1.5 km of the Site

SoTBC also measure NO_2 using a network of passive diffusion tube locations and in 2023 (latest data publicly available) there were 13 monitoring sites. All of these are located at roadside locations and the nearest (S09) is located at Marsh House Avenue in Billingham. The location of this monitor is presented in Figure 4.1.

A summary of the annual mean background NO_2 concentrations at the automatic continuous monitor (AQ3) and diffusion tube site (S09) is presented in Table 4.1 for 2021 to 2023. Measured concentrations are well below the AQAL of 40 $\mu g/m^3$.

Table 4.1 - Annual Mean NO_2 Concentrations (µg/m^3)

Monitoring Site	Type	2021	2022	2023
AQ3	Industrial	13.0	12.9	12.4
S09	Roadside	16.5	13.4	14.2

4.3 Background Mapped Concentrations

Urban background concentrations of NO_2 have also been obtained from the Defra UK Background Air Pollution Maps[15] for use in the assessment. These 1 km grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites.

The latest background maps were issued in November 2024 and are based on 2021 monitoring data. For the nine 1 km^2 grid squares surrounding the facility, the mapped concentrations of NO_2 range between 9.7 and 12.4 µg/m^3 with an average of 11.3 µg/m^3. This is comparable to the measured concentrations at AQ3 but lower than measured at S09. Therefore, for the purposes of the assessment the maximum measured 2023 concentration of 14.2 µg/m^3 (measured at SO9) has been adopted as being characteristic of exposure to NO_2 for the receptors considered.

4.4 Summary of Background Concentrations

A summary of background concentrations assumed for the assessment is provided in Table 4.2. For NO_2, an annual mean concentration of 14.2 µg/m^3 has been assumed based on recent diffusion tube monitoring at the nearest roadside location.

Table 4.2 - Summary of Background Concentrations (µg/m^3)

Pollutant	Annual Mean	Short-term Mean
Nitrogen dioxide (NO_2)	14.2	28.4 (1-hour)

15 http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

5. ASSESSMENT OF IMPACTS

5.1 Human Health Impacts

The maximum process contributions (PC) over the five years of meteorological data have been predicted at each of the discrete receptors identified in Table 3.2.

The significance of the impacts has been assessed in accordance with the Environment Agency's Risk Assessment Guidance.

5.1.1 Annual Mean NO_2 Concentrations – New Boilers

Predicted annual mean NO_2 PCs and PECs are presented in Table 5.1 for the new boilers. The maximum PC occurs at Receptor R9 (Sports Ground) and with a predicted concentration of 1.0 µg/m^3 is 2.5% of the AQAL of 40 µg/m^3 and would be assessed as potentially significant according to the Environment Agency's Risk Assessment Guidance. However, for a background concentration of 14.2 µg/m^3, the PEC is well below 70% of the AQAL and it is unlikely that this would be exceeded.

Table 5.1 - Predicted Annual Mean NO_2 Concentrations - New Boilers (µg/m^3)

Receptor	Annual Mean			
	PC	PC (% AQAL)	PEC	PEC (% AQAL)
Maximum predicted	1.2	3.1%	15.4	38.6%
R1. School	0.093	0.2%	14.3	35.7%
R2. Central Avenue	0.067	0.2%	14.3	35.7%
R3. School	0.053	0.1%	14.3	35.6%
R4. Weardale Crescent	0.064	0.2%	14.3	35.7%
R5. Cricket Pavilion	0.12	0.3%	14.3	35.8%
R6. Monksfield	0.066	0.2%	14.3	35.7%
R7. Rawlinson Avenue	0.11	0.3%	14.3	35.8%
R8. Bowling Club	0.14	0.3%	14.3	35.8%
R9. Sports Ground	1.0	2.5%	15.2	38.0%
R10. Greenwood Road	0.15	0.4%	14.3	35.9%
R11. Cafe Technology Park	0.063	0.2%	14.3	35.7%
R12. Hereford Terrace	0.28	0.7%	14.5	36.2%
AQAL	40			
Background	14.2			
Maximum PEC	15.4			
Maximum PEC (%AQAL)	38.6%			

Predicted annual mean NO_2 concentrations for the year in which maximum concentrations are predicted (2022), is presented as a contour plot in Figure 5.1.

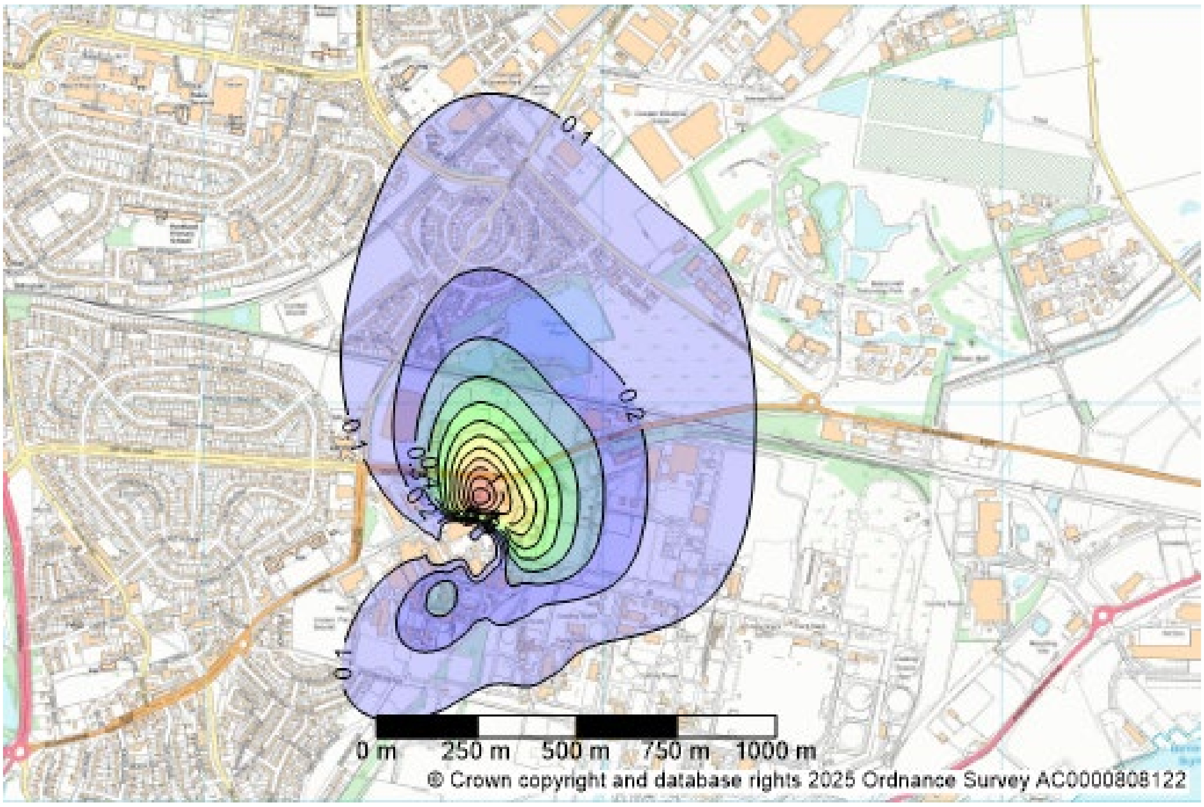


Figure 5.1 - Predicted Annual Mean NO_2 Concentrations as the PC for the New Boilers (µg/m^3)

5.1.2 Hourly Mean NO_2 Concentrations as the 99.8th Percentile – New Boilers

Predicted hourly mean NO_2 PCs and PECs as the 99.8th percentile of hourly means are presented in Table 5.2 for the new boilers. Predicted 99.8th percentile of hourly mean NO_2 concentrations for the year in which maximum concentrations are predicted (2020) are also presented as a contour plot in Figure 5.2.

Table 5.2 - Predicted NO_2 Concentrations as the 99.8th Percentile of Hourly Means (µg/m^3) – New Boilers

Receptor	99.8th Percentile of 1-Hour Means			
	PC	PC (% AQAL)	PEC	PEC (% AQAL)
Maximum predicted	9.1	4.5%	37.5	18.7%
R1. School	1.5	0.7%	29.9	14.9%
R2. Central Avenue	1.3	0.7%	29.7	14.9%
R3. School	1.3	0.6%	29.7	14.8%
R4. Weardale Crescent	1.4	0.7%	29.8	14.9%
R5. Cricket Pavilion	1.6	0.8%	30.0	15.0%
R6. Monksfield	1.1	0.5%	29.5	14.7%
R7. Rawlinson Avenue	1.2	0.6%	29.6	14.8%
R8. Bowling Club	1.8	0.9%	30.2	15.1%
R9. Sports Ground	3.6	1.8%	32.0	16.0%
R10. Greenwood Road	0.90	0.4%	29.3	14.6%
R11. Cafe Technology Park	0.68	0.3%	29.1	14.5%

R12. Hereford Terrace	1.3	0.6%	29.7	14.8%
AQAL	200			
Background	28.4			
Maximum PEC	37.5			
Maximum PEC (%AQAL)	18.7%			

As indicated in Table 5.2, the predicted maximum hourly mean NO_2 concentration as the PC arising from the new boilers is 9.1 µg/m^3, which is 4.5% of the AQAL of 200 µg/m^3. At sensitive receptors, the PC is 1.8% of the AQAL at worst. At less than 10% of the short-term AQAL, the impact at all locations would be assessed as not significant.

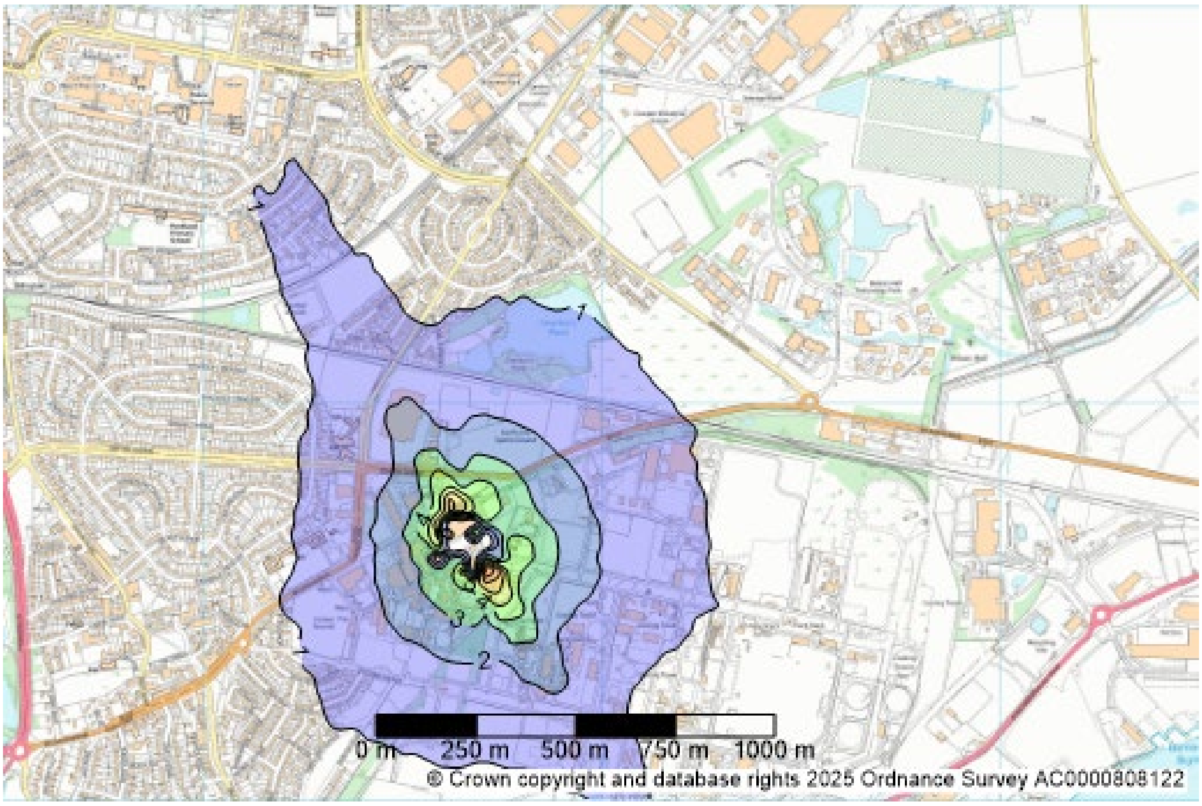


Figure 5.2 - Predicted 1-Hour Mean NO_2 Concentrations as the 99.8th Percentile (µg/m^3) – New Boilers

5.1.3 Annual Mean NO_2 Concentrations – Existing Boilers

Predicted annual mean NO_2 PCs and PECs are presented in Table 5.3 for the existing boilers. The maximum predicted PC is 2.6 µg/m^3 is 6.6% of the AQAL of 40 µg/m^3 but the PEC is well below 70% of the AQAL and it is unlikely that this would be exceeded. Other than R9, the PC is less than or equal to 1% of the AQAL and the impact at these receptors would be assessed as not significant. For R9, the PC is 3.1% of the AQAL but the PEC is well below 70% of the AQAL and it is unlikely that this would be exceeded.

Table 5.3 - Predicted Annual Mean NO_2 Concentrations - Existing Boilers (µg/m^3)

Receptor	Annual Mean			
	PC	PC (% AQAL)	PEC	PEC (% AQAL)
Maximum predicted	2.6	6.6%	16.8	42.1%
R1. School	0.096	0.2%	14.3	35.7%
R2. Central Avenue	0.070	0.2%	14.3	35.7%
R3. School	0.057	0.1%	14.3	35.6%
R4. Weardale Crescent	0.070	0.2%	14.3	35.7%
R5. Cricket Pavilion	0.13	0.3%	14.3	35.8%
R6. Monksfield	0.065	0.2%	14.3	35.7%
R7. Rawlinson Avenue	0.11	0.3%	14.3	35.8%
R8. Bowling Club	0.15	0.4%	14.3	35.9%
R9. Sports Ground	1.3	3.1%	15.5	38.6%
R10. Greenwood Road	0.15	0.4%	14.4	35.9%
R11. Cafe Technology Park	0.061	0.2%	14.3	35.7%
R12. Hereford Terrace	0.27	0.7%	14.5	36.2%
AQAL	40			
Background	14.2			
Maximum PEC	16.8			
Maximum PEC (%AQAL)	42.1%			

5.1.4 Hourly Mean NO_2 Concentrations as the 99.8th Percentile – Existing Boilers

Predicted hourly mean NO_2 PCs and PECs as the 99.8th percentile of hourly means are presented in Table 5.4 for the existing boilers.

Table 5.4 - Predicted NO_2 Concentrations as the 99.8th Percentile of Hourly Means (µg/m^3) – Existing Boilers

Receptor	99.8th Percentile of 1-Hour Means			
	PC	PC (% AQAL)	PEC	PEC (% AQAL)
Maximum predicted	12.5	6.2%	40.9	20.4%
R1. School	1.6	0.8%	30.0	15.0%
R2. Central Avenue	1.5	0.7%	29.9	14.9%
R3. School	1.4	0.7%	29.8	14.9%
R4. Weardale Crescent	1.7	0.8%	30.1	15.0%
R5. Cricket Pavilion	1.8	0.9%	30.2	15.1%
R6. Monksfield	1.2	0.6%	29.6	14.8%
R7. Rawlinson Avenue	1.3	0.6%	29.7	14.8%
R8. Bowling Club	2.2	1.1%	30.6	15.3%
R9. Sports Ground	4.5	2.3%	32.9	16.5%
R10. Greenwood Road	1.2	0.6%	29.6	14.8%

R11. Cafe Technology Park	0.72	0.4%	29.1	14.6%
R12. Hereford Terrace	1.4	0.7%	29.8	14.9%
AQAL	200			
Background	28.4			
Maximum PEC	40.9			
Maximum PEC (%AQAL)	20.4%			

As indicated in Table 5.4, the predicted maximum hourly mean NO_2 concentration as the PC arising from the existing boilers is 12.5 µg/m^3, which is 6.2% of the AQAL of 200 µg/m^3. At sensitive receptors, the PC is 2.3% of the AQAL at worst. At less than 10% of the short-term AQAL, the impact at all locations would be assessed as not significant.

5.1.5 Difference Between Existing and New Boilers

A comparison between the existing and new boilers is provided in Table 5.5 as the annual mean and Table 5.6 as the hourly mean (99.8th percentile).

Table 5.5 - Predicted Annual Mean NO_2 Concentrations - Existing and New Boilers (µg/m^3)

Receptor	Annual Mean			
	PC Existing Boilers	PC New Boilers	Difference	Difference (% AQAL)
Maximum predicted	2.6	1.2	-1.4	-3.5%
R1. School	0.096	0.093	0.00	<0.1%
R2. Central Avenue	0.070	0.067	0.00	<0.1%
R3. School	0.057	0.053	0.00	<0.1%
R4. Weardale Crescent	0.070	0.064	-0.01	<-0.1%
R5. Cricket Pavilion	0.13	0.12	0.00	<0.1%
R6. Monksfield	0.065	0.066	0.00	<0.1%
R7. Rawlinson Avenue	0.11	0.11	0.00	<0.1%
R8. Bowling Club	0.15	0.14	-0.01	<-0.1%
R9. Sports Ground	1.3	1.0	-0.23	-0.6%
R10. Greenwood Road	0.15	0.15	-0.01	<-0.1%
R11. Cafe Technology Park	0.061	0.063	0.00	<0.1%
R12. Hereford Terrace	0.27	0.28	0.01	<0.1%

For the majority of receptors there is very little difference between predicted annual mean concentrations for the existing and new boilers. The biggest difference is predicted as the maximum predicted concentration which is 1.4 µg/m^3 (3.5% of the AQAL) lower for the new boilers. For sensitive receptors, the biggest difference is at R9 where there is a 0.23 µg/m^3 (0.6% of the AQAL) reduction in annual mean NO_2 concentrations as a result of replacing the boilers.

Table 5.6- Predicted NO_2 Concentrations as the 99.8th Percentile of Hourly Means (µg/m³) – Existing and New Boilers

Receptor	99.8th Percentile of 1-Hour Means			
	PC Existing Boilers	PC New Boilers	Difference	Difference (% AQAL)
Maximum predicted	12.5	9.1	-3.4	-1.7%
R1. School	1.6	1.5	-0.12	-0.1%
R2. Central Avenue	1.5	1.3	-0.15	-0.1%
R3. School	1.4	1.3	-0.11	-0.1%
R4. Weardale Crescent	1.7	1.4	-0.24	-0.1%
R5. Cricket Pavilion	1.8	1.6	-0.13	-0.1%
R6. Monksfield	1.2	1.1	-0.13	-0.1%
R7. Rawlinson Avenue	1.3	1.2	-0.05	<-0.1%
R8. Bowling Club	2.2	1.8	-0.36	-0.2%
R9. Sports Ground	4.5	3.6	-0.96	-0.5%
R10. Greenwood Road	1.2	0.90	-0.29	-0.1%
R11. Cafe Technology Park	0.72	0.68	-0.04	<-0.1%
R12. Hereford Terrace	1.4	1.3	-0.19	-0.1%

As for the annual mean, there is little difference between predicted short-term concentrations for the existing and new boilers. The biggest difference is predicted as the maximum predicted concentration which is 3.4 µg/m³ (1.7% of the AQAL) higher for the existing boilers. For sensitive receptors, the biggest difference is at R9 where there is a 0.96 µg/m³ (0.5% of the AQAL) reduction in hourly mean NO_2 concentrations as a result of replacing the boilers.

5.2 Habitat Impact

5.2.1 Airborne Concentrations of NO_x – New Boilers

Predicted maximum ground level concentrations of NO_x at the identified habitat sites are compared with the relevant critical levels for NO_x in Table 5.7 for the new boilers.

Table 5.7 - Predicted Maximum NO_x Concentrations (µg/m³) – New Boilers

Habitat Site	Annual Mean		24-Hour Mean	
	PC	PC (% CL)	PC	PC (% CL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	0.032	0.1%	0.38	0.5%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	0.043	0.1%	0.32	0.4%
Critical Level	30		75	

Maximum predicted annual mean concentrations at the two habitat sites are less than 1% of the critical level of 30 µg/m³ and would be assessed as not significant. The maximum predicted 24-hour mean concentration is 0.38 µg/m^3 (0.5%) of the critical level and at less than 10% of the critical level would be assessed as not significant.

5.2.2 Nutrient Nitrogen Deposition – New Boilers

Predicted maximum nutrient nitrogen deposition rates arising from NO_x emissions are compared with the relevant critical loads for nutrient nitrogen deposition in Table 5.8 for the new boilers.

Table 5.8 - Predicted Nutrient Nitrogen Deposition – New Boilers

Habitat Site	Critical Load (kg N/ha/a)	Maximum PC (kg N/ha/a)	PC (% of CL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	5	0.0046	0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	5	0.0062	0.1%

The maximum predicted nutrient nitrogen deposition PC is 0.0062 kgN/ha/a and is 0.1% of the critical load and at less than 1% of the critical load would be assessed as not significant.

5.2.3 Acidification – New Boilers

Predicted maximum acid deposition rates arising from NO_x, are compared with the critical loads for acidification in Table 5.9 for the new boilers.

Table 5.9 - Predicted Acid Deposition – New Boilers

Habitat Site	Critical Load (kg N/ha/a)	Max PC (keq/ha/a)	PC (% of CL)
	CLmaxN	PC (N+S)	
H1. Teesmouth & Cleveland Coast SPA/SSSI	4.856	0.00033	<0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	4.856	0.00044	<0.1%

The maximum predicted acidification rate at the identified habitat sites as a result of emissions from the new boilers is 0.00044 keq/ha/a and for all receptors the PC is less than 1% of the respective critical load. Therefore, the impact of the new boilers on acidification is considered to be not significant.

5.2.4 Airborne Concentrations of NO_x – Existing Boilers

Predicted maximum ground level concentrations of NO_x at the identified habitat sites are compared with the relevant critical levels for NO_x in Table 5.10 for the existing boilers.

Table 5.10 - Predicted Maximum NO_x Concentrations (µg/m^3) – Existing Boilers

Habitat Site	Annual Mean		24-Hour Mean	
	PC	PC (% CL)	PC	PC (% CL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	0.033	0.1%	0.39	0.5%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	0.042	0.1%	0.34	0.5%

Critical Level	30	75

Maximum predicted annual mean concentrations at both habitat sites are less than 1% of the critical level of 30 µg/m^3 for the existing boilers and would be assessed as not significant. The maximum predicted 24-hour mean concentration is 0.39µg/m^3 (0.5%) of the critical level and at less than 10% of the critical level would be assessed as not significant.

5.2.5 Nutrient Nitrogen Deposition – Existing Boilers

Predicted maximum nutrient nitrogen deposition rates arising from NO_x emissions are compared with the relevant critical loads for nutrient nitrogen deposition in Table 5.11 for the existing boilers.

Table 5.11 -Predicted Nutrient Nitrogen Deposition – Existing Boilers

Habitat Site	Critical Load (kg N/ha/a)	Maximum PC (kg N/ha/a)	PC (% of CL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	5	0.0047	0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	5	0.0061	0.1%

The maximum predicted nutrient nitrogen deposition PC is 0.0061 kgN/ha/a and is 0.1% of the critical load and at less than 1% of the critical load would be assessed as not significant.

5.2.6 Acidification – Existing Boilers

Predicted maximum acid deposition rates arising from NO_x, are compared with the critical loads for acidification in Table 5.12 for the existing boilers.

Table 5.12 - Predicted Acid Deposition – Existing Boilers

Habitat Site	Critical Load (kg N/ha/a)	Max PC (keq/ha/a)	PC (% of CL)
	CLmaxN	PC (N+S)	
H1. Teesmouth & Cleveland Coast SPA/SSSI	4.856	0.00034	<0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	4.856	0.00044	<0.1%

The maximum predicted acidification rate at the identified habitat sites as a result of emissions from the existing boilers is 0.00044 keq/ha/a and for all receptors the PC is less than 1% of the respective critical load. Therefore, the impact of the existing boilers on acidification is considered to be not significant.

5.2.7 Difference Between Existing and New Boilers

A comparison between the existing and new boilers is provided in Table 5.13 as the annual mean NO_x, Table 5.14 for 24-hour mean NO_x, Table 5.15 for nutrient nitrogen deposition and Table 5.16 for acidification.

Generally, predicted concentrations and deposition rates are lower for the new boilers compared to the existing boilers but the differences are extremely small, less than 0.1% of the relevant critical level or critical load.

Table 5.13 - Predicted Maximum Annual Mean NO_x Concentrations (µg/m^3) – Existing and New Boilers

Habitat Site	Annual Mean			
	PC Existing Boilers	PC New Boilers	Difference	Difference (% AQAL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	0.033	0.032	-0.001	<-0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	0.042	0.043	0.001	<0.1%

Table 5.14 - Predicted Maximum 24-hour Mean NO_x Concentrations (µg/m3) – Existing and New Boilers

Habitat Site	Maximum 24-hour Mean			
	PC Existing Boilers	PC New Boilers	Difference	Difference (% AQAL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	0.39	0.38	-0.002	<-0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	0.34	0.32	-0.017	<-0.1%

Table 5.15 - Predicted Nutrient Nitrogen Deposition (kgN/ha/a) – Existing and New Boilers

Habitat Site	Annual Mean			
	PC Existing Boilers	PC New Boilers	Difference	Difference (% AQAL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	0.0047	0.0046	-0.0001	<-0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	0.0061	0.0062	0.0001	<0.1%

Table 5.16 - Predicted Acidification (keq/ha/a) – Existing and New Boilers

Habitat Site	Annual Mean			
	PC Existing Boilers	PC New Boilers	Difference	Difference (% AQAL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	0.00034	0.00033	-0.00001	<-0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	0.00044	0.00044	<0.00001	<0.1%

5.3 Cumulative Impacts with Diesel Generators

5.3.1 Diesel Generators

There are a number of standby diesel generators located at the installation. These only operate if there is an interruption to the power supply. Two of these, referred to as L6 and Borealis, are in excess of 1 MWth with thermal ratings of 1.062 MWth and 6.397 MWth, respectively.

Normally, these only operate for testing with testing taking place every fortnight (1 hour off-load) and every three months (1 hour on-load). Therefore, testing would result in 30 hours of operation per annum.

Furthermore, the two generators are not tested at the same time. Operation in emergency conditions is very rare and has occurred for only 40 minutes in the last seven years.

A cumulative assessment of the operation of the new boilers with the two generators is provided. It is assumed that the three generating units operate at the same time. As testing does not take place concurrently, this is a very conservative assessment. It is assumed that the new boilers operate continuously for both long-term and short-term impacts. For the emergency generators, long-term emissions are pro-rated to the operational hours. For short-term impacts (hourly means and 24-hour means), it is assumed that the two generators operate continuously at their emissions levels. Currently, the two generators are fuel optimised but it is proposed that in the future these will be converted to be emissions optimised and NOx emission concentrations are based on emissions optimised data. Emissions data for the two generators are provided in Appendix C.

5.3.2 Annual Mean NO_2 Concentrations – Cumulative Impact

Predicted annual mean NO_2 PCs and PECs are presented in Table 5.17 for the new boilers operating along with the diesel generators. Maximum predicted concentrations occur within the installation site and concentrations are presented for sensitive receptors only.

The maximum PC occurs at Receptor R9 (Sports Ground) and with a predicted concentration of 1.0 $\mu g/m^3$ is 2.6% of the AQAL of 40 $\mu g/m^3$ and would be assessed as potentially significant according to the Environment Agency's Risk Assessment Guidance. However, for a background concentration of 14.2 $\mu g/m^3$, the PEC is well below 70% of the AQAL and it is unlikely that this would be exceeded. As the generators do not operate frequently, predicted concentrations at most are only 0.1 $\mu g/m^3$ higher than the new boilers operating alone.

Table 5.17 - Predicted Annual Mean NO_2 Concentrations – Cumulative Impact ($\mu g/m^3$)

Receptor	Annual Mean			
	PC	PC (% AQAL)	PEC	PEC (% AQAL)
R1. School	0.10	0.3%	14.3	35.8%
R2. Central Avenue	0.074	0.2%	14.3	35.7%
R3. School	0.057	0.1%	14.3	35.6%
R4. Weardale Crescent	0.068	0.2%	14.3	35.7%
R5. Cricket Pavilion	0.128	0.3%	14.3	35.8%
R6. Monksfield	0.070	0.2%	14.3	35.7%
R7. Rawlinson Avenue	0.11	0.3%	14.3	35.8%
R8. Bowling Club	0.14	0.4%	14.3	35.9%
R9. Sports Ground	1.0	2.6%	15.2	38.1%
R10. Greenwood Road	0.15	0.4%	14.4	35.9%
R11. Cafe Technology Park	0.066	0.2%	14.3	35.7%
R12. Hereford Terrace	0.34	0.8%	14.5	36.3%
R13. Hereford Terrace	0.36	0.9%	14.6	36.4%
R14. Nursery	0.30	0.7%	14.5	36.2%

AQAL	40
Background	14.2
Maximum PEC	15.2
Maximum PEC (%AQAL)	38.1%

5.3.3 Hourly Mean NO_2 Concentrations as the 99.8th Percentile – Cumulative Impact

Predicted hourly mean NO_2 PCs and PECs as the 99.8th percentile of hourly means are presented in Table 5.18 for the new boilers operating along with the diesel generators.

Table 5.18 - Predicted NO_2 Concentrations as the 99.8th Percentile of Hourly Means (µg/m^3) – Cumulative Impact

Receptor	99.8th Percentile of 1-Hour Means			
	PC	PC (% AQAL)	PEC	PEC (% AQAL)
R1. School	24.8	12.4%	53.2	26.6%
R2. Central Avenue	18.1	9.0%	46.5	23.2%
R3. School	11.8	5.9%	40.2	20.1%
R4. Weardale Crescent	12.8	6.4%	41.2	20.6%
R5. Cricket Pavilion	10.5	5.2%	38.9	19.4%
R6. Monksfield	8.5	4.3%	36.9	18.5%
R7. Rawlinson Avenue	8.4	4.2%	36.8	18.4%
R8. Bowling Club	12.3	6.2%	40.7	20.4%
R9. Sports Ground	18.2	9.1%	46.6	23.3%
R10. Greenwood Road	7.5	3.8%	35.9	18.0%
R11. Cafe Technology Park	5.2	2.6%	33.6	16.8%
R12. Hereford Terrace	60.4	30.2%	88.8	44.4%
R13. Hereford Terrace	99.5	49.8%	127.9	64.0%
R14. Nursery	37.6	18.8%	66.0	33.0%
AQAL	200			
Background	28.4			
Maximum PEC	127.9			
Maximum PEC (%AQAL)	64.0%			

As indicated in Table 5.18, the predicted maximum hourly mean NO_2 concentration as the PC arising from the new boilers is 99.5 µg/m^3, which is 49.8% of the AQAL of 200 µg/m^3. This is representative of the worst-case where the diesel generators are assumed to operate continuously at their respective emission levels. There is no predicted exceedance of the AQAL even for this worst-case scenario and the operation of the diesel generators would not give rise to an exceedance of the AQAL.

5.3.4 Maximum Predicted Hourly Mean NO_2 Concentrations – Cumulative Impact

Predicted maximum hourly mean NO_2 PCs and PECs as the 100^{th} percentile of hourly means are presented in Table 5.19 for the new boilers operating along with the diesel generators.

Table 5.19 - Predicted NO_2 Concentrations as the 100^{th} Percentile of Hourly Means (µg/m³) – Cumulative Impact

Receptor	100^{th} Percentile of 1-Hour Means	
	PC	PEC
R1. School	26.9	55.3
R2. Central Avenue	19.4	47.8
R3. School	14.1	42.5
R4. Weardale Crescent	16.9	45.3
R5. Cricket Pavilion	15.0	43.4
R6. Monksfield	12.9	41.3
R7. Rawlinson Avenue	12.2	40.6
R8. Bowling Club	16.7	45.1
R9. Sports Ground	23.0	51.4
R10. Greenwood Road	9.9	38.3
R11. Cafe Technology Park	7.4	35.8
R12. Hereford Terrace	61.6	90.0
R13. Hereford Terrace	122.5	150.9
R14. Nursery	42.4	70.8
Background	28.4	
Maximum PEC	150.9	

As indicated in Table 5.19, the predicted maximum hourly mean NO_2 concentration as the PC arising from the new boilers when operating alongside the diesel generators is 122.5 µg/m³. This is representative of the worst-case where the diesel generators are assumed to operate continuously at their respective emission levels. There is no predicted exceedance of the AQAL of 200 µg/m³ (18 are allowed per annum) even for this worst-case scenario of both diesel generators and the new boilers operating continuously.

5.3.5 Airborne Concentrations of NO_x – Cumulative Impact

Predicted maximum ground level concentrations of NO_x at the identified habitat sites are compared with the relevant critical levels for NO_x in Table 5.20 for the new boilers operating alongside the two diesel generators. For the 24-hour mean predictions, it is assumed as a very worst-case that the diesel generators operate continuously, 24 hours a day.

Table 5.20 - Predicted Maximum NO_x Concentrations (µg/m^3) – Cumulative Impact

Habitat Site	Annual Mean		24-Hour Mean	
	PC	PC (% CL)	PC	PC (% CL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	0.034	0.1%	4.1	5.5%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	0.045	0.1%	3.1	4.2%
Critical Level	30		75	

Maximum predicted annual mean concentrations at the two habitat sites are less than 1% of the critical level of 30 µg/m^3 and would be assessed as not significant. The maximum predicted 24-hour mean concentration is 4.1 µg/m^3 (5.5%) of the critical level and at less than 10% of the critical level would be assessed as not significant.

5.3.6 Nutrient Nitrogen Deposition – Cumulative Impact

Predicted maximum nutrient nitrogen deposition rates arising from NO_x emissions are compared with the relevant critical loads for nutrient nitrogen deposition in Table 5.21 for the new boilers operating alongside the diesel generators.

Table 5.21 - Predicted Nutrient Nitrogen Deposition – Cumulative Impact

Habitat Site	Critical Load (kg N/ha/a)	Maximum PC (kg N/ha/a)	PC (% of CL)
H1. Teesmouth & Cleveland Coast SPA/SSSI	5	0.0048	0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	5	0.0064	0.1%

The maximum predicted nutrient nitrogen deposition PC is 0.0064 kgN/ha/a and is 0.1% of the critical load and at less than 1% of the critical load would be assessed as not significant.

5.3.7 Acidification – Cumulative Impact

Predicted maximum acid deposition rates arising from NO_x, are compared with the critical loads for acidification in Table 5.22 for the new boilers operating alongside the diesel generators.

Table 5.22 - Predicted Acid Deposition – Cumulative Impact

Habitat Site	Critical Load (kg N/ha/a)	Max PC (keq/ha/a)	PC (% of CL)
	CLmaxN	PC (N+S)	
H1. Teesmouth & Cleveland Coast SPA/SSSI	4.856	0.00034	<0.1%
H2. Teesmouth & Cleveland Coast SPA/SSSI and proposed Ramsar site	4.856	0.00046	<0.1%

The maximum predicted acidification rate at the identified habitat sites as a result of emissions from the new boilers and the two diesel generators is 0.00046 keq/ha/a and for all receptors the PC is less than 1%

of the respective critical load. Therefore, the cumulative impact on acidification is considered to be not significant.

6. CONCLUSIONS

Sol Environment Ltd has been commissioned to undertake an assessment of the likely local air quality impacts arising from the proposed replacement of boilers at the Fujifilm Diosynth Biotechnologies Limited's facility to the southeast of Billingham. The two existing boilers (referred to as Danks and Babcock) both emit via a 15.6 m stack and are located within the existing boiler house and their use will be discontinued when the new boilers are operational. The new boilers (two Clayton SEG-504 units) will be located within the same building but emissions will be via a new stack with a height of 20 m located at the existing stack location. The total thermal input of the (two operational) new boilers is 10.114 MW. The existing boilers have a total stated thermal input of 21.8 MW however the actual thermal capacity is significantly below the quoted thermal capacity and <20 MWth. The proposed new boilers will meet the definition of a new 'Medium Combustion Plant'.

Detailed dispersion modelling has been undertaken to determine potential air quality impacts arising from the operation of the new boilers. In addition, a comparison of predicted concentrations with the existing boilers is provided and a cumulative assessment with standby diesel generators is also presented.

Maximum predicted concentrations are compared with the relevant Air Quality Assessment Levels (AQALs) for the protection of health. The significance of the impacts has been assessed using criteria provided in the Environment Agency's Risk Assessment Guidance.

The predicted annual mean and hourly mean NO_2 concentrations are well below the relevant AQAL at all of the nearby sensitive receptors and the impact of the proposed new boilers on annual mean concentrations is considered to be not significant, in accordance with the Environment Agency Risk Assessment Guidance.

The impact of emissions of the new boilers on nearby habitat sites has also been determined. The impact of emissions on habitats was assessed as not significant when compared with existing background conditions and relevant critical levels and critical loads.

The difference in predicted concentrations between the existing boilers and the new boilers is very small (less than 0.3 $\mu g/m^3$) at sensitive receptor locations with predicted concentrations slightly lower for the new boilers due the higher stack and lower emission concentrations compared to the existing boilers. For habitat sites the difference between the existing and new boilers is negligible and less than 0.1% of the critical level or critical load.

APPENDIX A AIR QUALITY TERMINOLOGY

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
Defra	Department for Environment, Food and Rural Affairs.
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
MCPD	Medium Combustion Plant Directive
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
ppb parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10^9) units of air, there is one unit of pollutant present.
ppm parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every billion (10^6) units of air, there is one unit of pollutant present.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
SCR	Selective catalytic reduction
$\mu g/m^3$ micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1ug/m3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).

Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

APPENDIX B AIR QUALITY STANDARDS AND OBJECTIVES

Annex B1 – Air Quality Standards

Pollutant	Averaging Period	AQAL (µg/m^3)	Comments
Nitrogen dioxide (NO_2)	annual	40	UK AQO
	1-hour	200	UK AQO, not to be exceeded more than 18 times per annum, equivalent to the 99.8th percentile of 1-hour means

APPENDIX C DISPERSION MODEL INPUT PARAMETERS

Table C1: Generating Unit Emission Parameters (New Boilers)

Parameter	Per Boiler	Two Boilers Combined
Stack Height (m)	20	20
Flue exit diameter (m)	0.62	0.88
Emission velocity (m/s)	9.9	9.9
Operational Hours	Assumed continuous	Assumed continuous
Actual flow rate (Am^3/s)	2.98	5.95
Temperature of exhaust (ºC)	155	155
O_2 content of exhaust gas (% v/v dry)	3.5	3.5
H_2O content of exhaust gas (% v/v)	12.2	12.2
Normalised flow rate (Nm^3/s) (a)	1.62	3.24
NO_x ELV (mg/Nm^3) (a)	100	100
NO_x emission rate (g/s)	0.162	0.324
At 273K, dry and 3% O_2		

Table C2 - Generating Unit Emission Parameters (Existing Boilers)

Parameter	Babcock Boiler (b)	Danks Boiler (c)	Babcock and Danks Combined
Stack Height (m)	15.6	15.6	15.6
Flue exit diameter (m)	0.56	0.56	0.79
Emission velocity (m/s)	7.2	7.4	7.26
Operational Hours	Assumed continuous		
Actual flow rate (Am^3/s)	1.76	1.81	3.58
Temperature of exhaust (ºC)	214	202	208
O_2 content of exhaust gas (% v/v dry)	3.3	6.2	-
H_2O content of exhaust gas (% v/v)	9.4	15.0	-
Normalised flow rate (Nm^3/s) (a)	0.881	0.731	1.61
NO_x ELV (mg/Nm^3) (a)	161	169	165
NO_x emission rate (g/s)	0.142	0.124	0.266

(a) At 273K, dry and 3% O_2
(b) Based on January 2024, April 2024 and January 2025 extractive monitoring reports
(c) Based on November 2024 and January 2025 extractive monitoring reports

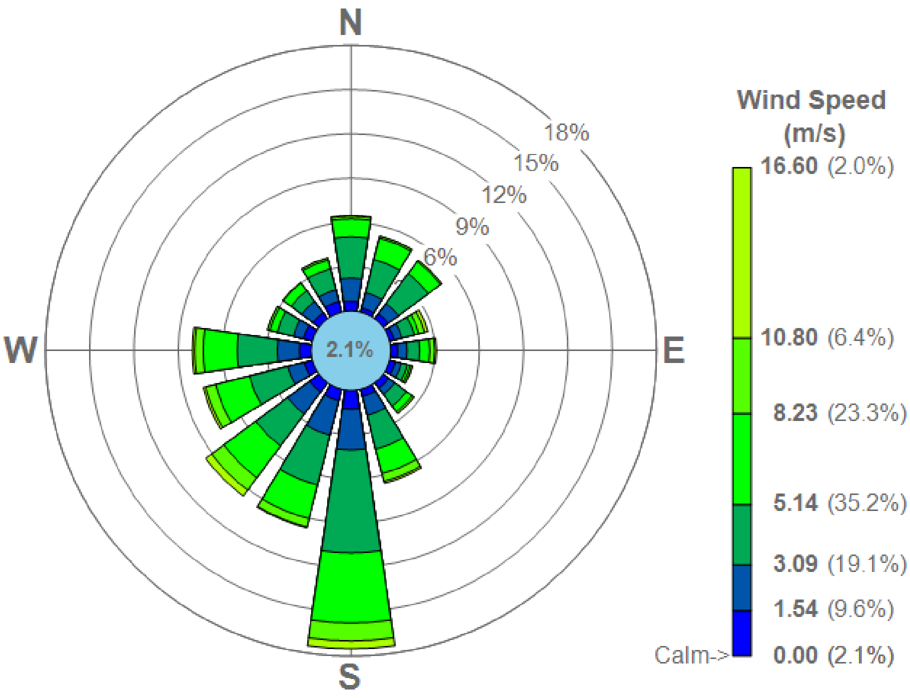
Table C3 – Standby Diesel Generators Emission Parameters

Parameter	Generator L6	Generator Borealis
Stack Height (m)	2.615	5.93
Flue exit diameter (m)	0.263	0.5
Emission velocity (m/s)	23.6	35.9
Operational Hours	30 hours per annum	
Actual flow rate (Am^3/s)	1.28	7.05
Temperature of exhaust (ºC)	524	476
O_2 content of exhaust gas (% v/v dry)	9.0	10.6
H_2O content of exhaust gas (% v/v)	8.1	10.0
Normalised flow rate (Nm^3/s) (a)	0.303	1.50
NO_x ELV (mg/Nm^3) (a)	2000	1600
NO_x emission rate (g/s) Long-term (b)	0.00207	0.00821
NO_x emission rate (g/s) Short-term	0.605	2.40

(a) At 273K, dry and 5% O_2
(b) Pro-rated to operational hours per annum

APPENDIX D WIND ROSES – DURHAM TEES VALLEY AIRPORT

2018


N
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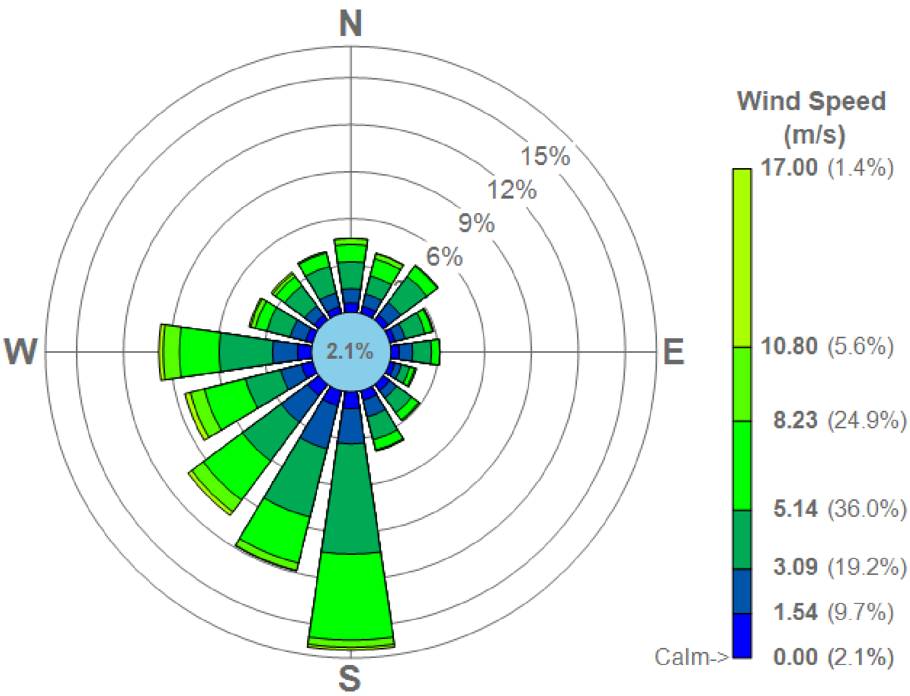
18%
15%
12%
9%
6%
2.1%
Wind Speed
(m/s)
16.60 (2.0%)
10.80 (6.4%)
8.23 (23.3%)
5.14 (35.2%)
3.09 (19.1%)
1.54 (9.6%)
Calm->
0.00 (2.1%)

2019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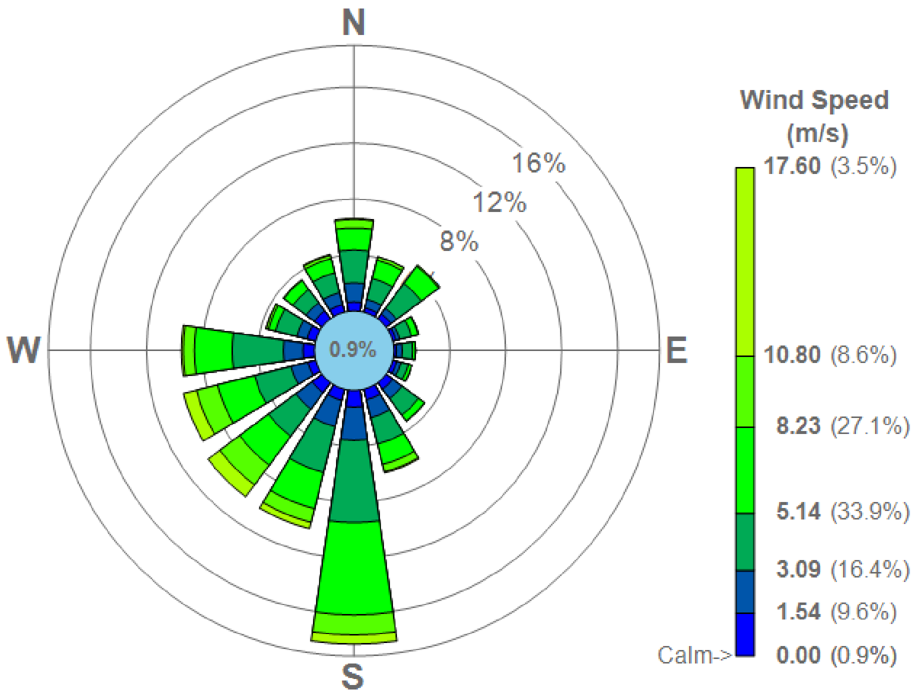
Wind Speed
(m/s)
17.00 (1.4%)
10.80 (5.6%)
8.23 (24.9%)
5.14 (36.0%)
3.09 (19.2%)
1.54 (9.7%)
Calm->
0.00 (2.1%)

2020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12%
8%
0.9%
Wind Speed (m/s)
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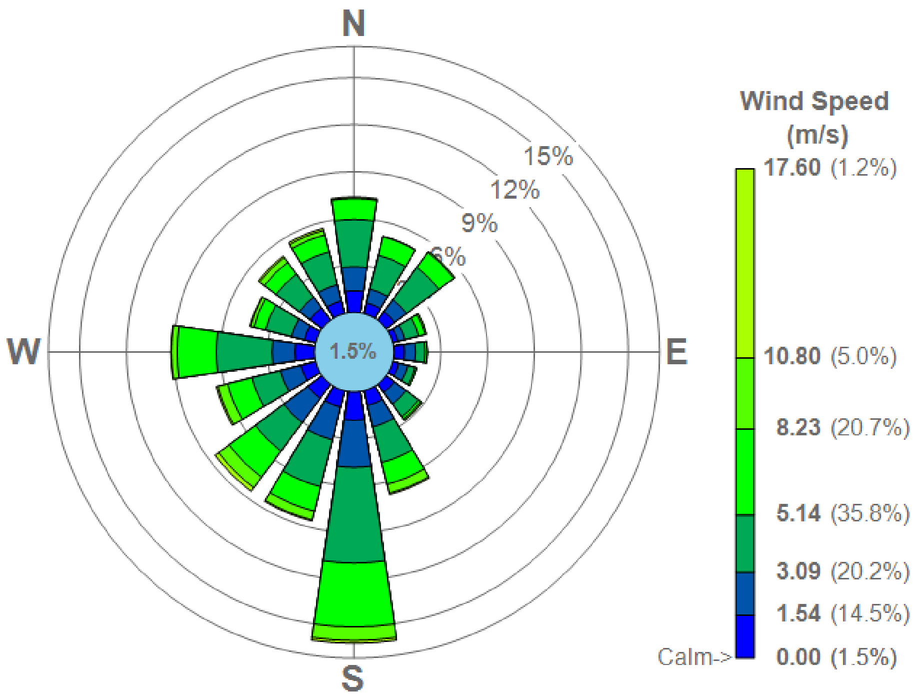
10.80 (8.6%)
8.23 (27.1%)
5.14 (33.9%)
3.09 (16.4%)
1.54 (9.6%)
Calm-> 0.00 (0.9%)

2021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Wind Speed (m/s)
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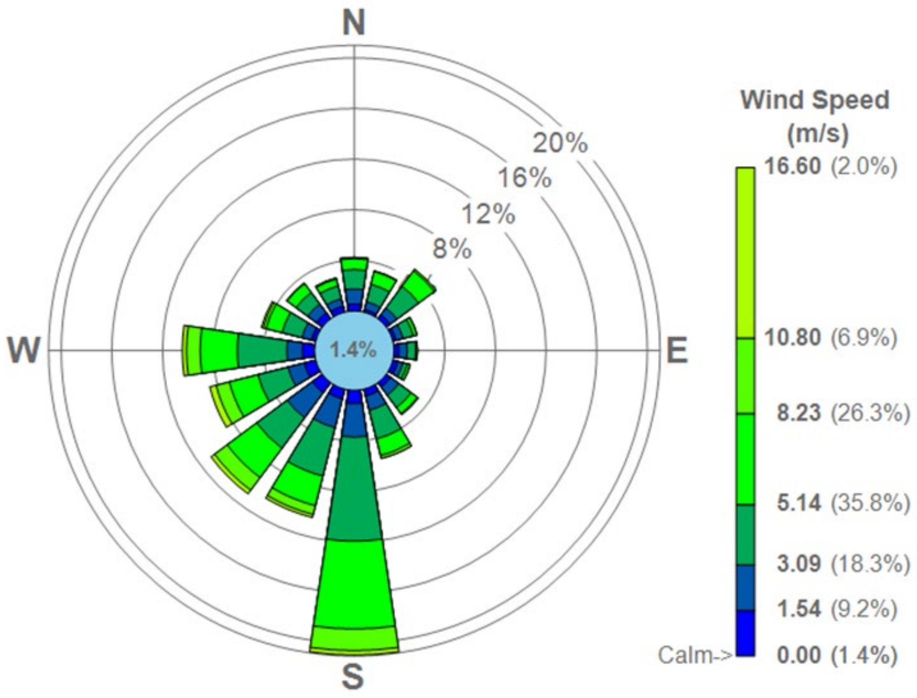
10.80 (5.0%)
8.23 (20.7%)
5.14 (35.8%)
3.09 (20.2%)
1.54 (14.5%)
Calm-> 0.00 (1.5%)

2022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Wind Speed
(m/s)
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10.80 (6.9%)
8.23 (26.3%)
5.14 (35.8%)
3.09 (18.3%)
1.54 (9.2%)
Calm->
0.00 (1.4%)