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Consulting Engineers Limited



Britton Ferry Paper Mill Biomass Boiler



Intertissue Ltd

Air Quality Assessment

Document approval

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Management Summary

Fichtner Consulting Engineers Ltd (Fichtner) has been engaged by Intertissue Ltd., part of Sofidel UK (the Client) to prepare an Air Quality Assessment (AQA) to support the planning application for the installation of a biomass boiler (the Biomass Boiler) at the Intertissue Britton Ferry Paper Mill (the Installation), operated by Sofidel and located at the Baglan Energy Park near Port Talbot.

The assessment has been carried out in a number of stages.

1) Review of Legislation

In the UK, the levels of pollution in the atmosphere are controlled by a number of European Directives, which have been fully implemented, and by the National Air Quality Strategy. These have led to the setting of a number of Air Quality Assessment Levels (AQALs) for pollutants. In addition, Critical Levels for NO_x and Critical Loads for nitrogen and acid deposition have been set for the protection of ecosystems.

There is no prescriptive methodology for air quality assessment outlined in either the National Planning Policy Framework or Planning Practice Guidance. Therefore, practitioners are directed to use guidance provided by other non-governmental organisations. In this case the guidance published by the Institute of Air Quality Management (IAQM) has been applied.

2) Review of Ambient Air Quality

Mapped background concentrations and monitoring information collected by the UK Government and by local authorities has been used to assess the current levels of pollutants in the atmosphere close to the site. Baseline concentrations in the vicinity are well below the relevant AQALs.

3) Identification of Sensitive Receptors

When assessing the impact of the proposal, the assessment considers the point of maximum impact outside of the Installation boundary as a worst-case. In addition, the impact has been assessed at the closest residential receptors.

Sensitive ecological sites within the relevant screening distances from the stack have been included in the assessment. One Site of Special Scientific Interest (SSSI), the Crymlyn Burrows SSSI, has been identified for assessment. The closest European designated site, the Crymlyn Bog Special Area of Conservation (SAC) and a number of locally-designated ecological receptors (local nature sites) have also been included in the assessment for completeness.

4) Dispersion Modelling of Emissions

The ADMS dispersion model is routinely used for air quality assessments to the satisfaction of local authorities and Natural Resources Wales (NRW). The model uses weather data from the local area to predict the spread and movement of the exhaust gases from the stack for each hour over a five-year period. The model takes account of wind speed, wind direction, temperature, humidity and the amount of cloud cover, as all of these factors influence the dispersion of emissions. The model also takes account of the effects of buildings and terrain on the movement of air.

To set up the model, it has conservatively been assumed that the Biomass Boiler operates for the whole year and releases emissions at the emission limits continuously. Consideration has also been given to the anticipated hours of operation of the Biomass Boiler. Existing on-site pollutant sources have been included in the model. The Biomass Boiler will displace emissions from an existing natural

gas-fired boiler. Therefore, the change in impact from existing operation of the Installation has been quantified, as well as the contribution from the Biomass Boiler alone and the total contribution from the proposed operation of the Installation.

The model has been used to predict the ground level concentration of pollutants on a long-term and short-term basis across a grid of points. In addition, concentrations have been predicted at the identified sensitive receptors.

5) Approach and Assessment of Impact on Air Quality – Protection of Human Health

The air quality impact of the proposals on human health has been assessed using a standard approach based on guidance provided the Institute of Air Quality Management (IAQM) and NRW and the Environment Agency (EA) as appropriate.

Using this approach, the following can be concluded from the assessment.

1. No exceedance of any AQAL is predicted.
2. All short-term impacts can be screened out as ‘negligible’ based on results at the point of maximum impact outside of the Installation boundary.
3. Long-term impacts on concentrations of nitrogen dioxide and particulate matter cannot be screened out based on results at the point of maximum impact outside of the Installation boundary. Further assessment of impacts at areas of relevant exposure has been undertaken. This has concluded that all impacts at areas of relevant exposure will be ‘negligible’.

6) Approach and Assessment of Impact on Air Quality – Protection of Ecosystems

The impact of air quality on ecology has been assessed using a standard approach based on guidance provided by the IAQM and NRW/the EA as appropriate.

1. The impact on annual mean airborne NO_x concentrations is ‘not significant’.
2. The impact on daily mean NO_x concentrations at Crymlyn Burrows SSSI can be screened out as ‘insignificant’. The change in impact at the Baglan Bay Site of Importance for Nature Conservation cannot be screened out ‘insignificant’; however no exceedance of the most stringent Critical Level is predicted, so no significant effects are anticipated.
3. The acid deposition impact at all receptors can be screened out as ‘insignificant’.
4. The nitrogen deposition impact cannot immediately be screened out as ‘insignificant’ at the Crymlyn Burrows SSSI and at several local nature sites. The significance of effect has been assessed by the ecologist for the project, taking into account the sensitivity of the habitats, the change in impact from the operational Installation, and baseline concentrations. This has concluded that no significant effects are predicted to occur as a result of operation of the Biomass Boiler.

7) Summary and Conclusions

In summary, the assessment has shown that the operation of the Biomass Boiler would not have a significant impact on local air quality, the general population or the local community. As such there should be no air quality constraint in granting planning consent for the Biomass Boiler.

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1 Introduction

1.1 Background

Fichtner Consulting Engineers Ltd (Fichtner) has been engaged by Intertissue Ltd., part of Sofidel UK, (the Client) to undertake an Air Quality Assessment (AQA) to support planning application for the installation of a biomass boiler (the Biomass Boiler) at the Intertissue Britton Ferry Paper Mill (the Installation), operated by Sofidel and located at the Baglan Energy Park near Port Talbot. The Installation is currently regulated by Natural Resources Wales (NRW) under EP number EPR/BU2489IT.

The Biomass Boiler will have rated thermal input of 9.1 MWth and will be used to generate steam for the paper manufacturing process. The steam generated by the Biomass Boiler will displace steam currently raised by a 10.5 MWth natural gas-fired boiler, although the existing boiler will be retained as back-up. The operation of a 12.6 MWth natural gas-fired paper dryer is unchanged by the proposals.

As the Biomass Boiler has a thermal input greater than 1 MW, it is classified as a Medium Combustion Plant (MCP) under the Medium Combustion Plant Directive (MCPD) (Directive 2015/2193) and is required to comply with the conditions set in the MCPD. This includes limits on emissions to air of oxides of nitrogen and dust for combustion units fired on virgin woody biomass.

1.2 Scope of assessment

In accordance with NRW's guidance a screening assessment has been undertaken using the Simple Calculation of Atmospheric Impact Limits (SCAIL) combustion tool. The impact of emissions from the Biomass Boiler cannot be screened out using SCAIL, so this comprehensive detailed dispersion modelling assessment has been undertaken. In addition to oxides of nitrogen and particulate matter (dust), this assessment also considers emissions of carbon monoxide.

In addition to considering the air quality impact of the Biomass Boiler, this assessment has considered emissions from all other on-site sources and quantified the impact of the installation of the Biomass Boiler as the change from the existing baseline, as well as quantifying the impact of the operation of the Biomass Boiler alone.

Construction activities associated with the installation of the Biomass Boiler will not occur within 250 m of a human sensitive receptor or 50 m of an ecological sensitive receptor, which are the screening distances prescribed by the Institute of Air Quality Management (IAQM) in the 2024 document "Guidance on the assessment of dust from demolition and construction v 2.2". Due to the relatively small scale of the activities and lack of sensitive receptors, the need for an assessment of construction phase dust emissions has been scoped out.

The number of vehicle movements predicted to be generated by the operation of the Biomass Boiler is 18 two-way heavy goods vehicles (HGVs) daily on average, with a maximum of 26 daily movements. The numbers will be lower on an Annual Average Daily Traffic (AADT) basis. The number of construction phase trips and operational staff trips has not been quantified but is anticipated to be similarly negligible. In accordance with the IAQM guidance document "Land-Use Planning & Development Control: Planning for Air Quality" (the IAQM 2017 guidance), a detailed air quality assessment is required where the change in vehicles exceeds 500 light duty vehicles (LDVs) or 100 HGVs on an AADT basis. As the number of vehicle movements generated by the construction and operation of the Biomass Boiler will be much lower than this, the need for an assessment of vehicle emissions has been scoped out.

1.3 Structure of the report

This report has the following structure.

- National and international legislation and guidance are considered in Section 2.
- The assessment criteria are presented in Section 3.
- The background levels of ambient air quality are described in Section 4.
- Section 5 highlights the residential properties and ecological receptors which are sensitive to changes in air quality associated with the Biomass Boiler.
- The inputs used for the dispersion model are contained within Section 6.
- Details of the sensitivity analyses carried out is presented in section 7.
- Section 8 presents the results of the assessment of the impact of emissions on human health.
- Section 9 presents the results of the assessment of the impact of emissions at ecological sites.
- The conclusions of the assessment can be found in Section 10.
- The Appendices include illustrative figures and detailed results tables.

2 Legislation and Planning Context

2.1 Air quality assessment levels

In the UK, Ambient Air Directive (AAD) Limit Values, Targets, and air quality standards and objectives for major pollutants are described in The Air Quality Strategy (AQS). In addition, the Environment Agency include Environmental Assessment Levels (EALs) for other pollutants in the environmental management guidance 'Air Emissions Risk Assessment for your Environmental Permit'¹ ("Air Emissions Guidance"), which are also considered. The long-term and short-term EALs from these documents have been used when the AQS does not contain relevant objectives. Standards and objectives for the protection of sensitive ecosystems and habitats are also contained within the Air Emissions Guidance and the Air Pollution Information System (APIS).

AAD Target and Limit Values, AQS Objectives, and EALs are set at levels well below those at which significant adverse health effects have been observed in the general population and in particularly sensitive groups. For the remainder of this report these are collectively referred to as AQALs.

Table 1 to Table 2 summarise the AQALs used in this assessment.

Table 1: Air Quality Assessment Levels (AQALs)

Pollutant	AQAL ($\mu\text{g}/\text{m}^3$)	Averaging Period	Frequency of Exceedances	Source
Nitrogen dioxide	200	1 hour	18 times per year (99.79 th percentile)	AAD Limit Value
	40	Annual	-	AAD Limit Value
Particulate matter (PM ₁₀)	50	24 hours	35 times per year (90.41 st percentile)	AQS Objective
	40	Annual	-	AQS Objective
Particulate matter (PM _{2.5}) ⁽¹⁾	20	Annual	-	AQS Target
	10	Annual		Environmental Targets (fine particulate matter) (England) regulations 2023
Carbon monoxide	10,000	8 hours, running	-	AAD Limit Value
	30,000	1 hour	-	Air Emissions Guidance

Note:

⁽¹⁾ In the first instance consideration has only been given to the lower AQAL for PM_{2.5} of 10 $\mu\text{g}/\text{m}^3$. This AQAL is a target to be achieved by 2040.

¹ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions>

Table 2: Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	Concentration ($\mu\text{g}/\text{m}^3$)	Measured as	Source
Nitrogen oxides (as nitrogen dioxide)	75/200*	Daily mean	APIS
	30	Annual mean	AAD Critical Level
Note: <i>*only for detailed assessments where the ozone is below the AOT40 Critical Level and sulphur dioxide is below the lower Critical Level of $10 \mu\text{g}/\text{m}^3$.</i> <i>The AOT40 for ozone is 3,000 ppb.h (6,000 $\mu\text{g}/\text{m}^3\cdot\text{h}$) calculated from accumulated hourly ozone concentrations – AOT40 means the sum of the difference between each hourly daytime (08:00 to 20:00 Central European Time, CET) ozone concentration greater than $80 \mu\text{g}/\text{m}^3$ (40 ppb) and $80 \mu\text{g}/\text{m}^3$, for the period between 01 May and 31 July.</i>			

In the first instance the lower Critical Level for oxides of nitrogen of $75 \mu\text{g}/\text{m}^3$ will be applied as a conservative measure, and consideration will be given to the applicability of the higher Critical Level if it is considered that there is a risk of exceedance of the Lower Critical Level.

In addition to the Critical Levels set out in the table above, APIS provides habitat specific Critical Loads for nitrogen and acid deposition. Details of the assessment against habitat specific Critical Loads can be found in section 9..

2.2 Areas of relevant exposure

The AQALs apply only at areas of exposure relevant to the assessment level. The following table extracted from Local Authority Air Quality Technical Guidance (2022) (LAQM.TG(22))² explains where the AQALs apply.

Table 3: Guidance on Where AQALs Apply

Averaging period	AQALs should apply at:	AQALs should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24-hour mean and 8-hour mean	All locations where the annual mean AQAL would apply, together with	Kerbside sites (as opposed to locations at the building façade), or

² Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance (TG22), August 2022, available at: <https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf>

Averaging period	AQALs should apply at:	AQALs should generally not apply at:
	hotels. Gardens of residential properties.	any other location where public exposure is expected to be short-term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean AQALs apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc., which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Source: Box 1-1, Local Air Quality Management Technical Guidance (TG22), Defra, August 2022

2.3 Industrial pollution regulation

Atmospheric emissions from industrial processes are controlled in Wales through the Environmental Permitting (England and Wales) Regulations (2016), as amended. The Installation has an EP to operate which includes conditions to minimise the environmental impact by limiting emissions to air. The emission limit values (ELVs) for the Biomass Boiler will be based on those prescribed under the MCPD for new plants.

2.4 Local air quality management

In accordance with Section 82 of the Environment Act (1995) (Part IV), local authorities are required to periodically review and assess air quality within their area of jurisdiction, under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves assessing present and likely future ambient pollutant concentrations against AQALs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, then the local authority is required to declare an Air Quality management Area (AQMA). For each AQMA, the local authority is required to produce an AQAP, the objective of which is to reduce pollutant levels in pursuit of the relevant AQALs.

3 Assessment Criteria

3.1 Human health

3.1.1 Long-term impacts

The IAQM 2017 guidance provides the following matrix which can be used to describe the magnitude of change based on the change in concentration (the process contribution, “PC”) relative to the annual AQAL, and the Predicted Environmental Concentration (PEC) with the scheme – i.e. the future baseline plus the PC.

Table 4: IAQM Magnitude of Change Descriptors

Long-term average concentration at receptor in assessment year	% change in concentration relative to AQAL			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

It is intended that the change in concentration relative to the AQAL (the process contribution) is rounded to the nearest whole number. Therefore, any impact which is between 0.5% and 1.5% will be classified as a 1% change in concentration. For process contributions of less than 0.5% of the AQAL the magnitude of change is described as ‘negligible’ irrespective of the PEC.

3.1.2 Short-term impacts

Table 4 is only designed to be used with annual mean concentrations. For short-term concentrations (i.e. those averaged over a period of an hour or less) the IAQM 2017 guidance states that the following descriptors of change should be used to describe the severity of the impact:

- < 10% - negligible;
- 10 – 20% - slight;
- 20 – 50% - moderate; and
- > 50% - substantial.

The approach for assessing the impact of short-term emissions has been carried out in line with the IAQM 2017 guidance and does not take into account the background concentrations as these are less important in determining the severity of impact for short-term concentrations.

3.1.3 Significance of effect

The IAQM criteria outlined above has been used to define the magnitude of change associated with the proposals. In accordance with IAQM 2017 guidance, the competent expert undertaking the assessment has then taken into account the following points to determine the overall significance

of effect of the development at receptor locations (i.e. as either 'significant' or 'not significant'). This judgement has considered:

- the existing air quality in the local area;
- the extent of the predicted impacts from the proposed development; and
- the influence and validity of the assumptions adopted in the dispersion modelling.

As the judgment as to the significance of effect is a binary one, as either 'significant' or 'not significant', the conclusion is made in accordance with the professional judgement of the assessor having considered the points above.

The IAQM 2017 guidance states that:

"In most cases, the assessment of impact severity for a proposed development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-term concentrations is approached through the presence of the new source, taking into account the contribution of other prominent local sources."

As such, the judgement of whether the predicted impact is 'significant' or not will be weighted towards the long-term impacts.

3.1.4 Ecology

The IAQM 2017 guidance states that it is not intended to be used to assess impacts on ecological features. In lieu of any assessment criteria specific to planning, the Environment Agency's guidance "Air emissions risk assessment for your environmental permit"³ (the Air Emissions Guidance), which is also used by NRW, has been applied.

The Air Emissions Guidance states that, to screen out impacts as 'insignificant' at European and UK statutory designated sites:

- the long-term PC must be less than 1% of the long-term environmental standard (i.e. the Critical Level or Load); and
- the short-term PC must be less than 10% of the short-term environmental standard.

If the above criteria are met, no further assessment is required. If the long-term PC exceeds 1% of the long-term environmental standard, the PEC must be calculated and compared to the standard. If the resulting PEC is less than 70% of the long-term environmental standard, the Air Emissions Guidance states that the emissions are 'insignificant' and further assessment is not required. In accordance with the guidance, calculation of the PEC for short-term standards is not required.

The Air Emissions Guidance states further that to screen out impacts as 'insignificant' at local nature sites⁴:

- the long-term PC must be less than 100% of the long-term environmental standard; and
- the short-term PC must be less than 100% of the short-term environmental standard.

In 2020 the IAQM published the guidance document 'A guide to the assessment of air quality impacts on designated nature conservation sites' (the IAQM 2020 guidance), which draws on the permitting guidance above, but states:

³ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>

⁴ National Nature Reserves (NNRs), Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs) and ancient woodlands

“For local wildlife sites and ancient woodlands, the Environment Agency uses less stringent criteria in its permitting decisions. Environment Agency policy for its permitting process is that if either the short-term or long-term PC is less than 100% of the critical level or load, they do not require further assessment to support a permit application. In ecological impact assessments of projects and plans, it is, however, normal practice to treat such sites in the same manner as SSSIs and European Sites, although the determination of the significance of an effect may be different. It is difficult to understand how the Environment Agency’s approach can provide adequate protection.”

As such, it is considered appropriate to apply the screening criteria for SSSIs and European Sites to local nature sites for the assessment of significance for planning.

4 Baseline Air Quality

The Installation is located near Port Talbot, within the administrative area of Neath Port Talbot County Borough Council (NPTCBC). Reference should be made to Figure 1 which shows the site location. In this section the existing air quality monitoring and mapped background datasets has been reviewed and the appropriate concentrations to be used in the assessment are determined.

4.1 Air quality review and assessment

Under Section 82 of the Environment Act (1995) (Part IV), local authorities are required to undertake an ongoing exercise to review air quality within their area of jurisdiction. As part of the review and assessment exercise, local authorities are required to identify areas of poor air quality and, if necessary, declare AQMAs and publish Air Quality Action Plans (AQAPs). NPTCBC has declared one AQMA, the Neath Port Talbot AQMA Taibach/Margam, located 4 km to the south-east of the Installation. This AQMA has been declared due to recorded exceedances of the daily mean AQAL for PM₁₀ attributed to emissions from industrial sources. Due to the distance from the Installation, no significant effects on the AQMA are anticipated and the impact of emissions from the Biomass Boiler on the AQMA have not been considered further.

4.2 Mapped background data

To assist local authorities with their responsibilities under LAQM, the Department for the Environment Food and Rural Affairs (Defra) provides modelled background concentrations of pollutants throughout the UK on a 1 km by 1 km grid. This model is based on known pollution sources and background measurements and is used by local authorities in lieu of suitable monitoring data. Mapped background concentrations have been downloaded for the grid squares containing the Installation and the immediate surroundings.

The mapped background data is calibrated against monitoring data. For instance, the most recent mapped background concentration (2018) are based on 2018 meteorological data and are calibrated against monitoring undertaken in 2018. Although the mapped background data includes projections of baseline concentrations up to 2030, the concentration for the year against which the data was validated has been used. This eliminates any potential uncertainties over anticipated trends in future background concentrations.

Concentrations will vary over the area covering the modelled grid, which extends up to 3 km from the Biomass Boiler. Therefore, the maximum mapped background concentration within the modelling domain (i.e., within 3 km) has been calculated. These are presented in Table 5 alongside the concentration for the grid square containing the Biomass Boiler stack.

Table 5: Mapped Background Analysis

Pollutant	Concentration (µg/m³)		Dataset
	At Biomass Boiler Stack	Maximum Within Modelling Domain	
Nitrogen dioxide	11.11	15.67	Defra 2018 Dataset
PM ₁₀	11.23	14.28	Defra 2018 Dataset
PM _{2.5}	7.15	9.49	Defra 2018 Dataset
Carbon monoxide	229	255	Defra 2001 Dataset
Note:			

Pollutant	Concentration (µg/m³)		Dataset
	At Biomass Boiler Stack	Maximum Within Modelling Domain	
As concentrations of carbon monoxide since are consistently well below levels at which significant health effects can occur, Defra has not updated the mapped background dataset for carbon monoxide since a baseline year of 2001.			

4.3 AURN and LAQM monitoring data

Monitoring locations are broadly classified into ‘roadside’ and ‘background’ type locations. ‘Background’ locations are typically sited so that no single pollutant source is dominant and are intended to be representative of background concentrations over several square kilometres. ‘Roadside’ sites are dominated by road traffic emissions and only representative of concentrations in the immediate vicinity of the analyser. This analysis has considered monitoring sites within the modelling domain, i.e. within 3 km of the Installation.

The UK Automatic Urban and Rural Network (AURN) is a country-wide network of air quality monitoring stations operated on behalf of Defra. This includes automatic monitoring of nitrogen dioxide, carbon monoxide, and particulate matter. A review of the AURN interactive map has shown that the closest AURN monitoring site available is the Port Talbot Margam site, an urban industrial monitoring site located approximately 6 km south-east of the Installation. Due to the distance from the Facility and its location adjacent to the Port Talbot steelworks this site is not considered representative of conditions in the vicinity of the Installation, so monitoring from this site has not been included in the assessment of baseline concentrations.

In addition to the national AURN, local authorities undertake monitoring of a range of pollutants as part of the LAQM review process. A review of the most recent Air Quality Annual Progress Report published by NPTCBC, dated 2022, shows that there are five non-automatic (nitrogen dioxide diffusion tube) monitoring locations within the modelling domain. These are all roadside sites along the A474 to the north-east of the Installation. The roadside nitrogen dioxide monitoring results are shown in Table 6, and the locations of the diffusion tubes are shown on Figure 2.

Table 6: Summary of non-automatic nitrogen dioxide monitoring data within 3 km

ID	Distance from stack (km)	2018 Mapped Bg (µg/m³)	Annual mean concentration (µg/m³)				
			2017	2018	2019	2020	2021
Roadside Monitoring							
7a, 7b, 7c	2.16	10.88	30.2	24.5	26.3	22.3	23.6
8	2.14	10.88	29.0	24.9	23.9	21.2	23.7
9	2.12	10.88	28.3	23.5	25.1	21.6	22.7
10	2.14	10.88	28.9	24.6	26.1	22.7	21.6
11	2.15	10.88	29.2	23.8	26.1	22.6	25.4

Source: NPTCBC 2022 LQAM Annual Progress Report (September 2022) and © Crown 2024 copyright Defra via [uk-air.defra.gov.uk](https://air.defra.gov.uk), licenced under the Open Government Licence (OGL).

As shown, no exceedances of the annual mean AQAL of 40 µg/m³ have been recorded. Whilst the roadside monitoring results are representative of baseline nitrogen dioxide concentrations close to each monitoring site, there is no representative background monitoring of nitrogen dioxide, particulate matter and carbon dioxide available.

4.4 Summary

In lieu of any representative local monitoring the maximum mapped background concentrations from within the modelling domain as presented in Table 5 have been used as the baseline concentrations for this assessment. Further consideration will be given to the baseline concentrations at any areas of relevant exposure where the impact of the Installation cannot be screened out as 'insignificant' or 'negligible' regardless of the total concentration.

The baseline concentrations to be used in this assessment are summarised in Table 7 below.

Table 7: Summary of Baseline Concentrations

Pollutant	Concentration ($\mu\text{g}/\text{m}^3$)	Justification
Nitrogen dioxide	15.67	Maximum mapped background concentration within modelling domain – Defra 2018 dataset.
PM ₁₀	14.28	
PM _{2.5}	9.49	
Carbon monoxide	255	Maximum mapped background concentration within modelling domain – Defra 2001 dataset.

5 Sensitive Receptors

The general approach of this assessment is to evaluate the highest predicted PC across the output grid outside of the Installation boundary, known as the point of maximum impact. In addition, the predicted PC at a number of sensitive receptors has been evaluated.

5.1 Human sensitive receptors

The human sensitive receptors identified for assessment are displayed in Figure 2 and listed in Table 8. These have been identified as the residential properties and schools closest to the Installation and have been modelled at a height of 1.5 m to represent typical breathing height.

Table 8: Human Sensitive Receptors

ID	Name/Approximate Address	Location (m)		Distance from biomass boiler stack (km)
		X	Y	
R1	Church St	273792	194137	1.5
R2	28 Swan Road	274238	193201	1.2
R3	Irving House Handel Avenue	273820	191461	1.5
R4	56 Fenbrook Close	274574	192048	1.6
R5	Baglan Primary School	274914	192712	1.8
R6	Sandfields Comprehensive School	274043	191404	1.7
R7	Llansawel Primary School	273772	194242	1.6

The impacts of emissions from the Biomass Boiler and from the Installation as a whole have been assessed at these receptor locations and are discussed in Section 8.

5.2 Ecological sensitive receptors

As the Biomass Boiler will be included in the EP as a new MCP, consideration has been given to NRW's screening distances for new MCPs⁵. This states that for an MCP of rated thermal input 5 – 10 MWth and firing woody solid biomass, the screening distance to a Site of Special Scientific Interest (SSSI), Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar sites or Marine Conservation Zone (MCZ) is 1,500 m.

Only one designated site has been identified within the relevant distance: the Crymlyn Burrows SSSI, approximately 500 m from the Biomass Boiler stack at the closest point. As a conservative measure the nearest European conservation site, Crymlyn Bog SAC, has also been considered in this assessment. This is located approximately 1.9 km north-west of the stack of the Biomass Boiler at the closest point, outside the 1.5 km screening distance. NRW's Medium Combustion Plant guidance does not require consideration of locally designated conservation sites (National Nature Reserves (NNRs), Local Nature Reserves (LNRs), and Local Wildlife Sites (LWSs)). However, those identified within the 1.5 km have been considered for completeness. Figure 3 shows the receptors included in the assessment.

⁵ <https://naturalresources.wales/permits-and-permissions/medium-combustion-plants-and-specified-generators/>

In accordance with NRW's guidance an initial screening assessment was undertaken using the SCAIL combustion tool. This showed that the impact on the Crymlyn Burrows SSSI could not be screened out as 'insignificant' and detailed dispersion modelling is required. A large number of ecological receptors have been identified within the screening distance. In the first instance the impact has been assessed using plot files to determine whether detailed assessment of the impacts at any ecological receptors is required; this analysis is presented in section 9.

6 Dispersion Modelling Methodology

6.1 Selection of model

Detailed dispersion modelling was undertaken using the model ADMS 6.0, developed and supplied by Cambridge Environmental Research Consultants (CERC). This is a new generation dispersion model, which characterises the atmospheric boundary layer in terms of the atmospheric stability and the boundary layer height. In addition, the model uses a skewed Gaussian distribution for dispersion under convective conditions, to take into account the skewed nature of turbulence. The model also includes modules to take account of the effect of buildings and complex terrain. ADMS is routinely used for modelling of emissions for planning and Environmental Permitting purposes to the satisfaction of the Natural Resources Wales, the Environment Agency, and Local Authorities.

6.2 Model inputs

6.2.1 Source and emissions data

6.2.1.1 Biomass Boiler

The principal inputs to the model with respect to the emissions to air from the Biomass Boiler are presented in Table 9. These have been derived from data provided by the Client. It has been assumed that the Biomass Boiler operates at 100% load.

Table 9: Source Data – New Biomass Boiler

Item	Unit	Value
Thermal input	kW	9,100
Fuel type	-	Woody solid biomass
Stack Data		
Stack height	m	30
Internal diameter	m	1.1
Location ⁽¹⁾	m, m	273131, 192799
Flue Gas Conditions		
Temperature	°C	200
Exit moisture content	% v/v	23.1
Exit oxygen content ⁽²⁾	% v/v dry	9.50
Reference oxygen content	% v/v dry	6.0
Volume at ref conditions (dry, ref O ₂)	Nm ³ /s	3.64
Volume at actual conditions	Am ³ /s	10.70
Flue gas exit velocity	m/s	11.26
Emissions Data		
NO _x release concentration	mg/Nm ³	300
NO _x release rate	g/s	1.089

Item	Unit	Value
Dust release concentration	mg/Nm ³	30
Dust release rate	g/s	0.1089
CO release concentration	mg/Nm ³	300
CO release rate	g/s	1.089

The release concentration for oxides of nitrogen and dust are the ELVs prescribed in the MCPD for 'woody solid biomass'. The carbon monoxide emission concentration is as advised by the Client.

The sensitivity of the results to potential variations in the temperature and oxygen content of the emissions (and resultant velocity) has been assessed in section 7.

6.2.1.2 Existing sources

Table 9 presents lists the emission points included in the existing EP for the Installation which either emit oxides of nitrogen, dust or carbon monoxide.

Table 10: Existing On-Site Emission Sources

Ref	Source	Pollutant(s)
A2	Paper machine dust removal	Particulate matter (dust)
A3	Exhaust to reel system	Particulate matter (dust)
A4	Gas hood exhaust	Oxides of nitrogen, carbon monoxide
A5	Gas boiler exhaust	Oxides of nitrogen, carbon monoxide

The conditions of the existing EP require that emissions from points A2 and A3 are monitored every six months. A review of the most recent four sets of monitoring reports from 2022 and 2023 has been undertaken to determine the appropriate input parameters.

Under the conditions of the existing EP, monitoring of emissions from A4 and A5 is not required. However, monitoring of emissions from A4 and A 5 was undertaken until 2011. A set of four emissions reports dated from 2009 to 2011 have been used to derive input parameters for A4. With reference to A5, a new burner was fitted in 2022, which significantly altered the emission parameters. Therefore, emissions parameters for A5 have been taken from the test reports for the new burner.

The height and location of each source have been taken from site plans and the internal diameter taken from the monitoring reports, except for A5 where the height and diameter have been taken from a stack inspection report dated 2022.

Full details of the emissions parameters from the additional on-site sources are presented in Appendix D.

6.2.2 Meteorological data and surface characteristics

The impact of meteorological data was taken into account by using weather data from the Mumbles Head meteorological station for the years 2019 – 2023. Mumbles Head is approximately 12 km to the south west of the Installation. This site has been selected as it is the closest and most representative site in the vicinity, given its coastal location. The data was obtained from Air

Pollution Services Limited. Five years of data have been used to take into account inter-annual fluctuations in weather conditions. Wind roses from Mumbles Head for each year can be found in Figure 4.

6.2.2.1 Minimum Monin-Obukhov length

The minimum Monin-Obukhov length can be selected in ADMS for both the dispersion site and the meteorological site. This is a measure of the minimum stability of the atmosphere and can be adjusted to account for urban heat island effects which prevent the atmosphere in urban areas from ever becoming completely stable. The minimum Monin-Obukhov length has been set to 10 m for both the dispersion site, which is appropriate for ‘small towns’ and is considered appropriate to account for the industrial setting of the Installation. The minimum Monin-Obukhov length has been set to ‘model calculated’ for the meteorological site, which in practice limits the limit minimum Monin-Obukhov length to the model default of 1 m which is suitable for rural areas such as the meteorological site.

6.2.2.2 Surface roughness

The surface roughness length can be selected in ADMS for both the dispersion site and the meteorological site. The area surrounding the dispersion site comprises sand dunes, open water, grassland, and industrial uses. To account for the varying surface roughness length a spatially-varying surface roughness file has been used as a model input. The land-use class for each point in the file has been extracted from the CORINE Land Cover database⁶ and cross-referenced with the most likely surface roughness length value⁷.

The parameters of this file are presented in Table 11 and Table 12, and a visual representation shown in Figure 5.

Table 11: Spatially Varying Surface Roughness File Parameters

Parameter	Value
Grid spacing (m)	50
Grid points	104
Grid Start X (m)	270925
Grid Finish X (m)	276075
Grid Start Y (m)	190425
Grid Finish Y (m)	195575

Table 12: Surface Roughness Lengths Used for Different Land Use Classes

Land Use Classification	Corine 2018 land use codes	Surface Roughness Length (m)
Continuous urban fabric	111	1.2
Broad-leaved forest, coniferous forest	311, 312	0.75

⁶ <https://land.copernicus.eu/pan-european/corine-land-cover>

⁷ Taken from “Roughness length classification of Corine Land Cover classes”, Megajoule Consultants, 2007.

Land Use Classification	Corine 2018 land use codes	Surface Roughness Length (m)
Discontinuous urban fabric	112	0.5
Non-irrigated arable land, inland marshes, salt marshes	211, 411, 421	0.05
Moors and heathland, natural grassland	322, 323	0.03
Bare rock	332	0.005
Intertidal flats	423	0.0005
Water ⁽¹⁾	511	0.0001
Note: ⁽¹⁾ The 'most likely' value for water is given as zero. ADMS cannot model a surface roughness length of zero, so areas of water have been assigned a roughness length of 0.0001 m which is the value recommended by CERC for 'sea'.		

A surface roughness length of 0.1 m has been selected for the meteorological site. This value is the minimum recommended by CERC for 'root crops' and is considered appropriate for the short vegetation surrounding Mumbles Head.

A summary of the meteorological parameters used in the dispersion modelling is shown in Table 13

Table 13: Meteorological parameters

Parameter	Dispersion Site Value (m)	Met Site Value (m)
Surface roughness length	Variable	0.1
Minimum Monin-Obukhov length	10	Model calculated (1)

The sensitivity of the modelling to the choice of surface roughness for the dispersion site has been considered in section 7.1.

6.2.3 Modelling domain

Modelling has been undertaken over a 1 km x 1 km grid of 10 m resolution nested inside a 4 km x 4 km grid of resolution 40 m. The nested grid option has been used to ensure that the grid spacing around the point of maximum impact is sufficiently fine to capture the maximum concentrations. The receptor height has been modelled at 1.5 m for human receptors, and 0 m for ecological receptors. Figure 6 shows the extent of the modelling domain.

Table 14: Modelling Domain

Parameter	Fine grid	Wide grid
Grid Spacing (m)	10	40
Grid Start X	272700	271500
Grid Finish X	273700	275500
Grid Start Y	192400	191000
Grid Finish Y	193400	195000

6.2.4 Terrain

It is recommended that, where gradients within 500 m of the modelling domain are greater than 1 in 10, the complex terrain module within ADMS (FLOWSTAR) should be used. A review of the local area has deemed that the effect of terrain needs to be included in the modelling. The spatial parameters of the terrain file are the same as for the surface roughness file presented in Table 11. Reference should be made to Figure 7 for a geographical representation of the terrain file used.

6.2.5 Buildings

The presence of adjacent buildings can significantly affect the dispersion of the atmospheric emissions in the following ways.

- Wind blowing around a building distorts the flow and creates zones of turbulence. The increased turbulence can cause greater plume mixing.
- The rise and trajectory of the plume may be depressed slightly by the flow distortion. This downwash leads to higher ground level concentrations closer to the stack than those which would be present without the building.

The Environment Agency recommends that buildings should be included in the modelling if both:

- The buildings are within 5L of the stack (where L is the smaller of the building height and maximum projected width of the building); and
- The stack height is less than 2.5 times the height of the building.

The details of the buildings included within the model are presented in Table 15 and a site plan showing their location is presented in Figure 8.

Table 15: Building Details

Building	Centre Point		Height (m)	Length (m)	Width (m)	Angle (°)
	X (m)	Y (m)				
B ⁽¹⁾	273142.3	192872.8	23.56	130.45	33.20	69
A	273027.4	192793.0	9.57	85.70	139.70	69
B1	273070.6	192839.0	12.56	28.83	45.95	69
BA1	273115.5	192838.7	8.12	42.70	12.75	69
BA2	273177.3	192861.9	12.58	24.00	12.40	69
C	273244.6	192877.4	9.56	65.70	99.70	69
CA1	273219.0	192840.0	7.70	12.92	26.21	69
D	273343.5	192900.0	12.00	125.55	161.10	69
E	273393.7	192803.0	9.56	82.45	57.85	69
F	273491.4	192904.6	9.58	156.20	220.70	69
ESP ⁽²⁾	273119.1	192795.4	14.50	18.50	9.50	69
New Boiler House ⁽²⁾⁽³⁾	273117.4	192807.7	24.00	24.00	14.50	69
Note: ⁽¹⁾ Selected as main building for sources A2 – A5. ⁽²⁾ Proposed buildings for the new Biomass Boiler. Only included in the ‘proposed’ scenario. ⁽³⁾ Selected as main building for the new Biomass Boiler						

6.3 Chemistry

The plant will release nitric oxide (NO) and nitrogen dioxide (NO₂) which are collectively referred to as NO_x. In the atmosphere, a proportion of nitric oxide will be converted to nitrogen dioxide in a reaction with ozone which is influenced by solar radiation. Since the AQALs are expressed in terms of nitrogen dioxide, it is important to define the conversion rate of nitric oxide to nitrogen dioxide.

Ground level NO_x concentrations have been predicted through dispersion modelling. Nitrogen dioxide concentrations reported in the results section assume 70% conversion from NO_x to nitrogen dioxide for annual means and a 35% conversion for short-term (hourly) concentrations, based upon the worst-case scenario in the Environment Agency guidance on dispersion modelling reports. This is applicable where the primary nitrogen dioxide to oxide of nitrogen ratio is less than 10%, as is expected to be the case for the Biomass Boiler. Given the short travel time to the areas of maximum concentrations, this approach is considered conservative.

6.4 Scenarios modelled

Three scenarios have been modelled to quantify the impact of the Biomass Boiler in the appropriate context for the assessment for the planning application. The treatment of each source in each scenario is detailed in Table 16. Scenario 3 represents the anticipated operational profile of each emission source within the Installation following commissioning of the Biomass Boiler. The change in impact has been calculated by subtracting scenario 2 from scenario 3.

Table 16: Scenarios Modelled

Scenario	Gas Hoods and dryers (A2 – A4)	Gas boiler (A5)	New Biomass Boiler
1 – Biomass Boiler only	-	-	8,760 hours per year at maximum load at ELVs
2 – Operational Installation	Continual operation at typical load, monitored emission concentrations	8,460 hours per year at typical load, monitored emission concentrations	-
3 – Proposed Operation	Continual operation at typical load, monitored emission concentrations	360 hours per year at typical load, monitored emission concentrations ⁽¹⁾	8,100 hours per year at maximum load at ELVs
Note: ⁽¹⁾ When used as the standby boiler the gas boiler would be 'hot banked', meaning it would be fired for 10 minutes per day at 20% load. Emissions from such short duration, low load operation would be negligible and have not been considered in this assessment.			

The gas boiler and Biomass boiler would not operate together at operational load; therefore, short-term impacts for Scenario 3 have been calculated assuming no emissions from the gas boiler.

Conclusions regarding the significance of effect have been based on the change in impact, i.e. the difference between the Operational Installation and Proposed Operation scenarios. The total impact of Proposed Operation has been used when calculating the PEC to determine the risk of Proposed Operation resulting in an exceedance of an AQAL.

7 Sensitivity Analysis

7.1 Surface roughness length

The sensitivity of the results to surface roughness length has been considered by running the model with a range of surface roughness lengths for the dispersion site.

The following parameters were kept constant:

- sources – Biomass Boiler only;
- stack height – 30 m;
- buildings – included;
- terrain – included at 64 x 64 resolution;
- meteorological site surface roughness – 0.1 m;
- dispersion site Minimum Monin-Obukhov length – 10 m;
- meteorological site Minimum Monin-Obukhov length – model calculated;
- meteorological data used – Mumbles Head 2019.

Table 17 presents the concentration of oxides of nitrogen at the ground level point of maximum impact outside of the Installation boundary, and the maximum impacted receptor, for each surface roughness value.

Table 17: Choice of Surface Roughness Length

Dispersion site surface roughness length (m)	PC ($\mu\text{g}/\text{m}^3$)					
	Point of maximum impact			Maximum impacted receptor		
	Annual mean	99.79%ile of 1-hour	Max 1- hour	Annual mean	99.79%ile of 1-hour	Max 1- hour
Variable	2.13	33.35	35.72	0.33	4.29	8.40
0.05	2.73	46.80	51.20	0.33	4.23	6.13
0.1	2.70	43.40	47.71	0.33	4.10	6.53
0.2	2.35	40.09	43.45	0.34	3.94	7.25
0.3	2.27	37.98	42.07	0.33	3.93	7.35
0.5	2.20	35.53	37.13	0.33	3.53	6.51
% Change from variable						
0.05	28.32%	40.35%	43.35%	-2.43%	-1.28%	-26.99%
0.1	26.45%	30.14%	33.57%	-0.39%	-4.39%	-22.29%
0.2	10.08%	20.24%	21.66%	0.82%	-8.05%	-13.64%
0.3	6.33%	13.89%	17.78%	0.22%	-8.43%	-12.45%
0.5	3.30%	6.54%	3.95%	-0.71%	-17.82%	-22.55%

As shown, the use of the spatially varying surface roughness file results in a lower impact at the point of maximum impact than any of the constant surface roughness values considered. The impact at the maximum impacted receptor is less affected, although the use of the variable surface roughness file results in higher short-term impacts.

The spatially varying surface roughness file was selected for the model as is most representative of the mix of land uses in the vicinity of the Installation; in particular, it accounts for the lower surface roughness over the sea and coastal areas to the south-west, which is a frequent wind direction.

7.2 Building parameters

The sensitivity of the results to the effect of buildings has been considered by running the model with and without buildings.

The following parameters were kept constant:

- sources – Biomass Boiler only;
- stack height – 30 m;
- terrain – included at 64 x 64 resolution;
- dispersion site surface roughness – spatially varying at 64 x 64 resolution;
- meteorological site surface roughness – 0.1 m;
- dispersion site Minimum Monin-Obukhov length – 10 m;
- meteorological site Minimum Monin-Obukhov length – model calculated;
- meteorological data used – Mumbles Head 2019.

Table 18 presents the concentration of oxides of nitrogen at the ground level point of maximum impact outside of the Installation boundary, and the maximum impacted receptor, for each building scenario.

Table 18: Effect of Buildings

Scenario	PC (µg/m ³)					
	Point of maximum impact			Maximum impacted receptor		
	Annual mean	99.79%ile of 1-hour	Max 1-hour	Annual mean	99.79%ile of 1-hour	Max 1-hour
Including buildings	2.13	33.35	35.72	0.33	4.29	8.40
Excluding buildings	0.80	16.10	25.27	0.32	3.08	5.11
% change	-62.60%	-51.71%	-29.25%	-5.10%	-28.29%	-39.19%

The inclusion of buildings results in significantly higher concentrations, particularly at the point of maximum impact. Therefore, buildings have been included in the dispersion model as this represents a realistic approach.

7.3 Terrain

The sensitivity of the results to the effect of terrain has been considered by running the model with and without terrain effects.

The following parameters were kept constant:

- sources – Biomass Boiler only;
- buildings – included;
- dispersion site surface roughness – spatially varying at 64 x 64 resolution;
- meteorological site surface roughness – 0.1 m;

- dispersion site Minimum Monin-Obukhov length – 10 m;
- meteorological site Minimum Monin-Obukhov length – model calculated; and
- meteorological data used – Mumbles Head 2019.

Table 19 presents the ground level concentration of oxides of nitrogen at the ground level point of maximum impact outside of the Installation boundary, and the maximum impacted receptor, for each terrain scenario.

Table 19: Effect of Terrain

Scenario	PC ($\mu\text{g}/\text{m}^3$)					
	Point of maximum impact			Maximum impacted receptor		
	Annual mean	99.79%ile of 1-hour	Max 1-hour	Annual mean	99.79%ile of 1-hour	Max 1-hour
Including terrain	2.13	33.35	35.72	0.33	4.29	8.40
Excluding terrain	2.24	33.43	35.25	0.33	4.26	8.01
% change	4.91%	0.26%	-1.31%	-1.00%	-0.72%	-4.65%

Modelling the effect of terrain has a slight effect on the results. Terrain effects have been included in the dispersion model as this represents a realistic approach.

7.4 Emission temperature and velocity

The sensitivity of the results to the likely operational range of temperature and oxygen content of the flue gas has been considered. The range of parameters is presented in Table 20.

Table 20: Temperature and Velocity Sensitivity Analysis - Inputs

Item	Unit	Minimum	Central	Maximum
Temperature	$^{\circ}\text{C}$	180	200	225
Exit oxygen content ⁽²⁾	% v/v dry	8.00	9.50	11.00
Volume at actual conditions	Am^3/s	9.04	10.70	12.93
Flue gas exit velocity	m/s	9.51	11.26	13.61

The following parameters were kept constant:

- sources – Biomass Boiler only;
- buildings – included;
- terrain – included at 64 x 64 resolution
- dispersion site surface roughness – spatially varying at 64 x 64 resolution;
- meteorological site surface roughness – 0.1 m;
- dispersion site Minimum Monin-Obukhov length – 10 m;
- meteorological site Minimum Monin-Obukhov length – model calculated; and
- meteorological data used – Mumbles Head 2019.

Table 19 presents the ground level concentration of oxides of nitrogen at the ground level point of maximum impact outside of the Installation boundary, and the maximum impacted receptor, for each scenario.

Table 21: Temperature and Velocity

Scenario	PC ($\mu\text{g}/\text{m}^3$)					
	Point of maximum impact			Maximum impacted receptor		
	Annual mean	99.79%ile of 1-hour	Max 1-hour	Annual mean	99.79%ile of 1-hour	Max 1-hour
Min temp + vel	2.29	36.81	38.95	0.35	4.73	7.77
Central	2.13	33.35	35.72	0.33	4.29	8.40
Max temp + vel	1.96	30.22	32.14	0.31	3.73	7.45
% Change from Central						
Min temp + vel	7.45%	10.40%	9.04%	6.04%	10.20%	-7.45%
Max temp + vel	-8.27%	-9.37%	-10.03%	-6.82%	-13.08%	-11.33%

As expected, reducing the temperature and velocity results in slightly higher impacts, and increasing these parameters results in slightly lower impacts. However, the variation in results is relatively small compared to variations with other parameters such as surface roughness length. Therefore, it is considered appropriate to use the central values in the main model runs.

7.5 Summary

In summary, the remainder of this assessment has been based on the following assumptions:

- Stack height – 30 m;
- Temperature and velocity; central values;
- buildings – included;
- terrain – included at 64 x 64 resolution;
- dispersion site surface roughness length – spatially varying at 64 x 64 resolution;
- meteorological site surface roughness length – 0.1 m;
- dispersion site Minimum Monin-Obukhov length – 10 m;
- meteorological site Minimum Monin-Obukhov length – model calculated; and
- meteorological data used – Mumbles Head 2019 to 2023.

8 Impact on Human Health

The general approach of this assessment is to evaluate the highest predicted PC across the output grid outside of the Installation boundary over the five modelled years (2019 - 2023), known as the point of maximum impact. In addition, the predicted impacts have been evaluated at the human sensitive receptors presented in Section 5.

8.1 Results – at the point of maximum impact

The impacts on concentrations of nitrogen dioxide, PM₁₀, PM_{2.5}, and carbon monoxide have been assessed against the relevant AQALs using the IAQM's criteria as set out in section 3 for the scenarios listed in section 6.4.

Results where the total contribution from all sources or the incremental change as a result of the operation of the Biomass Boiler cannot be screened out as 'negligible' irrespective of the total concentration have been highlighted.

For the calculation of short-term PECs the short-term background concentration has been assumed to be twice the annual mean background concentration, in accordance with Environment Agency guidance.

Full results for each year of modelled weather data are presented in Appendix C.

Table 22: Dispersion Modelling Results – Point of Maximum Impact outside of Installation Boundary

Pollutant	Quantity	Units	AQAL	Bg conc.	PC at Point of Maximum Impact Outside of Installation Boundary									
					1 – New Biomass Boiler Only		2 - Operational Installation		3 - Proposed Operation		Change in impact ⁽¹⁾		PEC - Proposed Operation	
					Conc.	% AQAL	Conc.	% AQAL	Conc.	% AQAL	Conc.	% AQAL	Conc.	% AQAL
Nitrogen dioxide	Annual mean	µg/m ³	40	15.67	1.49	3.73%	1.32	3.30%	2.35	5.87%	1.20	3.00%	18.02	45.05%
	99.79 th ile of hourly means	µg/m ³	200	31.34	11.90	5.95%	8.20	4.10%	14.84	7.42%	8.96	4.48%	46.18	23.09%
PM ₁₀	Annual mean	µg/m ³	40	14.28	0.21	0.53%	0.06	0.15%	0.25	0.62%	0.20	0.49%	14.53	36.33%
	90.41 st ile of daily means	µg/m ³	50	28.56	0.86	1.73%	0.23	0.46%	1.06	2.13%	0.87	1.74%	29.62	59.24%
PM _{2.5}	Annual mean	µg/m ³	10	9.49	0.21	2.13%	0.06	0.60%	0.25	2.48%	0.20	1.97%	9.74	97.40%
Carbon monoxide	8 hour running mean	µg/m ³	10,000	510	32.32	0.32%	6.56	0.07%	34.30	0.34%	29.46	0.29%	544	5.44%
	Hourly mean	µg/m ³	30,000	510	37.65	0.13%	10.0	0.03%	43.15	0.14%	38.49	0.13%	553	1.84%
Note: ⁽¹⁾ The change in impact has been calculated by subtracting the results for Scenario 2 from Scenario 3 for each grid output point. The maximum of the calculated change at any grid point outside of the Installation boundary has been reported.														

As shown, when considering the impact of emissions from the new Biomass Boiler alone, all short-term impacts are below 10% of the AQAL and can be screened out. However, the maximum impact outside of the Installation boundary cannot be screened out as 'negligible' irrespective of the total concentration for the following pollutants:

- Annual mean nitrogen dioxide;
- Annual mean PM₁₀; and
- Annual mean PM_{2.5}.

In addition, the impact of Proposed Operation as defined in Scenario 3 cannot be screened out as 'negligible' for these same pollutants and averaging periods. Therefore, consideration has been given to the change from the Operational Installation.

The maximum change in annual mean PM₁₀ concentrations is less than 0.5% of the AQAL and can be screened out as 'negligible' irrespective of the total concentration. The impact on annual mean concentrations of PM₁₀ has been assessed at receptor locations for completeness.

The maximum change in concentrations outside of the Installation boundary cannot be screened out as 'negligible' irrespective of the total concentration for the following pollutants:

- Annual mean nitrogen dioxide; and
- Annual mean PM_{2.5}.

For these pollutants the total impact of Proposed Operation, and the change in impact compared to the Operational Installation, has been assessed at the receptor locations identified in Table 8, and more generally at areas of relevant exposure with reference to plot files.

8.1.1.1 Further assessment – annual mean nitrogen dioxide

The annual mean nitrogen dioxide results at receptor locations are presented in Table 23.

Table 23: Annual Mean Nitrogen Dioxide at Receptors

Receptor	2 - Operational Installation		3 - Proposed Operation		Change	
	Conc.	% AQAL	Conc.	% AQAL	Conc.	% AQAL
R1	0.07	0.16%	0.13	0.34%	0.07	0.17%
R2	0.20	0.49%	0.40	1.01%	0.21	0.52%
R3	0.05	0.12%	0.09	0.23%	0.04	0.11%
R4	0.06	0.15%	0.12	0.30%	0.06	0.15%
R5	0.06	0.16%	0.14	0.34%	0.07	0.18%
R6	0.05	0.11%	0.09	0.22%	0.04	0.10%
R7	0.06	0.14%	0.11	0.28%	0.06	0.15%

Both the change in impact from the Operational Installation and the total impact of Proposed Operation is below 0.5% of the AQAL and can be screened out as 'negligible' irrespective of the total concentration at all receptor locations except R2.

At receptor R2 the overall impact and the change in impact both round to 1% of the AQAL. R2 is located along the A48, close to the M4. Due to the proximity of these road sources, the mapped background may not be representative of baseline concentrations. No roadside monitoring data is

available along this stretch of road. Defra's ambient air quality map⁸ provides predicted roadside concentrations along this stretch of the A48; the predicted nitrogen dioxide concentration for the most recent year (2022) is 19.63 µg/m³. Therefore, the PEC is approximately 50% of the AQAL and both the change in impact and the impact of Proposed Operation are described as 'negligible' at R2 and at all other areas of relevant exposure.

Figure 9 Appendix A illustrates the distribution of emissions for the Proposed Operation of the Installation, and the change in impact. As shown, both the change in impact and the impact of Proposed Operation is less than 0.5% of the AQAL at all areas of relevant exposure and is described as 'negligible' irrespective of the total concentration, except for the area around receptor R2 where the impact is described as 'negligible', as detailed above.

8.1.1.2 Further assessment – annual mean PM₁₀

The annual mean PM₁₀ results at receptor locations are presented in Table 24.

Table 24: Annual Mean PM₁₀ at Receptors

Receptor	2 - Operational Installation		3 - Proposed Operation		Change	
	Conc.	% AQAL	Conc.	% AQAL	Conc.	% AQAL
R1	0.003	0.01%	0.014	0.04%	0.011	0.03%
R2	0.010	0.02%	0.045	0.11%	0.035	0.09%
R3	0.003	0.01%	0.011	0.03%	0.008	0.02%
R4	0.003	0.01%	0.014	0.04%	0.011	0.03%
R5	0.003	0.01%	0.016	0.04%	0.012	0.03%
R6	0.003	0.01%	0.011	0.03%	0.008	0.02%
R7	0.002	0.01%	0.012	0.03%	0.010	0.02%

As shown, both the change in impact and the total impact of Proposed Operation are less than 0.5% of the AQAL at all receptor locations and are described as 'negligible' irrespective of the total concentration. Figure 10 of Appendix A illustrates the distribution of emissions for Proposed Operation, and the change in impact. As shown, the impact of Proposed Operation and the change in impact are both less than 0.5% of the AQAL at all areas of relevant exposure and is described as 'negligible' irrespective of the total concentration.

8.1.1.3 Further assessment – annual mean PM_{2.5}

The annual mean PM_{2.5} results at receptor locations are presented in Table 24.

Table 25: Annual Mean PM_{2.5} at Receptors

Receptor	2 - Operational Installation		3 - Proposed Operation		Change	
	Conc.	% AQAL	Conc.	% AQAL	Conc.	% AQAL
R1	0.003	0.03%	0.014	0.14%	0.011	0.11%
R2	0.010	0.10%	0.045	0.45%	0.035	0.35%

⁸ <https://uk-air.defra.gov.uk/data/gis-mapping/>

Receptor	2 - Operational Installation		3 - Proposed Operation		Change	
	Conc.	% AQAL	Conc.	% AQAL	Conc.	% AQAL
R3	0.003	0.03%	0.011	0.11%	0.008	0.08%
R4	0.003	0.03%	0.014	0.14%	0.011	0.11%
R5	0.003	0.03%	0.016	0.16%	0.012	0.12%
R6	0.003	0.03%	0.011	0.11%	0.008	0.08%
R7	0.002	0.02%	0.012	0.12%	0.010	0.10%

As shown, both the change in impact and the total impact of Proposed Operation are less than 0.5% of the AQAL at all receptor locations and are described as 'negligible' irrespective of the total concentration.

Figure 11 of Appendix A illustrates the distribution of emissions for Proposed Operation, and the change in impact. As shown, the impact of Proposed Operation and the change in impact are both less than 0.5% of the AQAL at all areas of relevant exposure and is described as 'negligible' irrespective of the total concentration.

8.2 Assessment of significance

The assessment has determined that the change in impact as a result of operation of the Biomass Boiler, and the overall impact of emissions from Proposed Operation, will be negligible at all areas of relevant exposure. Therefore, the effect of emissions on human health will be 'not significant'.

9 Impact at Ecological Receptors

This section provides an assessment of the impact of emissions at the ecological receptors identified in Section 5.2.

9.1 Atmospheric emissions

In addition to the objectives for the protection of human health, the AQS includes Critical Levels for the protection of ecosystems as presented in Table 2. The impacts have been compared to these Critical Levels. In accordance with the assessment criteria detailed in section 3.1.4, where the PC of a pollutant is greater than 1% of the long-term or 10% of the short-term Critical Level, further assessment has been undertaken.

The PC for each scenario as set out in section 6.4 has been calculated based on the maximum predicted using all five years of weather data. In the first instance, a screening assessment of the impacts on airborne concentrations of oxides of nitrogen has been undertaken using the following plot files:

Figure 12: Annual Mean Oxides of Nitrogen; and

Figure 13: Daily Mean Oxides of Nitrogen

As shown in these figures, the annual mean and daily mean PC of oxides of nitrogen from Proposed Operation are less than the screening criteria at Crymlyn Bog SAC. However, the annual mean PC from Proposed Operation exceeds 1% of the Critical Level at Crymlyn Burrows SSSI. The PC at the point of maximum impact within the Crymlyn Burrows SSSI and calculated PEC has been quantified in Table 26. Daily mean oxides of nitrogen at Crymlyn Burrows SSSI has been included for completeness.

Table 26: Oxides of Nitrogen – Crymlyn Burrows SSSI

Pollutant/ averaging period	1 – New Biomass Boiler Only		2 - Operational Installation		3 - Proposed Operation		Change		Proposed Operation PEC ⁽¹⁾	
	µg/m ³	% CL	µg/m ³	% CL	µg/m ³	% CL	µg/m ³	% CL	µg/m ³	% CL
Annual mean NOx	0.36	1.18%	0.31	1.02%	0.58	1.93%	0.27	0.91%	10.98	36.60%
Daily mean NOx	4.47	5.96%	3.63	4.84%	7.06	9.41%	3.89 ⁽²⁾	5.19%	27.86	37.15%
Note: ⁽¹⁾ Including the background concentration of 10.4 µg/m ³ as taken from APIS. The short-term background has been assumed to be twice the long-term background in accordance with EA guidance. ⁽²⁾ The maximum daily mean NOx PC occurs in different locations in scenarios 2 and 3; the change in impact presented is the maximum change at any grid output point in the SSSI.										

The change in impact between the Operational Installation and Proposed Operation at Crymlyn Burrows SSSI is 0.91% of the Critical Level and can be screened out as 'insignificant'. In addition, the PEC of annual mean oxides of nitrogen is well below 70% of the Critical Level, so the impact of Proposed Operation is 'not significant'. All impacts on daily mean oxides of nitrogen at Crymlyn Burrows SSSI are predicted to be 'insignificant'.

Figure 12 and Figure 13 show that impact of the Proposed Operation on annual mean and daily mean concentrations of oxides of nitrogen would exceed the screening criteria at a number of local nature sites.

A screening approach has been undertaken to determine the potential for a significant impact. The maximum PC from Proposed Operation at any local nature site has been calculated and added to the maximum baseline concentration from any grid square surrounding the Installation to produce a conservative estimate of the maximum PEC. This analysis is presented in Table 27.

Table 27: Oxides of Nitrogen for Proposed Operation Scenario – Local Nature Sites

Pollutant/averaging period	Max PC at any local nature site		Max baseline		Max PEC	
	$\mu\text{g}/\text{m}^3$	% CL	$\mu\text{g}/\text{m}^3$	% CL	$\mu\text{g}/\text{m}^3$	% CL
Annual mean NOx	3.35	11.18%	16.30	54.33%	19.65	65.50%
Daily mean NOx	35.78	47.70%	32.60 ⁽¹⁾	43.46%	68.38	91.17%
Note: ⁽¹⁾ The short-term baseline has been taken to be twice the annual mean baseline in accordance with the Air Emissions Guidance.						

Under these screening assumptions the annual mean PEC is below 70% of the Critical Level at all local nature sites considered, so all impacts are 'not significant', and no further analysis is required.

The maximum daily mean PEC of oxides of nitrogen is 91.17% of the Critical Level. Although no exceedance of the Critical Level is predicted in this conservative screening scenario of adding the maximum PC to the maximum baseline, the PEC is close to the Critical Level so further analysis of the impacts has been undertaken.

As shown on Figure 13, the change in impact exceeds 10% of the daily mean Critical Level at only one local nature site, the Baglan Bay Site of Importance for Nature Conservation (SINC). Table 28 presents the results at this site.

Table 28: Daily Mean Oxides of Nitrogen – Baglan Bay SINC

Pollutant/averaging period	Change in conc.		Max baseline		Max PEC	
	$\mu\text{g}/\text{m}^3$	% CL	$\mu\text{g}/\text{m}^3$	% CL	$\mu\text{g}/\text{m}^3$	% CL
Daily mean NOx	16.80	22.40%	16.40 ⁽¹⁾	43.46%	52.18 ⁽²⁾	69.57%
Note: ⁽¹⁾ The short-term baseline has been taken to be twice the annual mean baseline for the relevant grid square, in accordance with the Air Emissions Guidance. ⁽²⁾ PEC calculated using the Proposed Operation PC of 35.78 $\mu\text{g}/\text{m}^3$ as presented in Table 27.						

As shown, the maximum daily mean PEC at the Baglan Bay SINC is 52.18 $\mu\text{g}/\text{m}^3$, which is 69.6% of the Critical Level. As such, it is considered that there is no risk of Proposed Operation resulting in an exceedance of the Critical Level.

9.2 Deposition of emissions

9.2.1 Critical Loads

In addition to the Critical Levels for the protection of ecosystems, habitat specific Critical Loads for nature conservation sites at risk from acidification and nitrogen deposition (eutrophication) are outlined in APIS.

In accordance with the assessment criteria detailed in section 3.1.4, where the PC of a pollutant is greater than 1% of the long-term or 10% of the short-term Critical Level, further assessment has been undertaken.

The ecology consultant for the project has determined the appropriate habitat and Critical Load range for each designated site. This analysis is presented in the Ecological Assessment and included in Appendix B. As shown, the lowest (i.e. most sensitive) potential Critical Load of any habitat in the study area is 5 kgN/ha/yr for acid sand dune habitats, dry heath and dry acid grassland. Therefore, the Critical Load of 5 kgN/ha/yr has been used to screen for the potential for a significant impact. This is precautionary, as the ecology consultant has confirmed that the dune habitats in the area are unlikely to be decalcified, and the most applicable Critical Load is 10 kgN/ha/yr for calcareous dunes.

In addition to Critical Loads for nitrogen deposition, APIS defines Critical Loads for acid deposition. A search of APIS has confirmed that the lowest Critical Load for acid grassland (the appropriate habitat for sand dunes) for any grid square surrounding the Installation is 2.008 keq/ha/yr (as the CLmaxN).

9.2.2 Calculation methodology – nitrogen deposition

The impact of deposition has been assessed using the methodology detailed within the Habitats Directive AQTAG 6 (March 2014). The steps to this method are as follows.

1. Determine the annual mean ground level concentrations of nitrogen dioxide at each site.
2. Calculate the dry deposition flux ($\mu\text{g}/\text{m}^2/\text{s}$) at each site by multiplying the annual mean ground level concentration by the relevant deposition velocity presented in Table 29.
3. Convert the dry deposition flux into units of kgN/ha/yr using the conversion factors presented in Table 29.
4. Compare this result to the nitrogen deposition Critical Load.

Table 29: Deposition Factors

Pollutant	Deposition velocity (m/s)		Conversion factor ($\mu\text{g}/\text{m}^2/\text{s}$ to kg/ha/year)
	Grassland	Woodland	
Nitrogen dioxide	0.0015	0.003	96.0

Source: AQTAG 6 (March 2014)

9.2.2.1 Acidification

Deposition of nitrogen can cause acidification and should be taken into consideration when assessing the impact of emissions.

The steps to determine the acid deposition flux are as follows.

1. Determine the dry deposition rate in kg/ha/yr of nitrogen using the methodology outlined in Section 9.2.2.
2. Apply the conversion factor for N outlined in Table 29 to the nitrogen deposition rate in kg/ha/year to determine the total keq N/ha/year.
3. Plot the results against the Critical Load functions.

Table 30: Conversion Factors

Pollutant	Conversion factor (kg/ha/year to keq/ha/year)
Nitrogen	Divide by 14

Source: AQTAG (March 2014)

The process contribution has been calculated using the APIS formula:

Where $PEC\ N\ Deposition < CL_{min}N$:

$PC\ as\ \%\ of\ CL\ function = PC\ S\ deposition / CL_{max}S$

Where $PEC\ N\ Deposition > CL_{min}N$:

$PC\ as\ \%\ of\ CL\ function = (PC\ S + N\ deposition) / CL_{max}N$

9.3 Results – deposition of emissions

The PC for each scenario as set out in section 6.4 has been calculated based on the maximum predicted using all five years of weather data. In the first instance, a screening assessment of the deposition impacts has been undertaken using the following plot files:

Figure 14: Nitrogen Deposition; and

Figure 15: Acid Deposition.

As shown in Figure 15, acid deposition for Proposed Operation is less than 1% of the lowest Critical Load and can be screened out as 'insignificant', except at the Baglan Bay SINC immediately west of the Installation. The ecologist for the project has advised that the habitat in this section of the SINC is saltmarsh, which is not sensitive to acid deposition. Therefore, all acid deposition impacts can be screened out as 'insignificant'.

As shown in Figure 14, the nitrogen deposition impact of Proposed Operation exceeds 1% of the lowest Critical Load of 5 kgN/ha/yr at the Crymlyn Burrows SSSI and a number of local nature sites. However, the change in impact compared to the Operational Installation is less than 1% of the Critical Load and screens out as 'insignificant' at Crymlyn Burrows SSSI and all but three local nature sites.

The nitrogen deposition impact at Crymlyn Burrows SSSI has been quantified and the results presented in Table 31.

Table 31: Nitrogen Deposition – Crymlyn Burrows SSSI

Pollutant	1 – New Biomass Boiler Only		2 - Operational Installation		3 - Proposed Operation		Change		Proposed Operation PEC	
	kgN/ha/yr	% CL 5	kgN/ha/yr	% CL 5	kgN/ha/yr	% CL 5	kgN/ha/yr	% CL 5	kgN/ha/yr	% CL 5
Nitrogen deposition	0.036	0.72%	0.031	0.62%	0.058	1.18%	0.027	0.54%	8.858	177%

The change in impact is less than 1% of the most stringent Critical Load of 5 kgN/ha/yr and can be screened out as 'insignificant'. The total impact of Proposed Operation cannot be screened out and the PEC exceeds the Critical Load.

The ecology consultant has determined that the sand dunes in this section of SSSI are unlikely to be decalcified, and the most appropriate Critical Load is 10 kgN/ha/yr for calcareous dunes. When assessed against the Critical Load of 10 kgN/ha/yr the impact of Proposed Operation at Crymlyn Burrows SSSI is 0.59% of the Critical Load and no exceedance of the Critical Load is predicted. Therefore, the impact of nitrogen deposition at Crymlyn Burrows SSSI is 'insignificant'.

As shown in Figure 14, the change in impact from current operation is less than 1% of the Critical Load of 5 kgN/ha/yr and can be screened out as 'insignificant' except at the following sites:

- Baglan Bay;
- Neath Estuary;
- Brunel Dock Grassland;
- The Quays Car Park Bunds; and
- Triangular Pond.

Of these, only the Baglan Bay site potentially contains acid (decalcified) dunes. However, the section where the change in impact exceeds 1% of the Critical Load for acid dunes has been confirmed by the ecology consultant as consisting of saltmarsh, which has a lower Critical Load of 10 kgN/ha/yr.

The maximum change in impact at the saltmarsh in the Baglan Bay site is 0.25 kgN/ha/yr, 2.5% of the Critical Load of 10 kgN/ha/yr. The baseline deposition as taken from APIS is 8.8 kgN/ha/yr. Including the total contribution from Proposed Operation, the PEC is 9.14 kgN/ha/yr, giving a PEC of 91.4% with no exceedance of the Critical Load. Therefore, no significant effects are predicted.

10 Conclusions

This Air Quality Assessment has been undertaken to support the planning application for a Biomass Boiler to be installed at the Intertissue Britton Ferry Paper Mill located at the Baglan Energy Park near Port Talbot.

The primary conclusions of the assessment are presented below.

1. In relation to the impact on human health:
 - a. No exceedance of any AQAL is predicted.
 - b. All short-term impacts can be screened out as 'negligible' based on results at the point of maximum impact outside of the installation boundary.
 - c. Long-term impacts on concentrations of nitrogen dioxide and particulate matter cannot be screened out based on results at the point of maximum impact outside of the Installation boundary. Further assessment of impacts at areas of relevant exposure has been undertaken. This has concluded that all impacts at areas of relevant exposure will be 'negligible'.
2. In relation to the impact on ecologically sensitive sites:
 - a. The impact on annual mean airborne NO_x concentrations is 'not significant'.
 - b. The impact on daily mean NO_x concentrations at Crymlyn Burrows SSSI can be screened out as 'insignificant'. The change in impact at the Baglan Bay SINC cannot be screened out 'insignificant'; however no exceedance of the most stringent Critical Level is predicted, so no significant effects are anticipated.
 - c. The acid deposition impact at all receptors can be screened out as 'insignificant',
 - d. The nitrogen deposition impact of Proposed Operation cannot immediately be screened out as 'insignificant' at the Crymlyn Burrows SSSI and at several local nature sites. The significance of effect has been assessed by the ecologist for the project, taking into account the sensitivity of the habitats, the change in impact from the Operational Installation, and baseline concentrations. This has concluded that no significant effects are predicted to occur as a result of operation of the Biomass Boiler.

Based on the above, professional judgement has been used to conclude that emissions from the proposals will not have a significant effect on local air quality.

In summary, the assessment has shown that the operation of the Biomass Boiler would not have a significant impact on local air quality, the general population or the local community. As such there should be no air quality constraint in granting planning consent for the Biomass Boiler.

A Figures

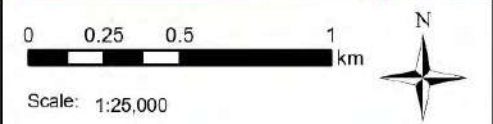


Legend

-  Site location
-  Installation boundary

Title:
Figure 1 - Site Location

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Legend

-  Installation boundary
-  Biomass Boiler Stack
-  Human receptors
-  Diffusion tube monitoring locations

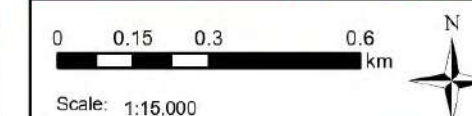
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Figure 2 - Human Receptors and AQ Monitoring

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- Legend**
-  Installation boundary
 -  Biomass Boiler Stack

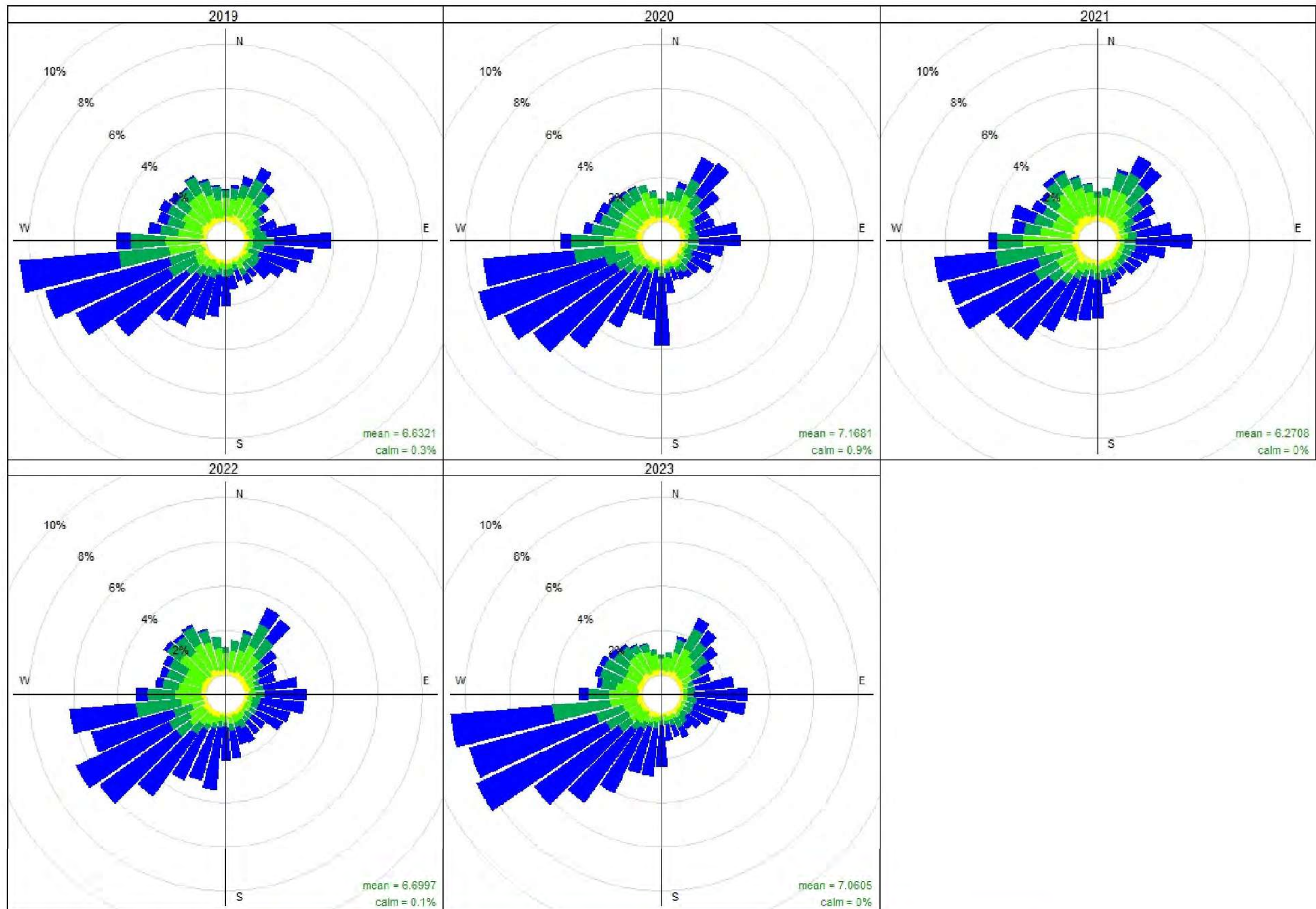
Title:
Figure 3 - Ecological Receptors

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0 0.1 0.2 0.4 km
Scale: 1:12,000

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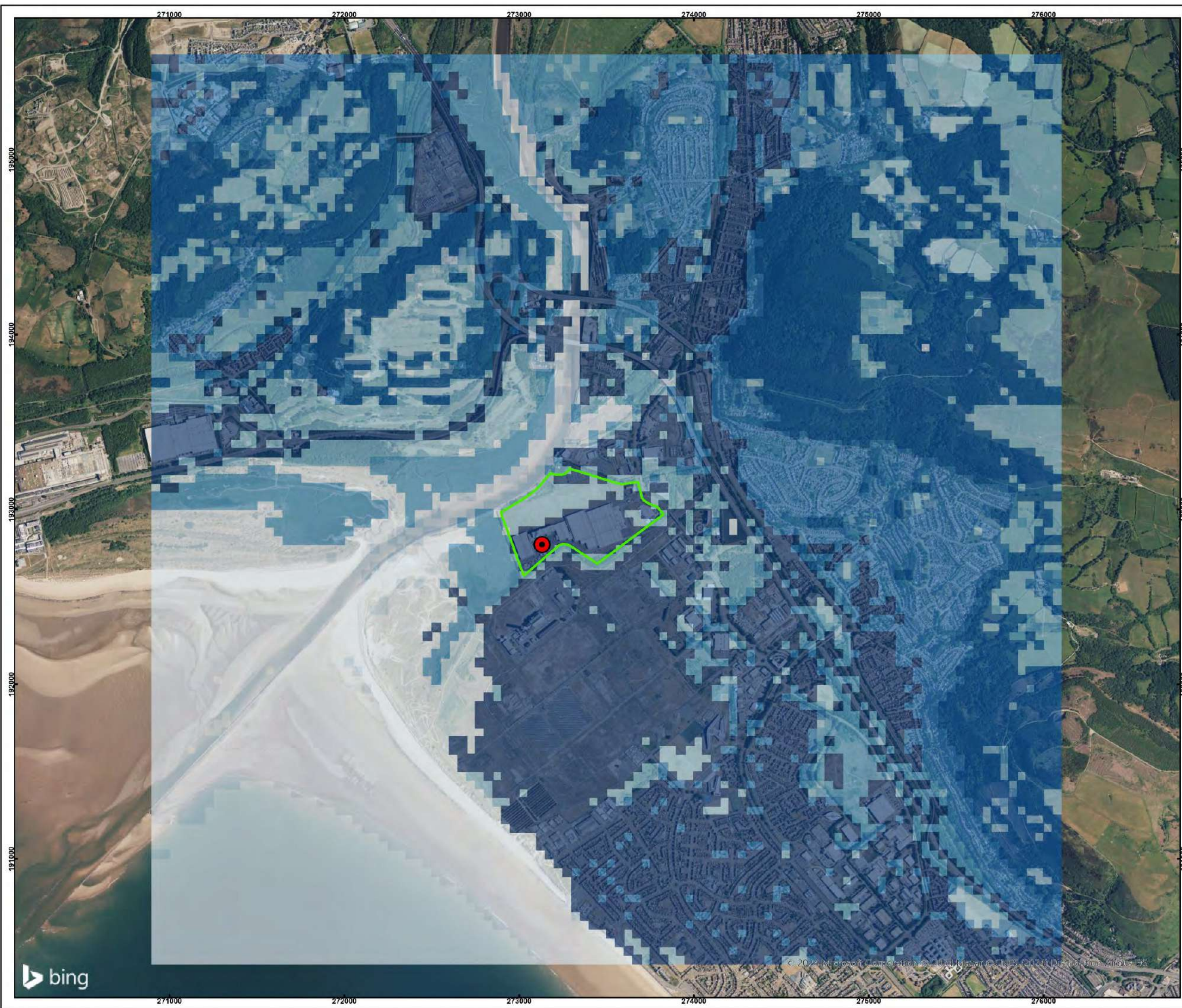


Title:
Figure 4 - Wind Roses - Mumbles Head
2019 - 2023

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Legend

Installation boundary

Biomass Boiler Stack

Roughness length (m)

	0.0001
	0.0005
	0.005
	0.03
	0.05
	0.5
	0.75
	1.2

Title:
Figure 5 - Surface Roughness File

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Date: 13/06/2024

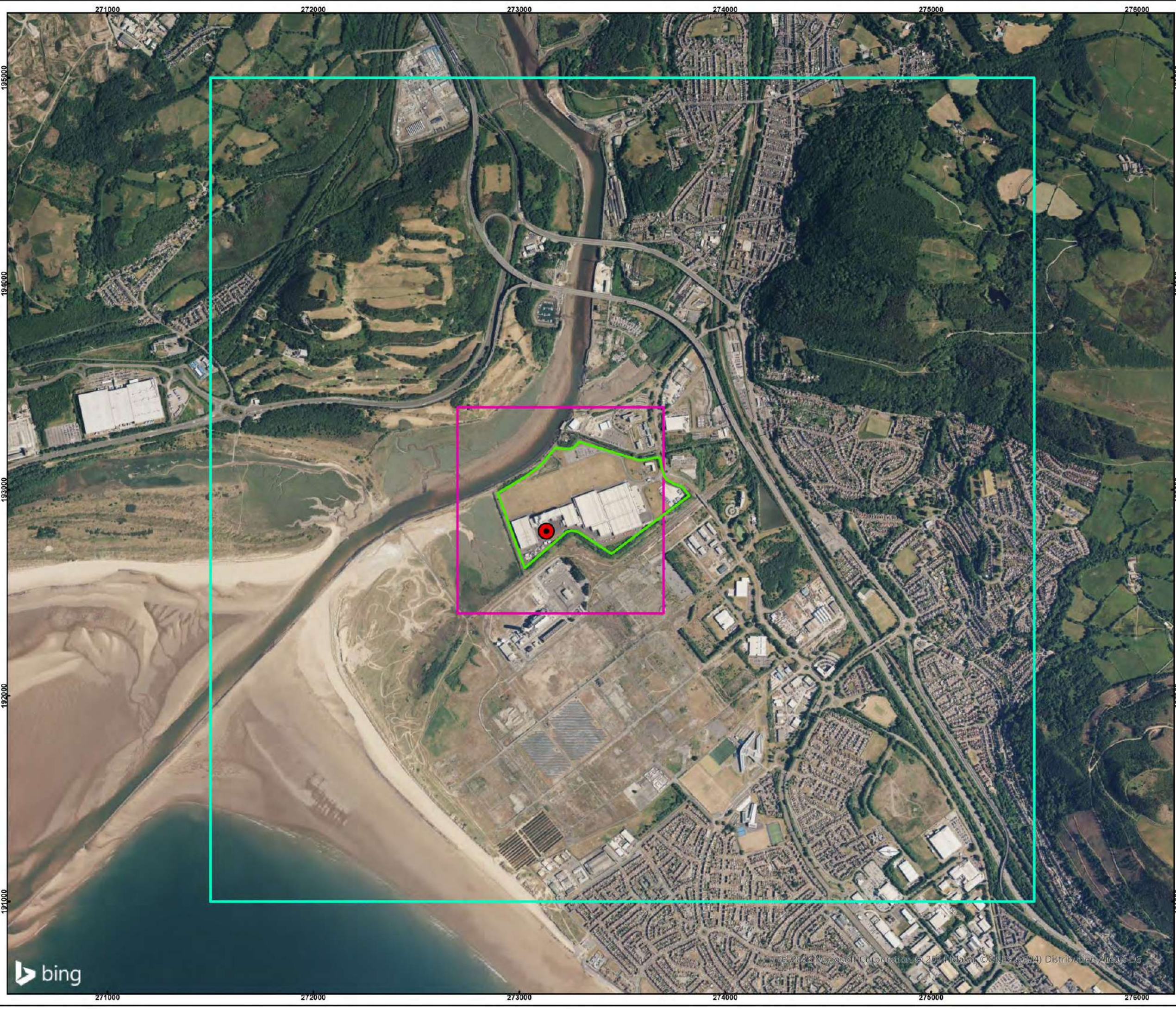
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Morrison Neath
Briton Ferry
Swansea
Port Talbot
Map data © OpenStreetMap

0 0.2 0.4 0.8 km

Scale: 1:20,000

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Legend

- Installation boundary
- Biomass Boiler Stack
- Fine grid extent
- Wide grid extent

Title:

Figure 6 - Modelling Domain

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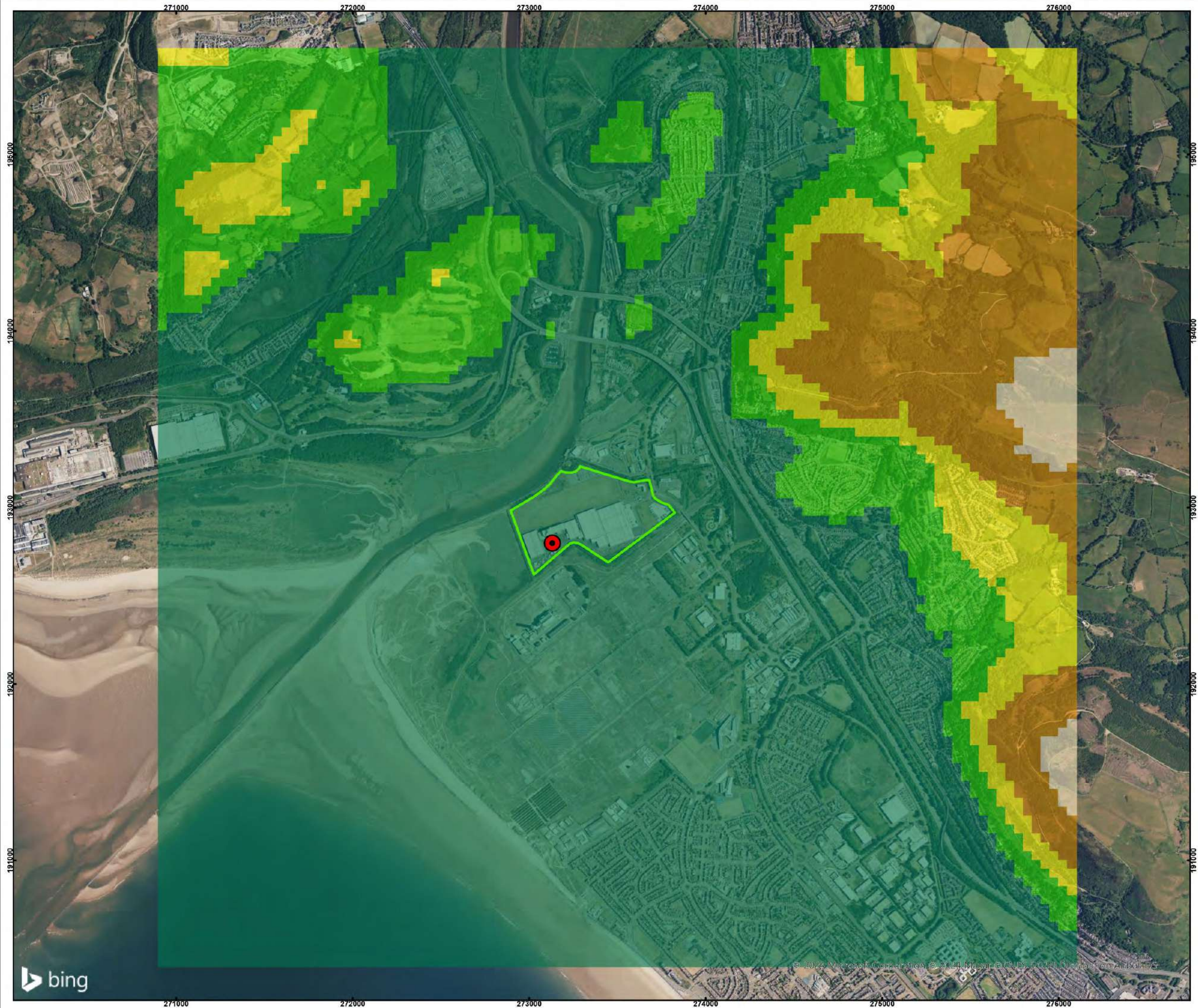
km

Scale: 1:17,000

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Legend

-  Installation boundary
-  Biomass Boiler Stack

Elevation (m)

-  <25
-  25 - 75
-  75 - 125
-  125 - 225
-  >225

Title:

Figure 7 - Terrain File

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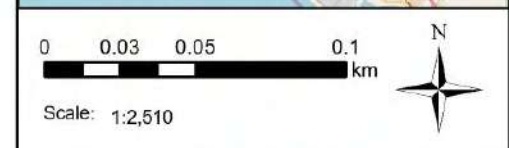
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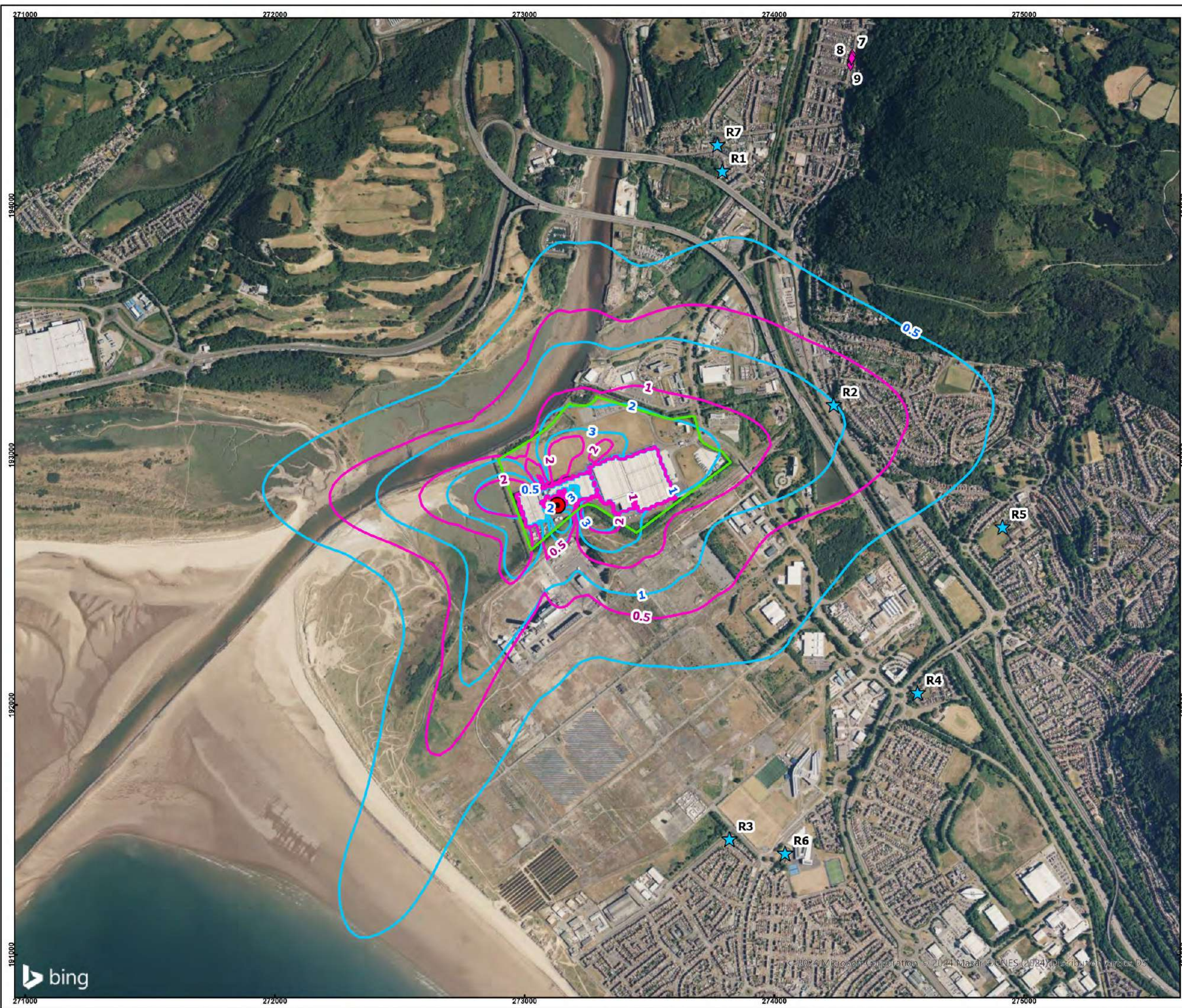
- Legend**
- Installation boundary
 - Biomass Boiler Stack
 - Existing sources modelled
 - Buildings modelled

Title:
Figure 8 - Buildings and Sources Modelled

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Legend

- Installation boundary
- Biomass Boiler Stack
- Human receptors
- Diffusion tube monitoring locations
- Annual Mean Nitrogen Dioxide as % of AQAL - Change
- Annual Mean Nitrogen Dioxide as % of AQAL - Proposed Operation

Title:

Figure 9 - Annual Mean Nitrogen Dioxide

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0 0.13 0.25 0.5 km

Scale: 1:14,000

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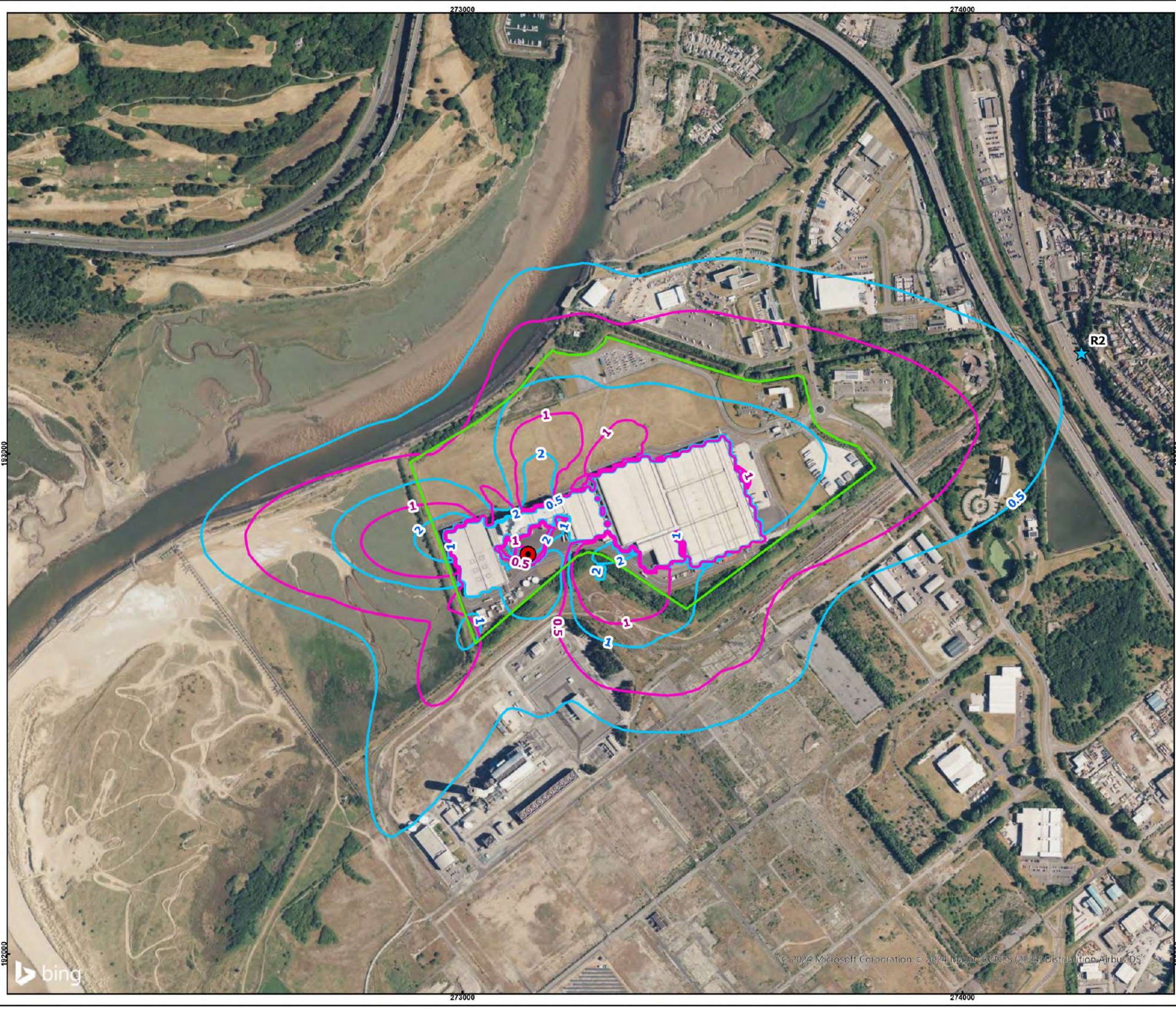
- Legend**
- Installation boundary
 - Biomass Boiler Stack
 - Annual Mean PM10 as % of AQAL - Change
 - Annual Mean PM10 as % of AQAL - Proposed Operation

Title:
Figure 10 - Annual Mean PM10

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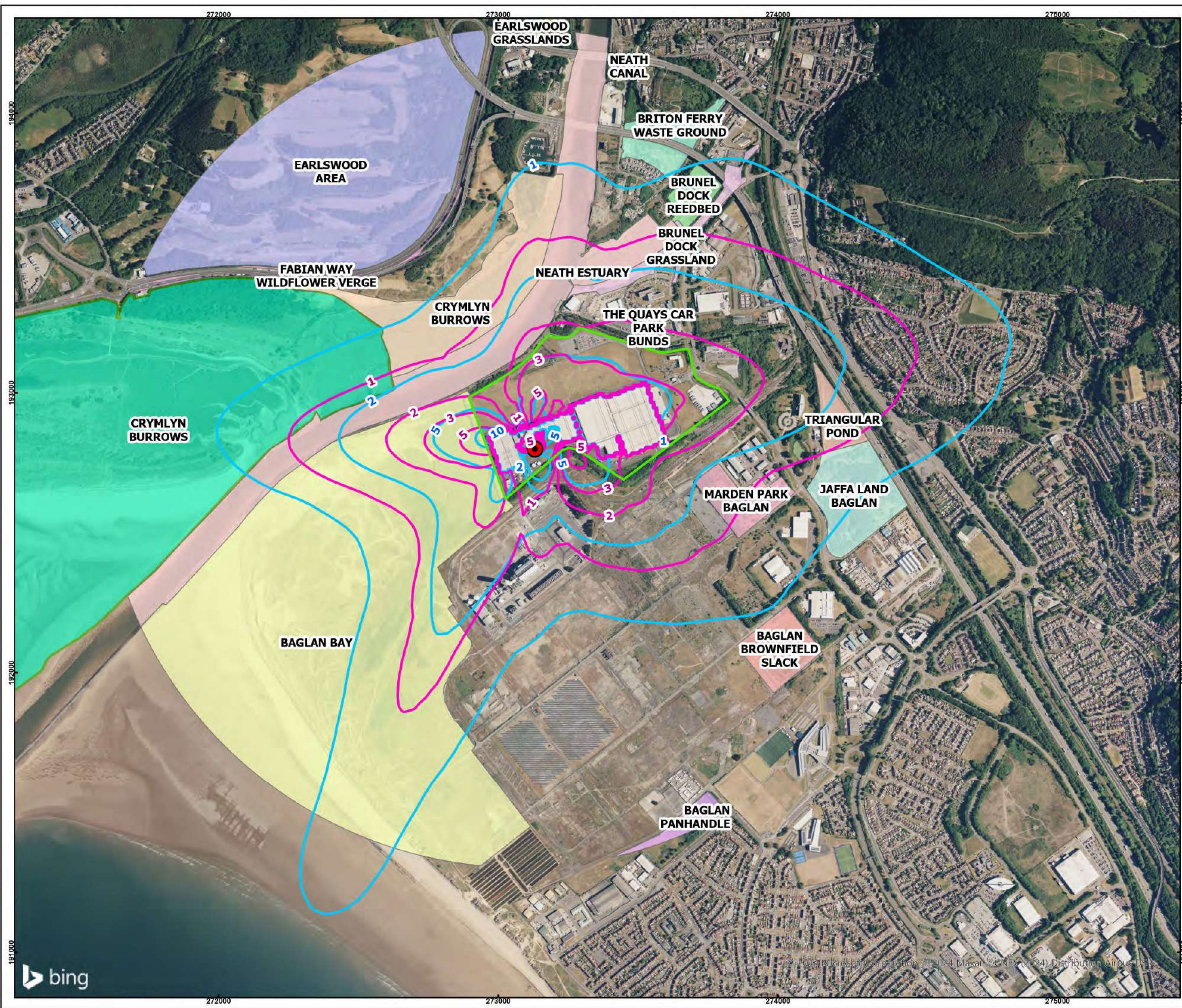
- Legend**
- Installation boundary
 - Biomass Boiler Stack
 - Annual Mean PM2.5 as % of AQAL of 10 $\mu\text{g}/\text{m}^3$ - Change
 - Annual Mean PM2.5 as % of AQAL of 10 $\mu\text{g}/\text{m}^3$ - Proposed Operation
 - ★ Human receptors

Title:
Figure 11 - Annual Mean PM2.5

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- Legend**
- Installation boundary
 - Biomass Boiler Stack
 - Annual Mean NOx as % of Critical Level - Change
 - Annual Mean NOx as % of Critical Level - Proposed Operation

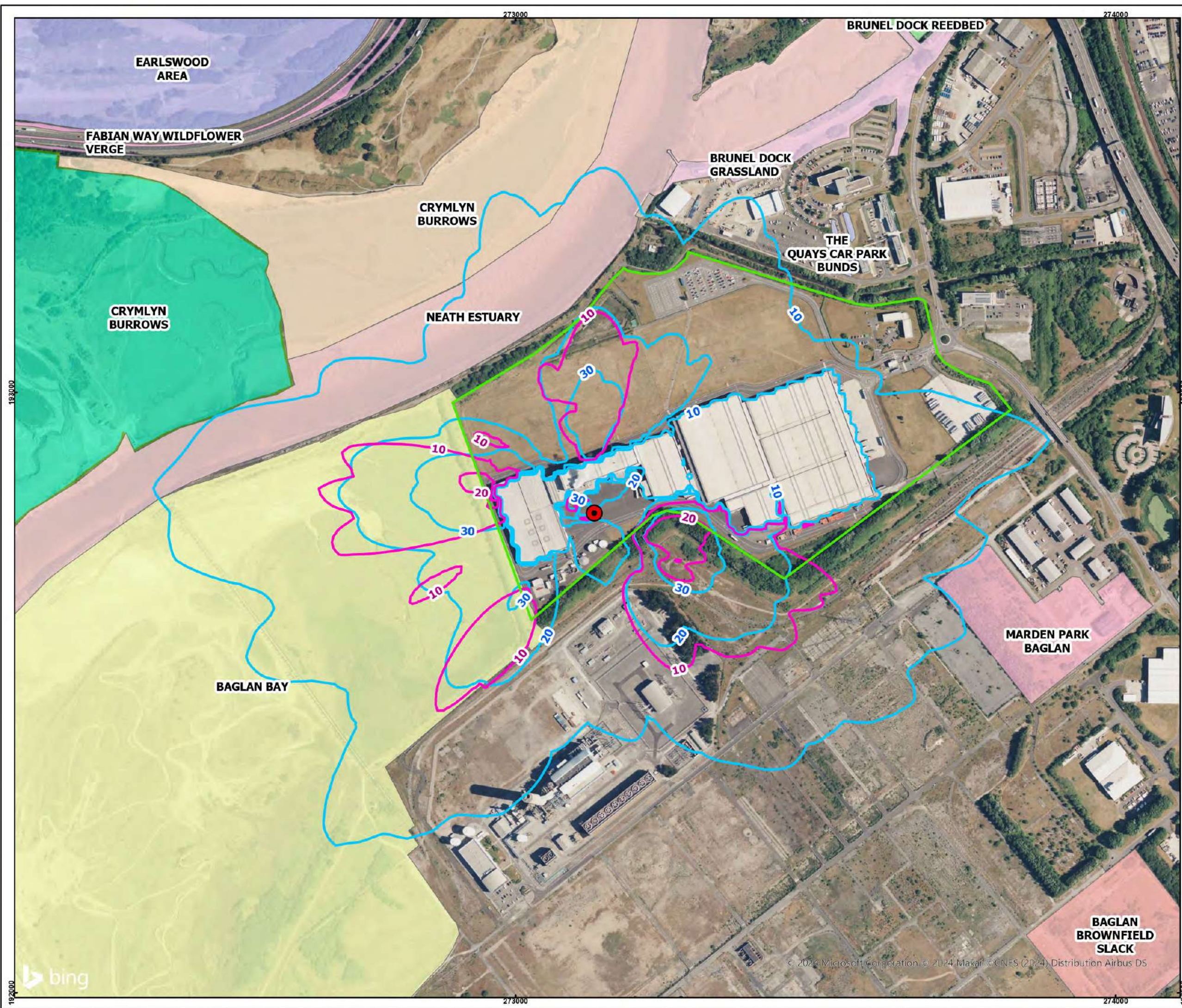
Title:
Figure 12 - Annual Mean NOx

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Scale: 1:12,500

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Legend

- Installation boundary
- Biomass Boiler Stack
- Daily Mean NOx as % of Critical Level - Change
- Daily Mean NOx as % of Critical Level - Proposed Operation

Title:

Figure 13 - Daily Mean NOx

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Map data © OpenStreetMap

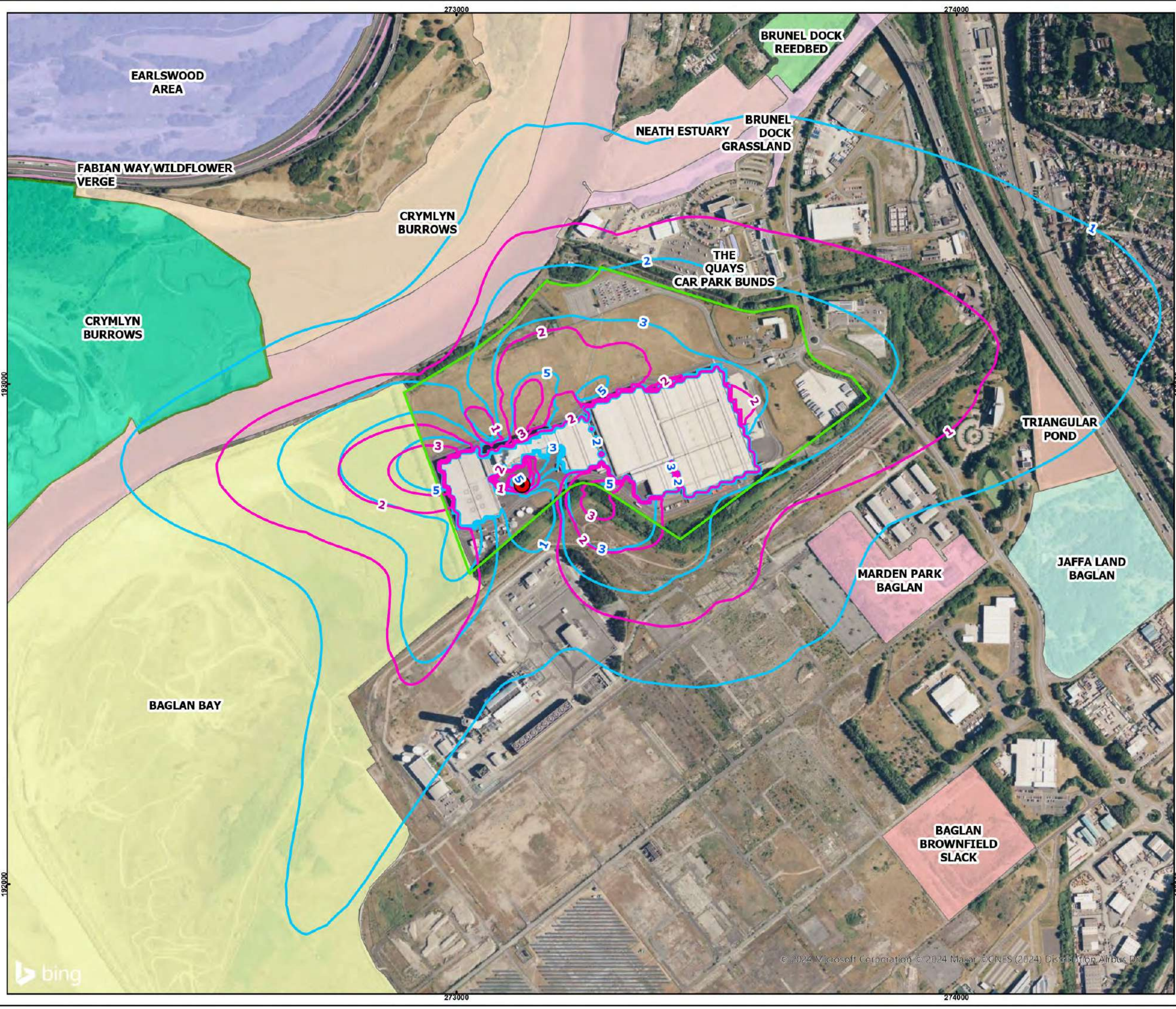
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Legend

- Installation boundary
- Biomass Boiler Stack
- Nitrogen Deposition as % of Critical Load of 5 kgN/ha/yr - Change
- Nitrogen Deposition as % of Critical Load of 5 kgN/ha/yr - Proposed Operation

Title:

Figure 14 - Nitrogen Deposition

Drawn by: SMN	Date: 13/06/2024
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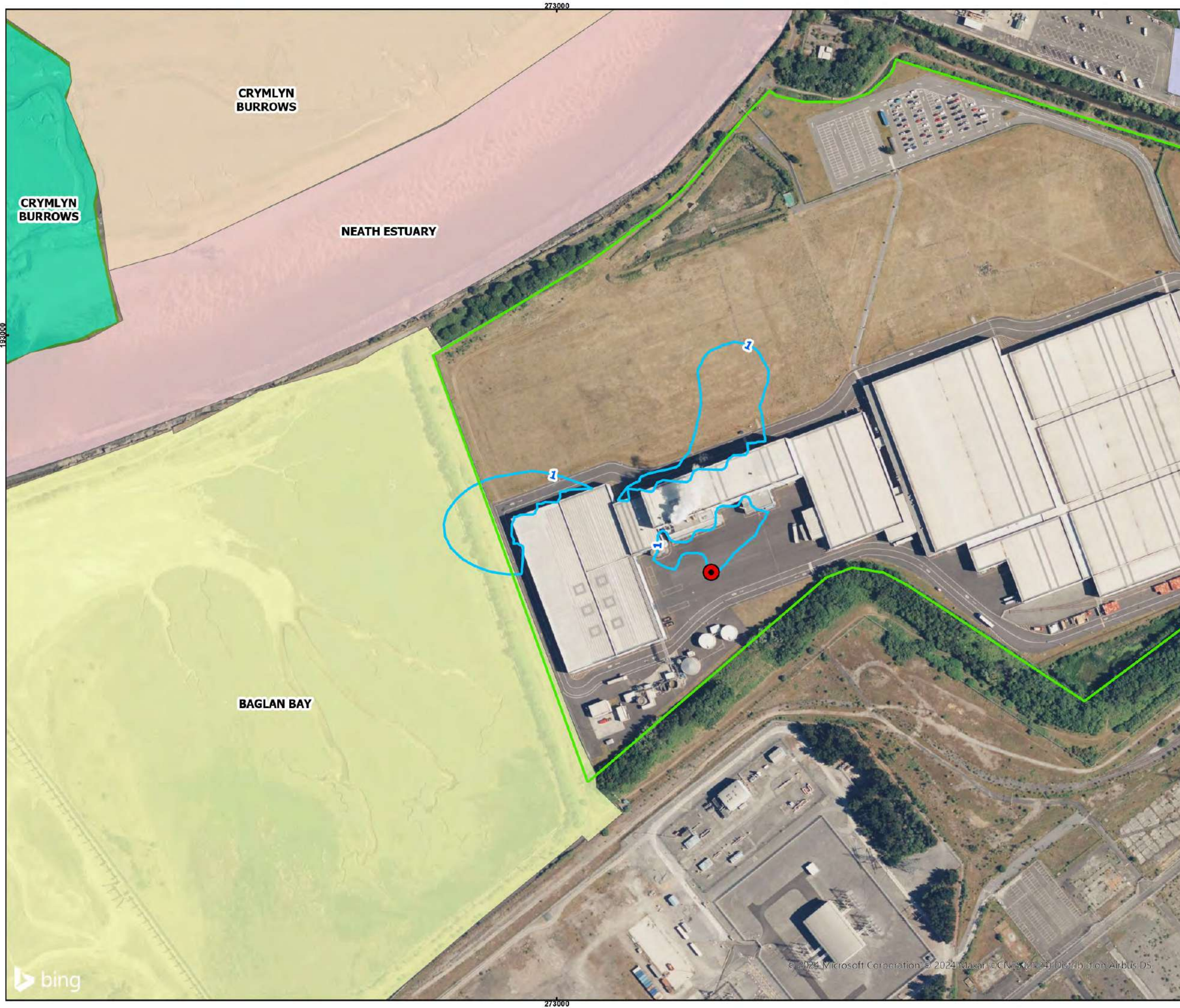
0 0.05 0.1 0.2 km

Scale: 1:7,000

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Legend

-  Installation boundary
-  Biomass Boiler Stack
-  Acid Deposition as % of Critical Load of 2.008 keq/ha/yr - Proposed Operation

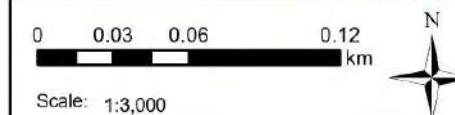
Title:

Figure 15 - Acid Deposition

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B Nitrogen Deposition Critical Loads

Site	Most sensitive qualifying feature	EUNIS habitat	N dep. critical load range (kgN/ha/yr)
Baglan Bay	Coastal sand dune	N15 / N1H: Atlantic and Baltic coastal dune grassland / dune slacks	5 - 15
Baglan Brownfield Slack	Coastal sand dune	N1H: Atlantic and Baltic coastal dune slacks	5 - 15
Baglan Panhandle	Coastal sand dune	N15: Atlantic and Baltic coastal dune grassland	5 - 15
Briton Ferry Waste Ground	Open mosaic habitat	No single equivalent - based on SINC description R22 Low and medium altitude hay meadows most sensitive	10 - 20
Brunel Dock Grasslands	Lowland meadows	R22 Low and medium altitude hay meadows	10 - 20
Brunel Dock Reedbeds	Reedbeds	Q5 reed marshes and sedge beds	not sensitive
Crymlyn Burrows (east of SSSI)	Coastal sand dune	N15 / N1H: Atlantic and Baltic coastal dune grassland / dune slacks	5 - 15
Earlswood Area	Coastal sand dune / heathland	N15: Atlantic and Baltic coastal dune grassland / S42: Dry heaths	5 - 15
Earlswood Grasslands	Heathland	S42 Dry heaths	5 - 15
Fabian Way Wildflower Verge	Lowland meadows	R22 Low and medium altitude hay meadows	10 - 20
Jaffa Land Baglan	Vascular plants	Q4 Base-rich fens (supporting habitat for rare sedge spp.)	15 - 25
Marden Park Grassland	Open mosaic habitat	No single equivalent habitat - R1P Inland sand grassland on dry acid and neutral soils most sensitive	5 - 15
Neath Canal	Standing open waters and canals	Eutrophic standing waters not listed as sensitive in Bobbinck <i>et al</i> (2022)	n/a
Neath Estuary	Coastal saltmarsh	MA223 / MA224: Atlantic upper-mid / mid-lower salt marshes	10 - 20
The Quays Car Park Bunds	Calcareous grassland	R1A Semi-dry perennial calcareous grassland	10 - 20
Triangular Pond	Ponds	Eutrophic standing waters not listed as sensitive in Bobbinck <i>et al</i> (2022)	n/a

Source: Intertissue Biomass Boiler, Briton Ferry Ecological Impact Assessment, Kevin Barry Honour, June 2024

C Detailed Results Tables

Table 32: Dispersion Modelling Results – Biomass Boiler Only - Point of Maximum Impact Outside of Installation Boundary

Pollutant	Quantity	Units	AQAL	PC at point of maximum impact						Max as % of AQAL
				2019	2020	2021	2022	2023	Max	
Nitrogen dioxide	Annual mean	µg/m ³	40	1.49	1.14	1.27	1.16	1.29	1.49	3.73%
	99.79th% ile of hourly means	µg/m ³	200	11.71	11.73	11.75	11.56	11.90	11.90	5.95%
PM ₁₀	Annual mean	µg/m ³	40	0.21	0.16	0.18	0.17	0.18	0.21	0.53%
	90.41 st oile of daily means	µg/m ³	50	0.86	0.64	0.68	0.64	0.73	0.86	1.73%
PM ₁₀	Annual mean	µg/m ³	10	0.21	0.16	0.18	0.17	0.18	0.21	2.13%
Carbon monoxide	8 hour running mean	µg/m ³	10,000	31.14	30.91	31.81	29.16	32.32	32.32	0.32%
	Hourly mean	µg/m ³	30,000	35.83	35.72	35.65	35.51	37.65	37.65	0.13%

Table 33: Dispersion Modelling Results – Operational Installation - Point of Maximum Impact Outside of Installation Boundary

Pollutant	Quantity	Units	AQAL	PC at point of maximum impact						Max as % of AQAL
				2019	2020	2021	2022	2023	Max	
Nitrogen dioxide	Annual mean	µg/m ³	40	1.32	0.98	1.03	1.04	1.12	1.32	3.30%
	99.79th% ile of hourly means	µg/m ³	200	8.18	8.04	8.01	8.05	8.20	8.20	4.10%
PM ₁₀	Annual mean	µg/m ³	40	0.06	0.05	0.05	0.05	0.05	0.06	0.15%
	90.41 st ile of daily means	µg/m ³	50	0.23	0.19	0.20	0.17	0.20	0.23	0.46%
PM ₁₀	Annual mean	µg/m ³	10	0.06	0.05	0.05	0.05	0.05	0.06	0.60%
Carbon monoxide	8 hour running mean	µg/m ³	10,000	6.56	6.31	6.38	6.45	6.37	6.56	0.07%
	Hourly mean	µg/m ³	30,000	8.52	9.89	8.41	9.67	10.00	10.00	0.03%

Table 34: Dispersion Modelling Results – Proposed Operation - Point of Maximum Impact Outside of Installation Boundary

Pollutant	Quantity	Units	AQAL	PC at point of maximum impact						Max as % of AQAL
				2019	2020	2021	2022	2023	Max	
Nitrogen dioxide	Annual mean	µg/m ³	40	2.35	1.72	1.81	1.88	2.03	2.35	5.87%
	99.79th% ile of hourly means	µg/m ³	200	14.71	14.66	14.77	14.53	14.84	14.84	7.42%
PM ₁₀	Annual mean	µg/m ³	40	0.25	0.19	0.20	0.20	0.21	0.25	0.62%
	90.41 st ile of daily means	µg/m ³	50	1.06	0.82	0.79	0.82	0.91	1.06	2.13%
PM ₁₀	Annual mean	µg/m ³	10	0.25	0.19	0.20	0.20	0.21	0.25	2.48%
Carbon monoxide	8 hour running mean	µg/m ³	10,000	32.69	32.56	33.53	32.07	34.30	34.30	0.34%
	Hourly mean	µg/m ³	30,000	38.64	37.97	43.15	38.81	39.01	43.15	0.14%

D Existing Sources Emissions Data

Table 35: Existing Sources - Modelled Source Data

Item	Unit	A2 Paper Dryer ⁽¹⁾	A3 Paper Reel	A4 Gas Hood	A5 Gas Boiler
Stack Data					
Stack height	m	25	25	27	25
Internal diameter	m	1.495	0.70	1.40	0.80
Location	m, m	273132, 192847	273124, 192845	273109, 192840	273166, 192858
Flue Gas Conditions					
Temperature	°C	32	28	163	99
Exit moisture content	% v/v	2.09%	2.30%	31.97%	14.91%
Exit oxygen content	% v/v dry	-	-	16.59%	5.00%
Reference oxygen content	% v/v dry	-	-	-	3.00%
Volume at ref conditions (dry, ref O ₂)	Nm ³ /s	20.70	0.86	10.54	1.69
Volume at actual conditions	Am ³ /s	22.99	0.94	16.83	3.04
Flue gas exit velocity	m/s	13.10	2.45	10.93	6.04
NOx emission concentration	mg/Nm ³	-	-	61.5	70.0
NOx emission rate	g/s	-	-	0.648	0.118
PM emission concentration	mg/Nm ³	0.97	0.77	-	-
PM emission rate	g/s	0.0020	0.0007	-	-
CO emission concentration	mg/Nm ³	-	-	21.87	-
CO emission rate	g/s	-	-	0.230	-

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