



Air Quality Assessment	
Goat Mill Road, Merthyr Tydfil	
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1 Introduction

1.1. Proposed Development

- 1.1.1 Air Quality Assessments Ltd (AQA) has been commissioned by Sirius Planning Ltd to undertake an air quality assessment for a proposed plastic recycling and processing facility at Goat Mill Road, Merthyr Tydfil. The proposed development would accept and process around 150,000 tonnes of rigid plastics and film a year from the commercial, industrial and public sector. Materials would arrive at the facility and be shredded, sorted and washed prior to compaction and baling ready for offsite transportation.

1.2. Scope of Assessment

- 1.2.1 This report describes the existing air quality conditions in proximity to the site and considers the effect of traffic generated by the proposed development on local air quality. The main air pollutants of concern related to road traffic are nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and PM_{2.5}).
- 1.2.2 The proposals include the operation of a natural gas fired combined heat and power (CHP) plant. Natural gas fired plant do not emit significant quantities of pollutants other than nitrogen oxides (NO_x) and the health effects of NO₂ emissions have been considered.
- 1.2.3 Emissions from the proposed CHP may also impact on sensitive habitats. The main air pollutants of concern related to impacts on sensitive habitats from natural gas plant are NO_x and nutrient and acid nitrogen deposition. The Cwm Cadlan Special Area of Conservation (SAC) and three areas of ancient woodland are located within 10km and 2km of the CHP plant respectively.
- 1.2.4 All of the processing operations would take place within buildings and the risk of odour effects on the surrounding area would be low. The facility would operate subject to the conditions of an Environmental Permit, which would ensure that odour would not have any impact on the local area. A standard odour condition in the Environmental Permit would be likely to state that:

"Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour."

The operator shall:

(a) if notified by the Natural Resources Wales that the activities are giving rise to pollution outside the site due to odour, submit to Natural Resources Wales for approval within the period specified, an odour management plan which identifies and minimises the risks of pollution from odour;

(b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales."

As the facility would operate in accordance with an Environmental Permit, the effect of odour on the local area would not be significant and odour is not considered further.

- 1.2.5 The assessment has been prepared taking into account all relevant local and national guidance and regulations.
- 1.2.6 The references and a glossary of common air quality terminology used in this assessment are shown in **Section 10** and **Section 11** respectively.

2 Air Quality Legislation and Policy

2.1. EU Limit Values

- 2.1.1 The European Union's Directive on ambient air quality and cleaner air for Europe (European Parliament, Council of the European Union, 2008) set legally binding limit values for NO₂, PM₁₀ and PM_{2.5}. The Air Quality Standards (Wales) Regulations 2010 (HMSO, 2010) implement the EU Directive limit values in Welsh legislation. Achievement of the limit values is a national obligation rather than a local one.
- 2.1.2 The limit values are the same as the objective values (see **Table 1**); however, the compliance dates differ, and the limit values apply at all locations (apart from where the public does not have access, where health and safety at work provisions apply and on the road carriageway). The PM₁₀ and NO₂ limit value applied from 2005 and 2010 respectively, whereas the PM_{2.5} limit value applied from 2015.
- 2.1.3 The United Kingdom left the European Union on 31st January 2020; however, EU legislation currently remains enshrined in UK law through the Air Quality Standards Regulations.

2.2. EU Habitats Directive

- 2.2.1 European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive") requires member states to introduce a range of measures for the protection habitats and species. The Conservation of Habitats and Species Regulations (2010b) transpose Directive 92/43/EEC into law in England and Wales. The Regulations place a duty on the Secretary of State to propose a list of sites which are important for either habitats or species, as listed in the Directive, to the European Commission. The Commission then identifies sites that must be designated as Special Areas of Conservation (SACs). The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs) classified under the Council Directive 79/409/EEC on the Conservation of Wild Birds (The European Parliament and the Council of the European Union, 2009). These sites form a network termed 'Natura 2000'.
- 2.2.2 The Regulations require local planning authorities to review planning applications that may affect a European site, and to restrict permission where the integrity of the site would be adversely affected. Where a planning application may have a likely significant effect on a site, an 'appropriate assessment' is required and consent only given where there is no adverse effect on the integrity of the site.
- 2.2.3 In addition to SACs and SPAs, some internationally important UK wetlands sites are designated under the Ramsar Convention and it is government policy to treat these sites as though they are designated as European sites.

2.3. Legislation

- 2.3.1 Part IV of The Environment Act 1995 required the UK Government to prepare an Air Quality Strategy which includes standards and objectives for air quality and sets out

- measures which are to be taken by local authorities and the government in order to achieve those objectives.
- 2.3.2 Standards are the concentrations of pollutants in the atmosphere, below which there is a minimum risk of health effects or ecosystem damage; they are set with regard to scientific and medical evidence. Objectives are the policy targets set by the Government, taking account of economic efficiency, practicability, technical feasibility and timescale, where the standards are expected to be achieved by a certain date.
- 2.3.3 Part IV of the Environment Act 1995 also describes the system of Local Air Quality Management (LAQM), which requires every local authority to carry out regular review and assessments of air quality in its area. Where an objective has not been, or is unlikely to be achieved, the local authority must declare an AQMA, and prepare an action plan which sets out appropriate measures to be introduced in pursuit of the objectives.
- 2.3.4 The objectives for NO₂ and PM₁₀, as prescribed by the Air Quality (Wales) Regulations 2000 and the Air Quality (Amendment) (Wales) Regulations 2002 (HMSO, 2000; HMSO, 2002), are shown in **Table 1**. The objectives for PM₁₀ and NO₂ were to have been achieved by 2004 and 2005 respectively and continue to apply in all future years thereafter. The PM_{2.5} objective, also shown in **Table 1**, was to be achieved by 2020; however, there is no obligation for local authorities to try to meet the PM_{2.5} objective, and it is not included in the Regulations.
- 2.3.5 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. Examples of where the objectives should apply are provided in the Local Air Quality Management Technical Guidance (Defra, 2021) issued by the Department for Environment, Food and Rural Affairs (Defra). The annual mean NO₂ and PM₁₀ objectives should apply at the building façades of residential properties, schools, hospitals, care homes etc.; they should not apply at the building façades of places of work, hotels, gardens or kerbside sites. The 24-hour mean PM₁₀ objective should apply at all locations where the annual mean objective applies, as well as the gardens of residential properties and hotels. The 1-hour mean NO₂ objective should apply at all locations where the annual and 24-hour mean objectives apply, as well as at kerbside sites where the public have regular access, e.g., the pavements of busy shopping streets.
- 2.3.6 The NO_x objective for the protection of vegetation and ecosystems is also shown in **Table 1**. Objectives for ecosystems only strictly apply where the ecosystem is more than 20km from an agglomeration (i.e., an area with a population of more than 250,000); or more than 5km away from industrial sources regulated under Part A1 of the Environmental Permitting Regulations), motorways and built up areas of more than 5,000 people. However, the regulatory agencies have agreed with the nature conservation agencies that non-statutory critical levels for the protection of ecosystems should be applied to all nature conservation sites regardless of their location.

2.4. The Clean Air Plan for Wales

- 2.4.1 The Welsh Government has published a Clean Air Plan for Wales (Welsh Government, 2020). The plan sets out the commitments, long-term ambitions and steps that the Welsh Government will take to improve air quality.

Table 1: The Objectives for NO_x, NO₂, PM₁₀ and PM_{2.5}

Pollutant	Concentration Measured As	Objective
Human Health		
NO₂	1-hour Mean	200 µg/m ³ not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m ³
PM₁₀	24-hour Mean	50 µg/m ³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m ³
PM_{2.5}	Annual Mean	25 µg/m ³
Protection of Vegetation and Ecosystems		
NO_x	Annual Mean	30 µg/m ³

2.5. Planning Policy

National Policies

- 2.5.1 Land-use planning policy in Wales is established within the policy document Planning Policy Wales Edition 11 (PPW), which provides the strategic policy framework for the effective preparation of local planning authority development plans (Welsh Government, 2021).
- 2.5.2 The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales.
- 2.5.3 PPW states that:

“The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.

In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and

the effects which existing air or soundscape quality may have on proposed developments. Air Quality and soundscape influence choice of location and distribution of development and it will be important to consider the relationship of proposed development to existing development and its surrounding area and its potential to exacerbate or create poor air quality or inappropriate soundscapes. The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable.”

2.5.4 PPW sets out what must be done:

“In proposing new development, planning authorities and developers must, therefore:

- address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
- not create areas of poor air quality or inappropriate soundscape; and*
- seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.”*

2.5.5 The PPW states:

“To assist decision making it will be important that the most appropriate level of information is provided and it may be necessary for a technical air quality and noise assessment to be undertaken by a suitably qualified and competent person on behalf of the developer.”

2.5.6 PPW goes on to discuss design and mitigation:

“Good design, for example setting back buildings from roads to avoid canyon effects and using best practice in terms of acoustic design to ensure the appropriate and intended acoustic environment of completed developments should be incorporated at an early consideration in the design and planning process. Other mitigation measures must be capable of being effectively implemented for their intended purpose, and could include those related to:

- traffic management and road safety;*
- ensuring progress towards a shift to low or zero emissions means of road transport, such as electrical charging points;*
- supporting low or zero emissions public transport;*
- providing active travel infrastructure; and*
- incorporating green infrastructure, where it can improve air quality by removing air pollution and aiding its dispersal, reduce real or perceived noise levels by absorbing and scattering noise and introducing natural sounds to soften man-made noise, provide areas of relative tranquillity, and reduce exposure by putting a buffer between sources of pollution and receptors.”*

2.5.7 PPW also states:

“Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur. In circumstances where impacts are unacceptable, for example where adequate mitigation is unlikely to be sufficient to safeguard local amenity in terms of air quality and the acoustic environment it will be appropriate to refuse permission.”

2.5.8 With regards potentially polluting development, including energy, PPW states:

Relevant considerations in making planning decisions for potentially polluting development are likely to include: ...

- *impact on health and amenity;*
- *effect of pollution on the natural and built environment and the enjoyment of areas of landscape and historic and cultural value; ...*
- *effect on biodiversity and ecosystem resilience, including where there may be cumulative impacts on air or water quality which may have adverse consequences for biodiversity and ecosystem resilience;*
- *the risk and impact of potential pollution from the development, insofar as this might lead to the creation of, or worsen the situation in, an air quality management area, a noise action planning priority area or an area where there are sensitive receptors; ...”*

2.5.9 PPW goes on to state:

“The location of potentially polluting development adjacent to sensitive receptors will be unacceptable where health and amenity impacts cannot be minimised through appropriate design and mitigation measures.”

And that:

“Early consideration is required to ascertain whether the location and design of proposed development is acceptable where air pollution or noise generating development is likely to affect a protected species, or is proposed in an area likely to affect a statutorily designated site (such as Natura 2000 sites or SSSIs) ...”

Local Policies

2.5.10 The Merthyr Tydfil County Borough Council Replacement Local Development Plan (2016 – 2023) Written Statement includes Policy EnW4: Environmental Protection, the relevant parts of which state (Merthyr Tydfil County Borough Council, 2020a):

“Development proposals will be required to demonstrate they will not result in an unacceptable impact on people, residential amenity, property and / or the natural environment from either:

- *Pollution of land, surface water, ground water and the air; ...*
- *Noise, vibration, dust, odour nuisance and light pollution; or*
- *Any other identified risk to public health and safety.*

Where impacts are identified the Council will require applicants to demonstrate that appropriate measures have been incorporated to reduce, or minimise the impact identified to the lowest possible acceptable level.

Planning conditions may be imposed or legal obligation entered into, to secure any necessary mitigation and monitoring processes. ...”

3 Methodology

3.1. Existing Conditions

3.1.1 Information on existing air quality within the study area has been collated from the following sources:

- The results of monitoring and the LAQM review and assessment reports undertaken by Merthyr Tydfil County Borough Council (Merthyr Tydfil County Borough Council, 2021); and
- Background pollutant concentration maps published by Defra (Defra, 2022).

3.2. Road Traffic Impacts

3.2.1 Guidance for air quality and planning officers within local authorities, and developers and consultants involved in air quality assessments, has been published by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) in Land-Use Planning & Development Control: Planning for Air Quality (EPUK and IAQM, 2017). The guidance sets out criteria to help establish when an air quality assessment is likely to be considered necessary.

3.2.2 There would be no relevant exposure to the air quality objectives at the proposed development; therefore, the impact of existing air quality on the proposed development is not considered.

3.2.3 For impacts of development on the local area, a two-stage approach is suggested, with the first stage intended to screen out small developments, and developments considered likely to have insignificant air quality effects. The full criteria are shown in **Appendix A1**. The EPUK/IAQM guidance is clear that:

“If none of the criteria are met, then there should be no requirement to carry out an air quality assessment for the impact of the development on the local area, and the impacts can be considered as having an insignificant effect.”

3.2.4 A qualitative assessment of the air quality impacts associated with the development has been undertaken based on the scale of the development, the distance of the development from emissions sources and the existing air quality. The criteria in the EPUK/IAQM guidance and professional judgement have been used to screen the requirement for a full air quality assessment, with the professional experience of the consultant preparing this report set out in **Appendix A2**.

3.3. CHP Plant Impacts

3.3.1 Natural Resources Wales have not produced any guidance on the assessment of air quality impacts; however, Environment Agency guidance on assessing the impact of releases to air is available online at Air Emissions Risk Assessment for your Environmental Permit (Environment Agency and Defra, 2016). The guidance sets out the distances within which sensitive habitats need to be considered. The guidance indicates that impacts from combustion plant would need to be assessed at SSSIs and locally designated sites (ancient woods, local wildlife sites and national and local nature reserves) within 2km of the site, and at European (SPAs, SACs and Ramsar sites) within 10km of a site.

- 3.3.2 The impacts of emissions from the proposed CHP plant have been modelled using the ADMS 5 (v5.2.4.0) dispersion model (CERC, 2022). ADMS 5 is an extensively validated new generation Gaussian plume air dispersion model, and is used by regulators, government departments, consultancies and industry. The model is able to simulate the entrainment of the plume in the wake of the building.
- 3.3.3 The model has been used to predict the process contribution (PC) due to the operation of the CHP plant to the following:
- Annual mean NO_x concentrations; and
 - the 99.79th percentiles of 1-hour mean NO_x concentrations (equivalent to the 18th highest 1-hour mean NO_x concentration in the year).

Sensitive Locations

- 3.3.4 In order to assess the potential health impacts, concentrations have been predicted across a 2km x 2km Cartesian grid centred on the CHP exhaust flue at a height of 1.5m, with a 20m resolution. Concentration isopleths have then been plotted in order to determine the level of impact at local health receptors.
- 3.3.5 Receptors have been identified at the sensitive habitat areas closest to the CHP plant. The receptors are described in **Table 2** and are shown in **Figure 1**.

Table 2: Description of Sensitive Habitat Receptors

Receptor	Location	x	y	z
AW1	Area of Ancient Woodland	306416.0	205804.3	0
AW2	Area of Ancient Woodland	304519.1	207193.9	0
AW3	Area of Ancient Woodland	304562.2	207677.9	0
SAC	Cwm Cadlan	297290.5	210082.2	0

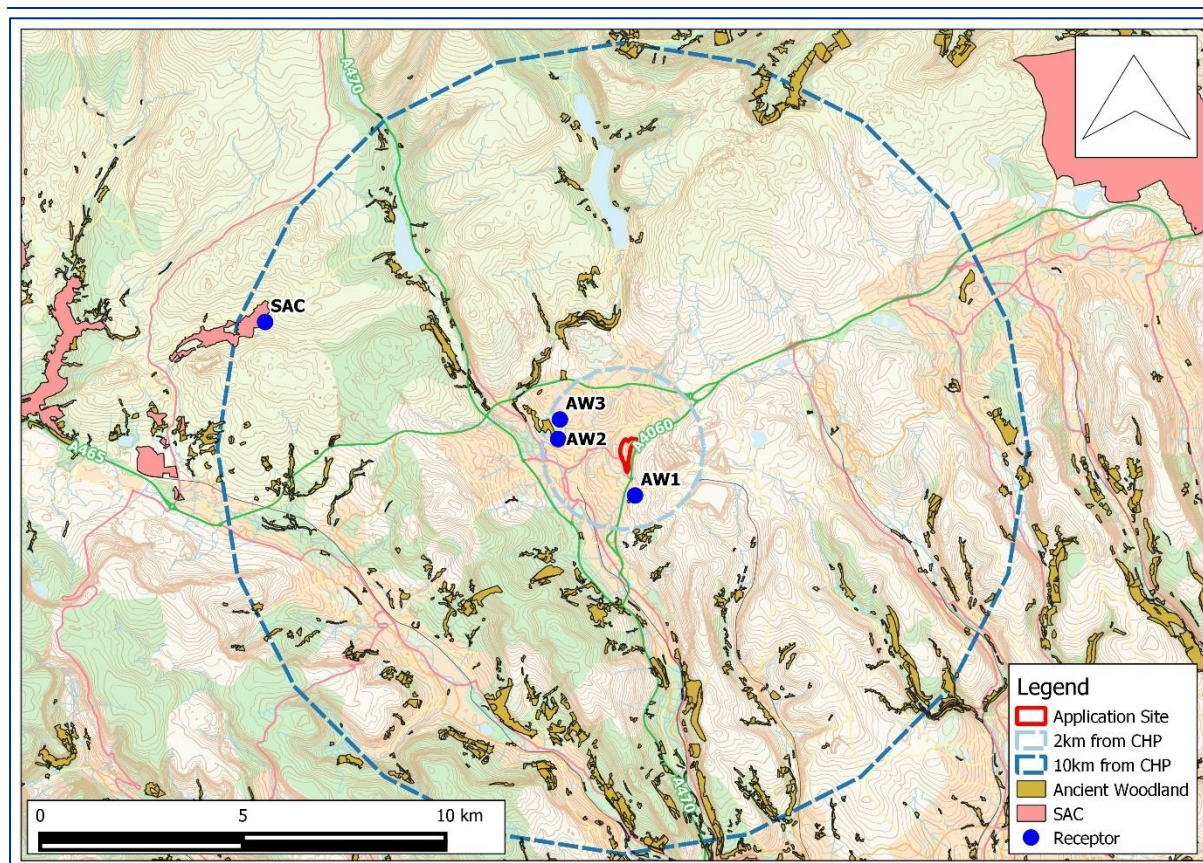


Figure 1: Location of Sensitive Habitat Receptors

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Model Input Parameters

3.3.6 The exhaust parameters used in the model have been taken from specifications for the Jenbacher J616 GS-J-12 CHP plant. The generator exhaust parameters input to the model are shown in **Table 3**. The CHP plant exhaust location is shown in **Figure 2**.

Table 3: Exhaust Parameters used in ADMS 5

Exhaust Parameters	Value
Efflux volume flow rate (Nm ³ /s) ^a	1.888
Exhaust gas temperature (°C)	120
Exhaust internal diameter (m)	0.6
Exhaust height above ground (m)	11
NOx emissions (g/s) ^a	0.472

^a Normalised to 0 °C, 101.325 kPa, dry, 5% O₂

3.3.7 In order to provide a conservative assessment, it has been assumed that the CHP plant would operate at full load, 24hrs a day, 365 days a year.

Buildings

- 3.3.8 The CHP plant would be housed in a container located between two buildings at the proposed development. To simulate the entrainment of the exhaust plumes that may occur in the wake of the buildings (the building downwash effect), both buildings have been included in the model, with the heights shown in **Figure 2**.

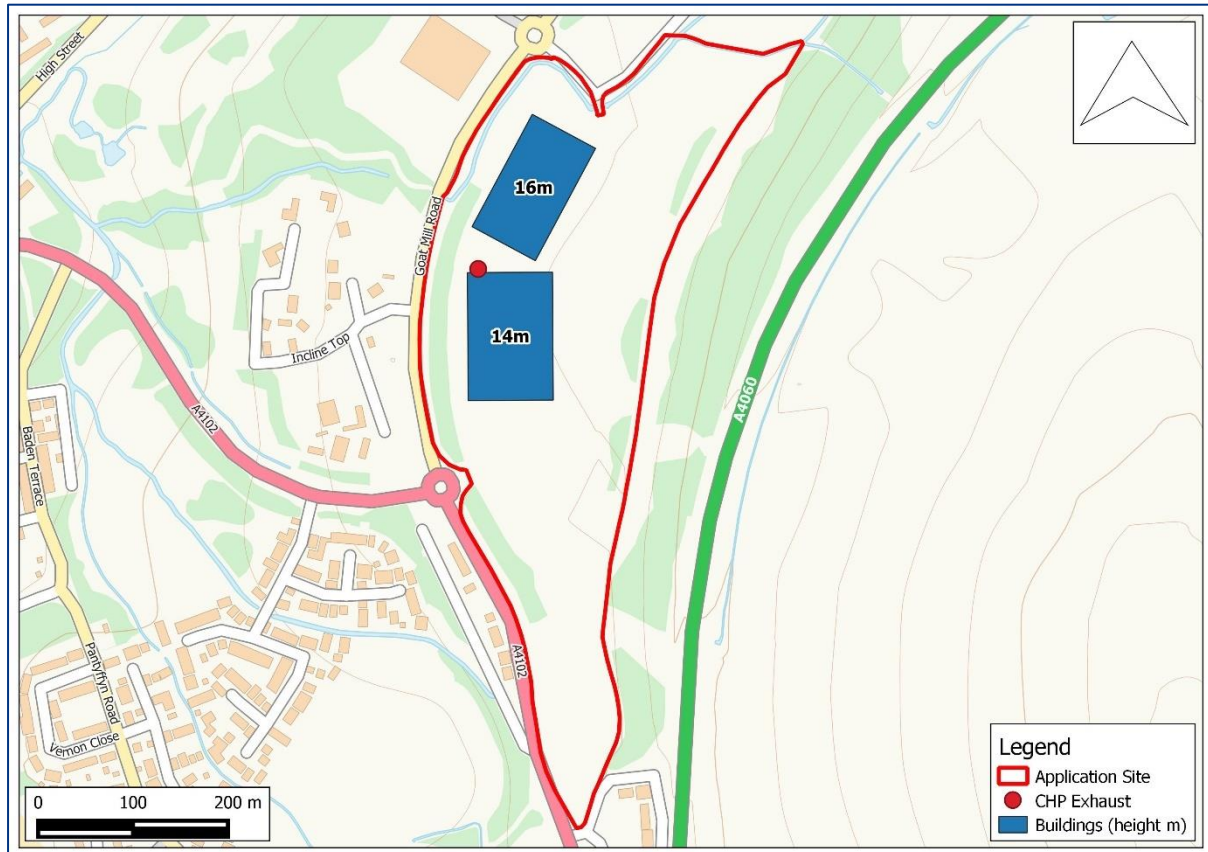


Figure 2: Location of the Modelled Buildings and the CHP Exhaust

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Meteorological Data

- 3.3.9 The model has been run using 5 years of hourly sequential meteorological data in 10° sectors from the Sennybridge meteorological station. The station is located approximately 40km to the north-northwest of the application site at a similar elevation and is considered suitable for the area.
- 3.3.10 The model has been run for each meteorological year (2015, 2016, 2017, 2018 and 2019) and the predicted concentrations at each grid point from the worst-case year used for the assessment. A wind rose for each meteorological year is shown in **Figure 3**. Other model inputs relating to meteorology are shown in **Table 4**. The ADMS 5 default values have been used for surface albedo and the Priestly-Taylor parameter.

Table 4: Model Meteorological Input Parameters used in ADMS 5 ^a

Parameter		Value
Monin-Obukhov Length (m)	Dispersion Site	30
	Met Measurement Site	10
Surface Roughness (m)	Dispersion Site	0.5
	Met Measurement Site	0.03

Terrain

3.3.11 Ordnance Survey Terrain 50 data has been included in the model to account for local topography (Ordnance Survey, 2022).

Post-processing

3.3.12 The approach recommended by the Environment Agency has been used to adjust the model output of NO_x to nitrogen dioxide as follows (Environment Agency, 2005):

- annual mean nitrogen dioxide concentration = annual mean nitrogen oxides x 0.7; and
- 99.79th percentile of 1-hour mean nitrogen dioxide concentrations = 99.79th percentile of 1-hour mean nitrogen oxides x 0.35.

3.3.13 Deposition has been calculated from the predicted ambient concentrations using the NO₂ deposition velocity for forests (0.003 m/s) and for grassland (0.0015 m/s) published by the Environment Agency (Environment Agency, 2011).

3.3.14 The deposition velocity multiplied by the predicted concentration (µg/m³) gives the deposition flux (µg/m²/s). A factor of 96 was then used to calculate the nutrient nitrogen deposition due to NO₂ in units of kg/ha/yr (Environment Agency, 2011).

3.3.15 The acid nitrogen deposition has been calculated from the nutrient nitrogen deposition using a factor of 0.071428 (Environment Agency, 2011).

3.3.16 Wet deposition has not been assessed as it is not considered to be significant within the distances covered by the study area (Environment Agency, 2011).

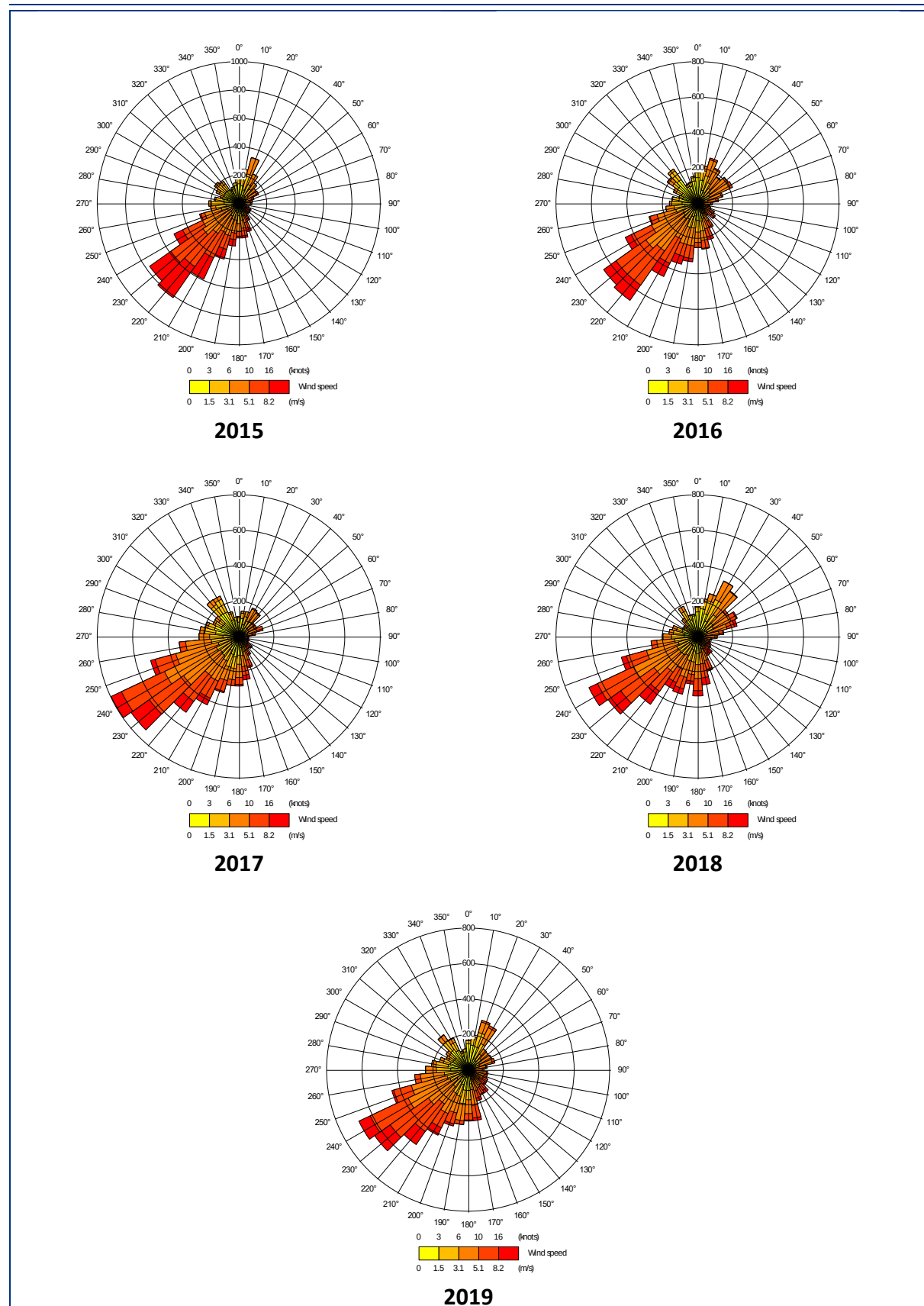


Figure 3: Wind Rose for each Meteorological Year

3.4. Assessment Criteria and Significance

Screening the Impacts

- 3.4.1 The Environment Agency's online guidance explains that regardless of the baseline environmental conditions, a process can be considered as insignificant if:
- the long-term (annual mean) process contribution is <1% of the long-term environmental standard; and
 - the short-term (24-hour mean or less) process contribution is <10% of the short-term environmental standard.
- 3.4.2 Guidance on Land-Use Planning & Development Control: Planning for Air Quality published by Environmental Protection UK (EPUK) and the IAQM adopts the Environment Agency's short-term screening criterion; however, for long-term concentrations, only changes of less than 0.5% of the annual mean objectives would be considered as negligible regardless of baseline conditions (EPUK and IAQM, 2017). For the purposes of this assessment, where concentrations at off-site receptors are predicted to increase by less than 0.5% of the annual mean objective, or 10% of the 1-hour mean NO₂ objective, the potential for significant impacts has been discounted and no further assessment undertaken.
- 3.4.3 It should be recognised that these criteria determine when an impact can be screened out as insignificant. They do not imply that impacts will necessarily be significant above these criteria, merely that there is a potential for significant impacts to occur that should be considered using a detailed assessment methodology, such as a detailed dispersion modelling study (as has been carried out for this assessment in any event) and taking into account background concentrations.

Health Criteria and Significance

- 3.4.4 There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. The approach suggested by Environmental Protection UK (EPUK) and the IAQM in guidance on Land-Use Planning & Development Control: Planning for Air Quality (EPUK and IAQM, 2017) has been used for this assessment. The air quality impacts have been described at each receptor by determining the percentage change in concentrations relative to an air quality assessment level (AQAL) and comparing this with the total long-term average concentration, as set out in **Table 5**. The AQAL for NO₂ is based on the annual mean objective (as shown in **Table 1**).
- 3.4.5 With regard to impacts on short-term concentrations, the approach outlined in the EPUK/IAQM guidance has been used, where a short-term process contribution of 10-20% of the relevant standard is considered to be of small magnitude, 20-50% of medium magnitude and above 50% of large magnitude, with the severity of the impact described as slight, moderate or substantial respectively.

Table 5: Impact Descriptors for Individual Receptors

Long-term Average Concentration at Receptor in Assessment Year ^b	% Change in Concentration Relative to AQAL ^a			
	1	2-5	6-10	>10
≤ 75% 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% of AQAL	Moderate	Substantial	Substantial	Substantial

a The % change rounded to a whole number. Changes of 0%, i.e., less than 0.5%, are described as negligible. The AQAL for NO₂ is 40 µg/m³.

b The without scheme concentration where there is a decrease in predicted concentrations, and the with scheme concentration where there is an increase in predicted concentrations.

3.4.6 The air quality impact, i.e., the change in concentrations as a result of the proposed development, may have an effect on human health, dependent on the severity of the impact and other factors.

3.4.7 The IAQM guidance advises that the overall effect of the air quality impacts should be judged as either significant or not significant taking account of:

- The descriptions of the predicted impacts;
- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts;
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- The potential for cumulative impacts, i.e., several slight impacts taken together could have a significant effect, or a moderate or substantial effect confined to a small area and not obviously a cause of harm to human health could be described as not significant; and
- The consequences of the impacts, i.e., will the impacts have an effect on human health that can be considered significant? The impacts from an individual development would usually not be large enough to result in a measurable change in health outcomes regarded as significant by healthcare professionals, and therefore the impact on local air quality is used as a proxy for assessing effects on health.

3.4.8 The judgement of significance should be made by a competent, suitably qualified professional, and the professional experience of the consultant preparing the report is set out in **Appendix A2**.

3.4.9 The IAQM 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.”

Sensitive Habitats Criteria

- 3.4.10 Critical loads for nitrogen deposition onto sensitive ecosystems have been specified by the United Nations Economic Commission for Europe (UNECE). They are defined as a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur, according to present knowledge. The critical load relates to the quantity of pollutant deposited from air to ground, whereas the critical level is the gaseous concentration of a pollutant in the air. It must be emphasised that exceedance of the critical load does not provide a quantitative estimate of damage to an ecosystem, but only the *potential* for damage to occur.
- 3.4.11 The Environment Agency online guidance sets out the annual mean NO_x critical level the protection of vegetation and ecosystems, as shown in **Table 6**, which is the same as the site specific critical loads obtained from the APIS database. The critical level for annual mean NO_x is derived from the objective. There is also a critical level for 24-hour mean NO_x; however, IAQM guidance recommends that only the annual mean NO_x concentration is used in assessments (IAQM, 2020).
- 3.4.12 The site specific critical load for the most sensitive qualifying feature within the Cwm Cadlan SAC is shown in **Table 7**. The minimum critical load has been used as the assessment criteria to provide a conservative assessment.
- 3.4.13 The APIS database does not provide site specific data for ancient woodlands; therefore, location specific data was obtained from the APIS database assuming the broad habitat shown in **Table 7** to provide a conservative assessment.
- 3.4.14 When considering the impacts at European designated sites, the impacts are considered insignificant if the following criteria are met:
- the long-term (annual mean) process contribution is <1% of the long-term critical level/load; and
 - the 24-hour mean NO_x process contribution is <10% of the 24-hour mean critical level.
- 3.4.15 When considering the impacts at sensitive habitats within locally designated sites, the Environment Agency considers that there will be no significant pollution if the process contribution is less than 100% of the appropriate environmental criterion (Environment Agency and Defra, 2016). However, IAQM guidance considers that the same criteria as used for European designated sites should be used, with a difference in the determination of the significance of any predicted effect (IAQM, 2020).
- 3.4.16 Where predicted concentrations are above the screening criteria, the overall effect of any air quality impacts on sensitive habitats should be judged as either significant or not significant following evaluation by a qualified ecologist with full consideration of the habitat's circumstances.

Table 6: Critical Levels

Pollutant	Averaging Period	Concentration ($\mu\text{g}/\text{m}^3$) ^a
Nitrogen oxides	Annual	30
	24 hours	75

Table 7: Critical Loads

Receptor	Most Sensitive Qualifying Feature/Broad Habitat	Critical Load	
		Nutrient N Deposition ($\text{kg}/\text{ha}/\text{yr}$)	Acid Deposition (Nmax) ($\text{keq}/\text{ha}/\text{yr}$) ^a
Ancient Woodland	Coniferous Woodland with lichens	5	3.867
Cwm Cadlan SAC	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (H6410)	15	1.161

^a MinCLMaxN

4 Baseline Conditions

4.1. LAQM Review and Assessment

- 4.1.1 Merthyr Tydfil County Borough Council has declared an AQMA for exceedances of the annual mean NO₂ objective on Twynyrodyn Road, approximately 900m to the southwest of the application site. The AQMA is shown in **Figure 4**. No traffic generated by the proposed development would travel along Twynyrodyn Road and the AQMA would not be affected.

4.2. Local Air Quality Monitoring

- 4.2.1 Merthyr Tydfil County Borough Council operates two automatic monitoring sites, one measuring NO₂, the other PM, and a number of diffusion tube monitoring sites. The EEC automatic monitor is an AQMesh Pod and was moved to its current location in 2019. Data from the automatic monitoring sites and diffusion tube monitoring sites located within 1km of the application site are shown in **Table 8**, **Table 9**, **Table 10** and **Table 11**. The monitoring locations shown in **Figure 4**.
- 4.2.2 The annual mean NO₂ objective has been achieved at all of monitoring sites within 1km of the application site. Annual mean nitrogen dioxide concentrations within 1km of the application site ranged from 8.4 to 30.7µg/m³ between 2016 and 2020, with no exceedances of the objective.
- 4.2.3 Measurements across the UK have shown that there is a risk of exceedances of the 1-hour mean NO₂ objective where the annual mean concentration is above 60 µg/m³ (Defra, 2021). Annual mean NO₂ concentrations measured at the diffusion tube monitoring sites within 1km of the application site have remained below 60 µg/m³ and results from the ECC automatic monitor show that there have been no exceedances of the 1-hour objective at that location (**Table 9**).
- 4.2.4 No exceedances of the PM₁₀ or PM_{2.5} objectives have been measured at the APM1 automatic monitoring site (**Table 10** and **Table 11**).
- 4.2.5 Measured concentrations in 2020 would have been affected by travel restrictions due to the Covid-19 pandemic, resulting in lower levels of traffic and lower pollutant concentrations, and would not be representative of usual conditions.

Table 8: Measured Annual Mean NO₂ Concentrations ^a

Site ID	Location	Site Type ^b	Annual Mean (µg/m3) a				
			2016	2017	2018	2019	2020
Automatic Monitor							
ECC	Pontmorlais	K	-	-	-	20.8	17.7
Diffusion Tube							
3	Twynyrodyn School	SU	13.0	11.4	10.7	11.1	8.4
10	Penydarren Road	R	-	-	-	30.7	26.1
12	Dowlais Upper	R	26.4	23.4	23.3	22.0	17.6
28	Darren View	SU	-	-	-	16.2	12.2
Objective			40				

^a Exceedances are shown in bold.

^b K = kerbside, SU = suburban, R = roadside.

Table 9: Exceedance Statistics for the 1-hour Mean NO₂ Objective

Site ID	Location	Site Type ^a	Number of Hours > 200 µg/m ³				
			2016	2017	2018	2019	2020
ECC	Pontmorlais	K	-	-	-	0	0
Objective			18				

^a K = kerbside.

Table 10: Summary of PM₁₀ Monitoring Data

Site ID	Location	Site Type ^a	2016	2017	2018	2019	2020
Annual Mean (µg/m ³)							
APM1	Twynyrodyn School	SU	8.4	11.3	8.7	8.8	9.4
Objective			40				
Number of Days > 50 µg/m ³							
APM1	Twynyrodyn School	SU	0	0	0	0	0
Objective			35				

^a SU = suburban.

Table 11: Summary of PM_{2.5} Monitoring Data

Site ID	Location	Site Type ^a	2016	2017	2018	2019	2020
Annual Mean (µg/m³)							
APM1	Twynyrodyn School	SU	3.8	4.5	4.5	4.4	3.8
Objective			25				

^a SU = suburban.

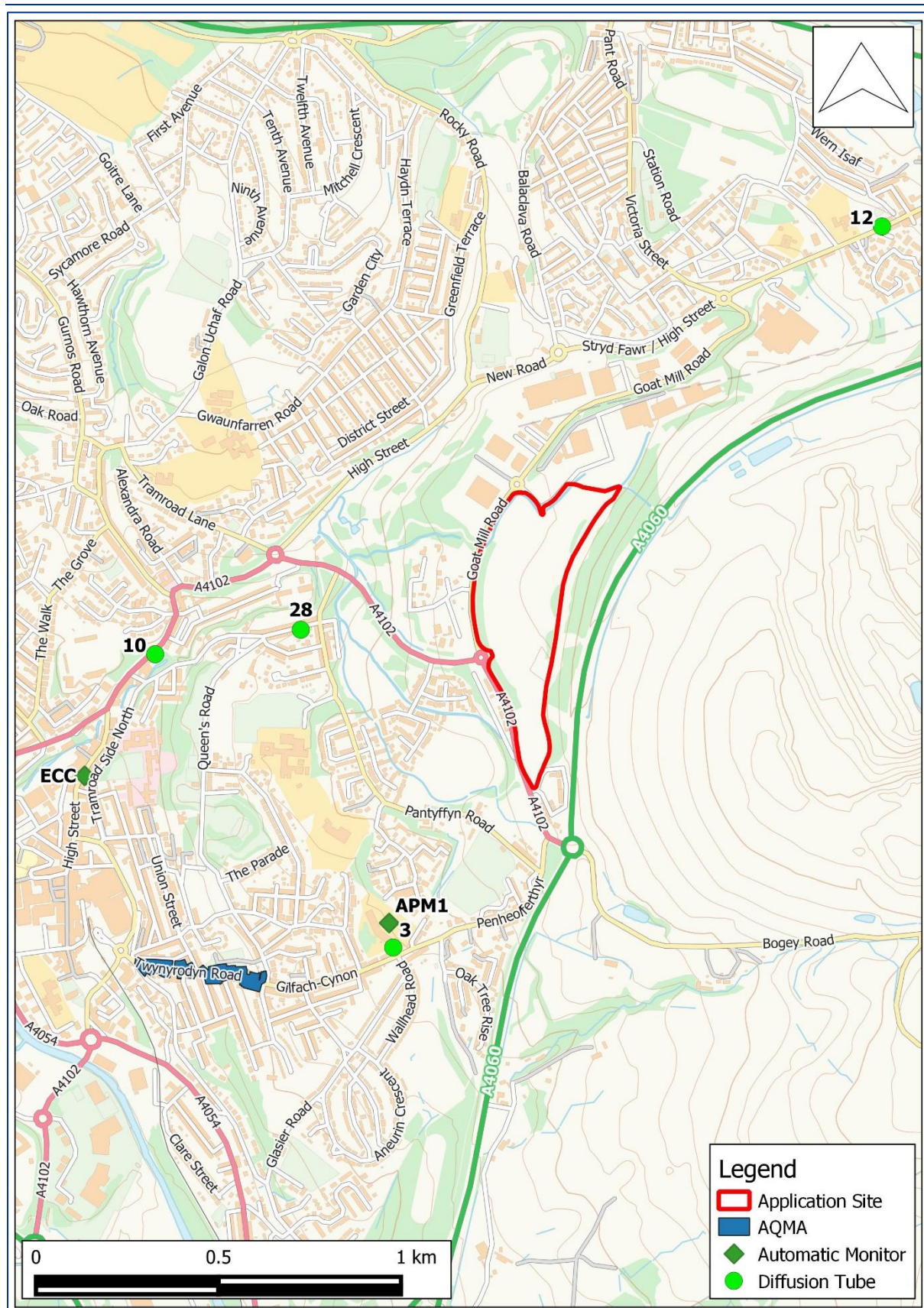


Figure 4: Air Quality Monitoring Sites and AQMA

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4.3. Background Concentrations

4.3.1 Estimated background concentrations at the application site, obtained from the national maps published by Defra, are shown in **Table 12**. The background concentrations are well below the objectives.

Table 12: Estimated Annual Mean Background Concentrations in 2022 ($\mu\text{g}/\text{m}^3$)

Grid Square	NO ₂	PM ₁₀	PM _{2.5}
306500,206500	6.5	11.1	7.1
Objective	40	40	25

5 Road Traffic Emissions Screening Assessment

- 5.1.1 Trip data for the proposed development, and the distribution across the local road network, have been provided by Sanderson Associates (Consulting Engineers) Limited, the Transport Consultants for the scheme, as shown in **Table 13**.
- 5.1.2 The data shows that none of the traffic generated by the proposed development will affect the AQMA; therefore, the IAQM screening criteria for areas outside AQMA's have been used. The proposed development would generate a maximum net increase of 227 light vehicle movements and 47 heavy vehicle movements on local roads.
- 5.1.3 The increase in traffic is well below the screening criteria for areas outside an AQMA, as set out in **Appendix A1**; therefore, detailed assessment of the air quality impacts of the development on the surrounding area should not be required as the impacts would be insignificant.

Table 13: Trips Generated by the Proposed Development ($\mu\text{g}/\text{m}^3$)

Road	Increase in Traffic Due to Proposed Development		
	Light	Heavy	Total
High Street N of Goat Mill Road	77	0	77
Victoria Street	88	0	88
Goat Mill Road N of Site Access	164	0	164
Site Access	219	47	266
Goat Mill Road S of Site Access	227	47	274
Site Egress	241	47	288
A4102 W of Site Egress	155	0	155
A4102 S of Site Egress	141	47	188
Penheolferthyr	40	0	40
A4102 S of Penheolferthyr	100	47	147
A4060 N	0	24	24
Bogey Rd	13	0	13
A4060 S	87	48	135
Screening Criteria (Outside AQMA)	500	100	-

6 CHP Plant Assessment

6.1. Human Health Impacts

Annual Mean NO₂ Concentrations

- 6.1.1 The process contributions to annual mean NO₂ concentrations due to the operation of the CHP plant are shown in the concentration isopleths in **Figure 5**.
- 6.1.2 There is relevant exposure with the 0.4µg/m³ concentration isopleth; therefore, the assessment considers background concentrations along with the process contributions due to the CHP plant.
- 6.1.3 There is no relevant exposure within the 2.4µg/m³ concentration isopleth, i.e., the maximum change in annual mean NO₂ concentrations due to the operation of the CHP relative to the AQAL where there is relevant exposure is 2-5%.
- 6.1.4 Receptors within the area affected by emissions from the CHP plant are all located more than 20m from the kerb of any major roads; therefore, the baseline annual mean NO₂ concentration within the area affected by emissions from the CHP plant would likely fall within the range measured at diffusion tube monitoring sites 3, 12 and 28, i.e., 8.4-26.4 µg/m³.
- 6.1.5 A baseline annual mean NO₂ concentration of 26.4 µg/m³ added to a maximum process contribution of 2.3µg/m³ would give a long-term average concentration at a worst case receptor of 72% of the AQAL. Therefore, with regard to **Table 5**, the impact on annual mean NO₂ concentrations due to the operation of the CHP plant would be described as negligible.

1-hour Mean NO₂ Concentrations

- 6.1.6 **Figure 6** shows the area across which slight, moderate and substantial impacts on 1-hour mean NO₂ concentrations are predicted. Slight impacts are associated with a process contribution to 99.79th percentiles of 1-hour mean NO₂ concentrations of between 20 and 40 µg/m³, moderate impacts between 40 and 100 µg/m³ and substantial impact greater than 100 µg/m³.
- 6.1.7 Moderate impacts are predicted at one receptor to the west of the proposed CHP plant. The short-term background NO₂ concentration has been estimated by assuming that it is twice the long-term background concentration, i.e., 2 x 26.4 µg/m³ = 52.8 µg/m³ (Environment Agency and Defra, 2016). Adding a process contribution of 100 µg/m³ would give a worst-case total 1-hour mean NO₂ concentration of 152.8 µg/m³, which is below the objective.

6.2. Sensitive Habitats Impacts

- 6.2.1 The maximum predicted process contributions to ambient NO_x concentrations and nutrient and acid nitrogen deposition, and the process contributions as a percentage of the AQALs at the sensitive habitats are shown in **Table 14**. Predicted process contributions are below the screening criteria at all receptors and the impacts on sensitive habitats have been screened out as insignificant.

Table 14: Process Contributions to NOx Critical Levels and Nutrient and Acid Nitrogen Critical Loads and as % of AQAL

Receptor	Process Contribution			AQAL			Process Contribution as % of AQAL		
	Ann. Mean NOx $\mu\text{g}/\text{m}^3$	Nut. N kg/ha/yr	Acid N keq/ha/yr	Ann. Mean NOx $\mu\text{g}/\text{m}^3$	Nut. N kg/ha/yr	Acid N keq/ha/yr	Ann. Mean NOx	Nut. N	Acid N
AW1	0.08	0.02	0.00	30	5	3.867	0.3	0.3	0.0
AW2	0.05	0.01	0.00	30	5	3.867	0.2	0.2	0.0
AW3	0.03	0.01	0.00	30	5	3.867	0.1	0.1	0.0
SAC	0.00	0.00	0.00	30	15	1.161	0.0	0.0	0.0

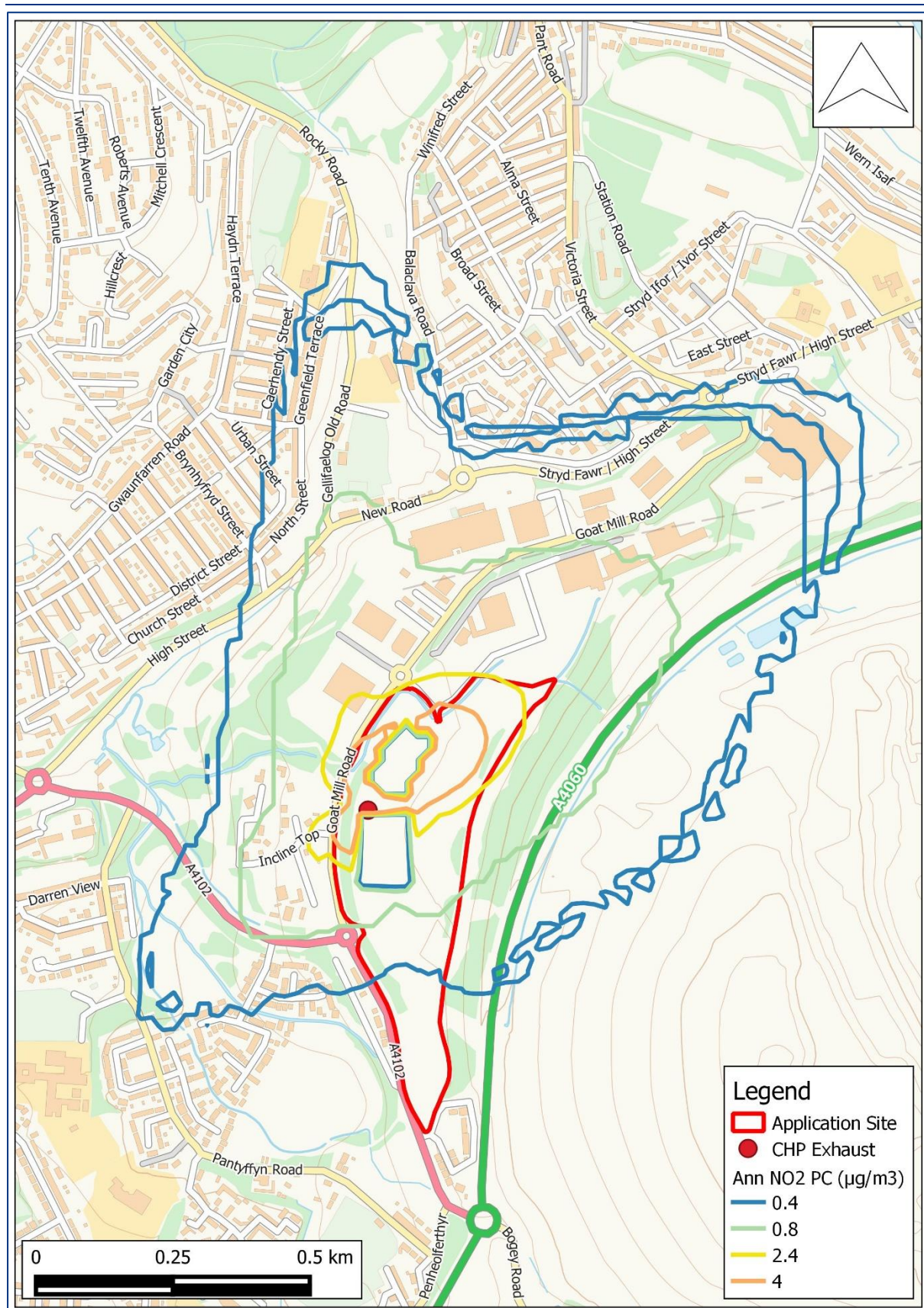


Figure 5: Annual Mean NO₂ Process Contributions

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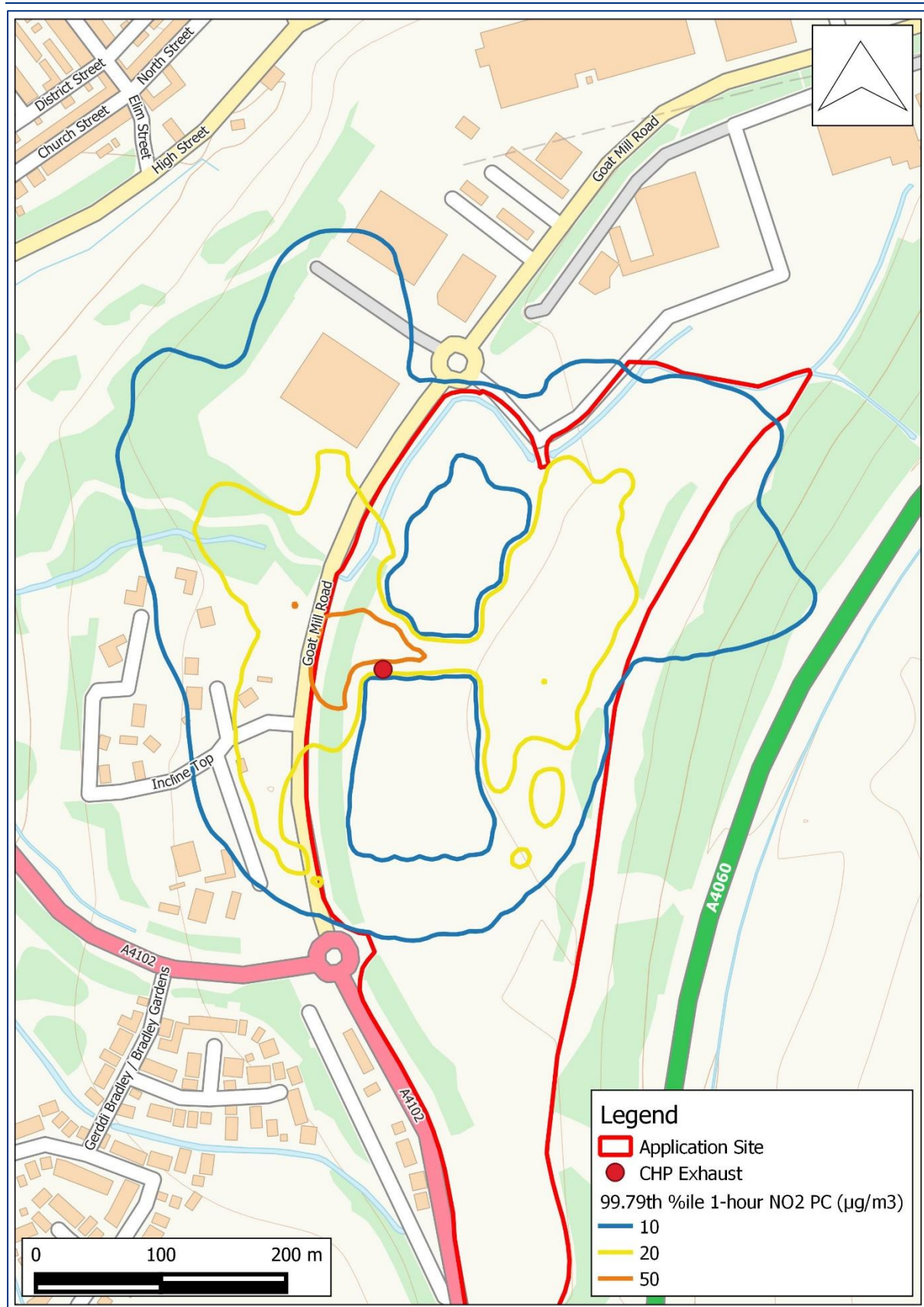


Figure 6: 99.79th Percentiles of 1-hour Mean NO₂ Process Contributions
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7 Mitigation

7.1. Road Traffic Emissions

- 7.1.1 The screening assessment has shown that the air quality impacts will be insignificant. Mitigation measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation. Therefore, it is not considered appropriate to propose further mitigation measures for this scheme.

7.2. CHP Plant

- 7.2.1 The assessment has shown that the proposed CHP plant would have a negligible impact on annual mean NO₂ concentrations. The proposed CHP plant would have a moderate impact on 1-hour mean NO₂ concentrations at one receptor; however, the 1-hour mean objective would be achieved. Therefore, it is considered that the proposed CHP plant would have an insignificant effect on health receptors. The impact on sensitive habitats due to the operation of the CHP plant would be insignificant.
- 7.2.2 Given that the proposed CHP plant would have an insignificant effect on local air quality, it is not considered appropriate to recommend any further mitigation.

8 Residual Impacts

8.1.1 The residual impacts will be the same as those identified in **Section 5**.

9 Conclusions

- 9.1.1 The air quality impacts associated with the operation of the proposed development of a plastics recycling facility in Merthyr Tydfil have been assessed.
- 9.1.2 The development will not increase traffic above the level of the IAQM/EPUK screening criteria; therefore, detailed air quality assessment should not be necessary, and the development will have an insignificant effect on local air quality.
- 9.1.3 Emissions due to the operation of a proposed CHP plant would have an insignificant effect on health and sensitive habitat receptors.
- 9.1.4 There should be no constraints to the operation of the proposed development, with regard to air quality, as the proposed development is consistent with the relevant parts of:
 - PPW Edition 11; and
 - Policy EnW4 of the Written Statement of the Merthyr Tydfil County Borough Council Local Development Plan.

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11 Glossary

AQAL	Air quality assessment level
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
Defra	Department for Environment, Food and Rural Affairs
DMP	Dust Management Plan
EPUK	Environmental Protection UK
Exceedence	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
µg/m³	Microgrammes per cubic metre
NO	Nitric oxide
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be NO ₂ + NO)
NPPF	National Planning Policy Framework
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PM₁₀	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
PM_{2.5}	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
SPG	Supplementary Planning Guidance
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

12 Appendices

A1	Criteria Used to Establish when an Air Quality Assessment is Likely to be Necessary	35
A2	Professional Experience.....	37

A1 Criteria Used to Establish when an Air Quality Assessment is Likely to be Necessary

A1.1.1 Stage 1 (criteria to proceed to Stage 2).

A. If any of the following apply:

- 10 or more residential units or a site area of more than 0.5ha;
- more than 1,000 m² of floor space for all other uses or a site area greater than 1ha

B. Coupled with any of the following:

- the development has more than 10 parking spaces
- the development will have a centralised energy facility or other centralised combustion process

Note: Consideration should still be given to the potential impacts of neighbouring sources on the site, even if an assessment of impacts of the development on the surrounding area is screened out.

A1.1.2 The Stage 2 criteria are shown in **Table A1**.

Table A1: Indicative Criteria for Requiring an Air Quality Assessment

The development will:	Indicative Criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight)	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA; - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight)	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA; - more than 100 AADT elsewhere.
3. Realign roads, i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA.
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA; - more than 100 AADT elsewhere.

The development will:	Indicative Criteria to Proceed to an Air Quality Assessment
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor; coupled with the car park having more than 100 movements per day (total in and out).
7. Have one or more substantial combustion processes	Where the combustion unit is: - any centralised plant using bio fuel; - any combustion plant with single or combined thermal input >300kW; - a standby emergency generator associated with a centralised energy centre (if likely to be tested/used >18 hours a year).
8. Have a combustion process of any size	Where the pollutants are exhausted from a vent or stack in a location and at a height that may give rise to impacts at receptors through insufficient dispersion. This criterion is intended to address those situations where a new development may be close to other buildings that could be residential and/or which could adversely affect the plume's dispersion by way of their size and/or height.

A2 Professional Experience

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Bob Thomas is a Director at AQA, with over fourteen years' experience in the field of air quality management and assessment. He has carried out air quality assessments for a wide range of developments, including residential, commercial, industrial, minerals and waste developments. He has been responsible for air quality projects that include ambient air quality monitoring of nitrogen dioxide, dust and PM₁₀, the assessment of nuisance odours and dust, and the preparation of Review and Assessment reports for local authorities. He has extensive dispersion modelling experience for road traffic, energy centre and industrial sources, and has completed many stand-alone reports and chapters for inclusion within an Environmental Statement. Bob has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers, architects and process operators, and has provided expert witness services at public inquiry. He is a Chartered Scientist, a Member of the Institute of Air Quality Management and a Member of the Institution of Environmental Sciences.

A full CV for Bob Thomas is available at <http://aqassessments.co.uk/about>