Hawkins environmental

Air Quality Assessment:

ABP New Manufacturing Plant, Newport

Stroma Built Environment Limited

22nd January 2020

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This report has been prepared by Hawkins Environmental Limited for the sole purpose of assisting in gaining planning consent for the proposed development described in the introduction of this report.

This report has been prepared by Hawkins Environmental Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This assessment takes into account the prevailing conditions at the time of the report and assesses the impact of the development (if applicable) using data provided to Hawkins Environmental Limited by third parties. The report is designed to assist the developer in refining the designs for the proposed development and to demonstrate to agents of the Local Planning Authority that the proposed development is suited to its location. This should be viewed as a risk assessment and does not infer any guarantee that the site will remain suitable in future, nor that there will not be any complaints either from users of the development or from impacts emanating from the development site itself.

This report is for the exclusive use by the client named in the report. Hawkins Environmental Limited does not accept any liability in negligence for any matters arising outside of the agreed scope of works.

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1. INTRODUCTION

1.1. Overview

Hawkins Environmental Limited has been instructed by Stroma Built Environment Limited to undertake an air quality assessment for the proposed development of the ABP New Manufacturing Plant, situated on Land adjacent to West Way Road at the Alexandra Docks in Newport, Wales.

During the planning process, it has been identified that the site may require an air quality assessment to determine whether the site is suitable for its intended use and to determine whether the proposed development would have an adverse impact on the surrounding environment. Consequently, this assessment has been completed in order to determine whether the proposed development achieves compliance with the National Air Quality Objectives, as well as national, regional and local planning policy.

This assessment has been undertaken in accordance with the Department of Environment, Food and Rural Affairs' (Defra) current *Technical Guidance on Local Air Quality Management (LAQM) (TG16)* and the Institute for Air Quality Management and Environmental Protection UK's *Land-Use Planning & Development Control: Planning for Air Quality* (January 2017).

The assessment addresses the effects of air pollutant emissions from traffic using the adjacent roads and emissions associated with the development of the site. In addition, a risk-based assessment of the likely impact of construction on the air quality of the local environment has been conducted in accordance with the Institute of Air Quality Management's 2014 edition of the *Guidance on the assessment of dust from demolition and construction.*

This report assesses the overall levels of nitrogen dioxide (NO_2) and particulates (PM_{10} and $PM_{2.5}$) in the vicinity of the site. A glossary of terms is detailed in **Appendix 1.**

1.2. Site Description

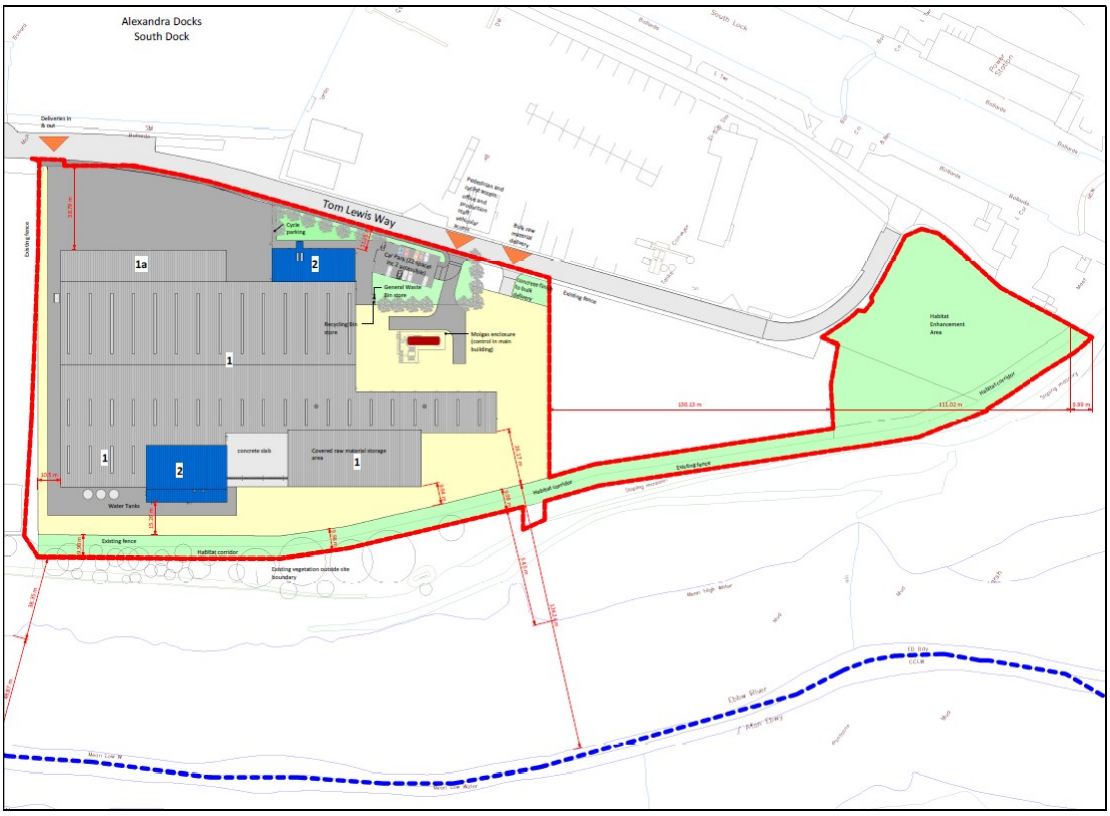
The proposed development site is located to the south west of South Dock, off Tom Lewis Way, at the Port of Newport. The site is bounded to the north by an industrial site, east by the access road, south and west by the River Usk and Ebbw and subsequent vegetation.

The proposed development consists of a 15140 m^2 GIA warehouse for the production of plasterboard on a 14940 m^2 footprint with a mezzanine floor. The main building will have a maximum height to eaves of approximately 18 m and a maximum ridge height of approximately 21 m. The predominant eaves height will be approximately 9.2 m and the predominant ridge height will be approximately 12.5 m. The building will be approximately 202 m long at its longest point and approximately 110 m wide at its widest point.. External storage areas and hardstanding for parking with also be provided in the form of 22 car parking spaces, four loading docks and 45 bicycle parking spaces.

A strip of vegetation approximately 10 m wide will be maintained at the western boundary and an area of approximately 6,000 m^2 will be maintained to incorporate the 'priority habitat open mosaic habitats on previously developed land' in the proposed development layout.

A plan of the proposed site and its location within Newport can be seen in **Figure 1.1**.

Figure 1.1: Site Location Plan



2. LEGISLATION, PLANNING POLICY & GUIDANCE

2.1. National Legislation

Part IV of the Environment Act (1995), requires the UK government to produce a national Air Quality Strategy which contains standards, objectives and measures for improving ambient air quality. The National Air Quality Strategy sets out National Air Quality Objectives (NAQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale.

The Clean Air for Europe (CA FE) programme revisited the management of Air Quality within the EU and replaced the EU Framework Directive 96/62/EC, its associated Daughter Directives 1999/30/EC, 2000/69/EC, 2002/3/EC, and the Council Decision 97/101/EC, with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC.

Directive 2008/50/EC is currently transcribed into UK legislation by the Air Quality Standards Regulations 2010, which came into force on 11th June 2010. These limit values are binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole. These limit values are the basis of the NAQOs.

The National Air Quality Objectives (NAQOs) and their Limit Values will form the basis of this air quality assessment of the proposed development. The NAQOs are based on an assessment of the effects of each pollutant on public health. Therefore, they are a good indicator in assessing whether, under normal circumstances, the air quality in the vicinity of a development is likely to be detrimental to human health. In determining whether air pollutant levels may constrain development, the results of studies are compared against the acceptability criteria. The Air Quality Standards are displayed in **Table 2.1**.

Table 2.1: Air Quality Standards

Pollutant	Average Period	NAQO Limit Value
Sulphur Dioxide	One Hour	350 µg/m^3 Not to be exceeded more than 24 times per calendar year
	One Day	150 µg/m^3 Not to be exceeded more than 3 times per calendar year
Nitrogen Dioxide	One Hour	200 µg/m^3 Not to be exceeded more than 18 times per calendar year
	Calendar Year	40 µg/m^3
Benzene	Calendar Year	5 µg/m^3
Lead	Calendar Year	0.5 µg/m^3

Pollutant	Average Period	NAQO Limit Value
PM_{10}	One Day	50 µg/m^3 Not to be exceeded more than 35 times per calendar year
	Calendar Year	40 µg/m^3
$PM_{2.5}$	Calendar Year	25 µg/m^3
Carbon Monoxide	Maximum daily running 8-hour mean	10 mg/m^3

2.2. Planning Policy Wales

Edition 10 of Planning Policy Wales (PPW) was published in 2018 and sets out the land use planning policies of the Welsh Government and ensures that a commitment to sustainability is adopted into the planning system. Planning Policy Wales, in conjunction with supplementary Technical Advice Notes (TANs), are to be taken into account during the preparation of development plans and their content is material to decisions made on planning applications and appeals. PPW sets out the requirement for all local planning authorities in Wales to develop their own Local Development Plan (LDP).

PPW states that the planning system *"manages the development and use of land in the public interest, contributing to improving the economic, social, environmental and cultural well-being of Wales, as required by the Well-Being of Future Generations (Wales) Act 2015. It should reconcile the needs of development and conservation, securing economy, efficiency and amenity in the use of land, and protecting natural resources and the historic environment. A well functioning planning system is fundamental for sustainable development"*.

2.3. Clean Air Strategy (2019)

The Government's Clean Air Strategy was launched on the 14th January 2019 and sets out a range of initiatives that will help reduce air pollution, providing healthier air to breathe, enhancing the economy and protecting nature. The Clean Air Strategy highlights action to be taken to reduce emissions across all sectors, including transport, the home, farming, and industrial sources. This includes actions to reduce particulate matter from domestic emissions, by introducing new legislation to prohibit the sales of the most polluting fuels and ensuring only the cleanest stoves are available for sale by 2022. In addition, the Clean Air Strategy sets out proposals to halve the population living in areas with concentrations of fine particulate matter ($PM_{2.5}$) above the World Health Organisation (WHO) guideline levels of 10 µg/m^3 by 2025.

2.4. Land-Use Planning & Development Control: Planning for Air Quality (2017)

Land-Use Planning & Development Control: Planning for Air Quality, jointly published by the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) in May 2015 and updated in January 2017, provides general guidance on air quality and planning. Specifically, the guidance provides details on the scoping of effects, how to assess the impacts in relation to air quality, as well as details on how to assess the significance of impacts.

2.5. Local Air Quality Management Technical Guidance TG16 - (2016)

Specifically designed to provide technical guidance to Local Planning Authorities (LPAs) in relation to their review and assessment of air quality, TG(16) provides useful guidance in relation to the appropriate methods of air quality modelling and monitoring, which can be as equally useful to the assessment of air quality impacts.

2.6. Guidance on the Assessment of Dust from Demolition and Construction (2014)

Published in 2014, the IAQM's Guidance on the Assessment of Dust from Demolition and Construction provides guidance on preparing an Air Quality Statement for construction and demolition activities, specifically in relation to dust risk assessments, as well as providing details on how best to mitigate the impacts of construction dust. Much of the detail within the IAQM's Guidance was adopted within the Control of Dust and Emissions from Construction and Demolition SPG.

2.7. A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (2019)

The Institute of Air Quality Management's (IAQM) *Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites*, published in June 2019, provides more detailed guidance on the assessment of the ecological impacts of air pollution. The document covers primarily the screening stage which determines the need for a more detailed *"appropriate assessment"* that forms the second stage of the process, based on road traffic emissions that may affect European sites (Special Areas of Conservation (SACs), candidate SACs, Special Protection Areas (SPAs), Sites of Community Importance (SCIs), potential SPAs, possible SACs, listed or proposed Ramsar sites and sites identified, or required, as compensatory measures for adverse effects on these European sites. The guide provides more details on how to conduct a more detailed assessment of the impacts, if the effects cannot be screened out.

2.8. Newport Local Development Plan 2011-26

The Local Development Plan, adopted in January 2015, contained a number of policies and principles by which the Council uses to assess planning applications.

General Development Principle 2 (GP2) General Amenity states that *"Development will be permitted where… there will not be a significant adverse effect on local amenity including… air quality"*.

General Development Principle 7 (GP2) Environmental Protection and Public Health states that "Development will not be permitted which would cause or result in unacceptable harm to health because of land contamination, dust, instability or subsistence, air heat, noise or light pollution, flooding, water pollution, or any other identified rusk to environment, local amenity or public health and safety.

2.9. Newport Development Management Air Quality Supplementary Planning Guidance

The Newport air quality SPG outlines when an air quality assessment, what is required in an air quality assessment, as well as providing an overview of the regulatory framework.

3. ASSESSMENT METHODOLOGY

3.1. Methodology Overview

The assessment of air quality considered several different areas, specifically:

1. The constraints that the existing air quality has on the Proposed Development;
2. The impact of the changes in road traffic flows on air pollutant concentrations, at nearby sensitive receptors;
3. The impact of emissions from the Proposed Development's industrial plant and processes on air pollutant concentrations at nearby sensitive receptors; and
4. The impact of construction and demolition dust at nearby sensitive receptors.

Land-Use Planning & Development Control: Planning for Air Quality states with respect to the identification of local receptors, they should include *"residential and other properties close to and within the proposed development, as well as alongside roads significantly affected by the development, even if well away from the development site, and especially if within AQMAs. These receptors will represent locations where people are likely to be exposed for the appropriate averaging time (dependent on the air quality objective being assessed against)"*. The last point is critical as this identifies that sensitivity in relation to air quality is directly related to the amount of time one spends in a location. For example, when considering annual mean objectives (such as that of NO_2), any area where one might spend large parts of the year might be considered a sensitive receptor. An example could be a dwelling, where one might expect to spend at least half of their time during one day. Health centres, hospitals, schools and nurseries could all expect to be considered sensitive receptors, partially due to the length of exposure spent in these locations, but also due to vulnerable members of society (e.g. the very young, the very old, or the ill) spending significant amounts of time at these locations. Offices would not normally be considered to be a highly sensitive receptor since most visitors would be healthy adults and would only spend around 8 hours per day, 5 days per week there (i.e. less than 25% of the year), whereas people could spend over 50% of their time within a dwelling. Hotels would not be considered sensitive receptors in terms of the annual mean since residents would only normally expect to spend a small number of nights in that location; however, hostels, sheltered accommodation and student accommodation would be considered as sensitive as dwellings, as residents could be expected to stay for several months.

The baseline scenario will consider two separate sets of site conditions, specifically the existing 2017 baseline conditions (the latest date for which data is available) and the future 2021 baseline site conditions, which represents the opening year of the proposed development. The consideration of a future baseline for air quality is important as it takes into account future changes in both traffic flow, but also pollutant concentrations, which could vary.

To determine the baseline conditions, the following was undertaken:

- A review of the most recent progress reports on air quality carried out by the local planning authority, as submitted to the Department for the Environment, Food and Rural Affairs (Defra);
- Determination of whether the site is situated within a designated Air Quality Management Area (AQMA);

- A review of local air quality monitoring within the area of the site;
- A review of the Natural Resources Wales' register of industrial sites under the EC Integrated Pollution Prevention and Control Directive (IPPC) to determine whether industrial sources of air pollution could be affecting the site;
- Review of the list of registered Part A2 and Part B permitted premises under the PPC Regulations to determine whether any other sources of air pollution could be affecting the site;
- Using the methodology described in the ADMS-Roads Detailed Dispersion Model (details of which can be seen in **Appendix 2**, utilising data described in **Appendix 3**), predict concentrations of air pollutants on-site within the current baseline year and the future baseline year.

3.2. Methodology for Determining Demolition and Construction Effects

The determination of demolition and construction effects of the Proposed Development was based on the IAQM's Guidance on the Assessment of Dust from Demolition and Construction, which provides a risk-based assessment methodology to determine the significance of an air quality impact arising from the construction of a new development, based on the magnitude of change. The methodology provides a five-step approach to determining the significance:

*"**STEP 1** is to screen the requirement for a more detailed assessment. No further assessment is required if there are no receptors within a certain distance of the works.*

***STEP 2** is to assess the risk of dust impacts. This is done separately for each of the four activities (demolition; earthworks; construction; and trackout) and takes account of:*

the scale and nature of the works, which determines the potential dust emission magnitude (STEP 2A); and

the sensitivity of the area (STEP 2B).

These factors are combined in STEP 2C to give the risk of dust impacts.

Risks are described in terms of there being a low, medium or high risk of dust impacts for each of the four separate potential activities. Where there are low, medium or high risks of an impact, then site-specific mitigation will be required, proportionate to the level of risk.

Based on the threshold criteria and professional judgement one or more of the groups of activities may be assigned a 'negligible' risk. Such cases could arise, for example, because the scale is very small and there are no receptors near to the activity.

***STEP 3** is to determine the site-specific mitigation for each of the four potential activities in STEP 2. This will be based on the risk of dust impacts identified in STEP 2. Where a local authority has issued guidance on measures to be adopted at demolition/construction sites, these should also be taken into account.*

***STEP 4** is to examine the residual effects and to determine whether or not these are significant.*

***STEP 5** is to prepare the dust assessment report."*

3.3. Methodology for Determining Operational Effects

To determine the operational effects of the Proposed Development, the change in traffic flow at sensitive receptors in the future opening year of the proposed development, both with and without development related traffic, was modelled using the methodology described in the ADMS-Roads Detailed Dispersion Model (details of which can be seen in **Appendix 2**, utilising data described in **Appendix 3**).

To assess the likelihood of impacts arising from combustion emissions from the on-site plant, emissions were modelled using the ADMS Roads dispersion modelling software for point source emissions, using the emission data and flue design information for the proposed plant.

To determine the impact of the proposed development on surrounding local sensitive receptors, the impact magnitude has been derived from Land-Use Planning & Development Control: Planning for Air Quality, jointly published by the IAQM and EPUK. **Table 3.1** identifies the advice given in the IAQM / EPUK Guidance regarding impact descriptors upon individual receptors.

Table 3.1: Impact Descriptors for Individual Receptors

Long-Term Average Concentration at Receptor in Assessment Year	% Change in Concentrations Relative to Air Quality Assessment Level (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

Source: Table 6.3 of the IAQM Guidance

The guidance goes on to offer the following explanation (taken from the footnotes of Table 6.3 of the IAQM Guidance):

"AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e.. less than 0.5% will be described as Negligible.

The Table is only designed to be used with annual mean concentrations.

Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.

When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.

The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it."

3.4. Significance Criteria

Land-Use Planning & Development Control: Planning for Air Quality provides a framework to assess significance in air quality assessments. As described in the guidance, the *"assessment framework for describing impacts can be used as a starting point to make a judgement on significance of effect, but there will be other influences that might need to be accounted for. The impact descriptors set out in Table 6.3* [Replicated in **Table 3.1** of this chapter] *are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it may be that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances (Paragraph 7.4)".*

The Land-Use Planning & Development Control guidance goes on to state that any significance needs to be assessed using a certain amount of professional judgement and should take into account *"the existing and future air quality in the absence of the development; the extent of current and future population exposure to the impacts; and the influence and validity of any assumptions adopted when undertaking the prediction of impacts"* (Paragraph 7.7). For example, for a large development, a major adverse impact on a single dwelling might be considered insignificant; however, a minor impact to 100,000 dwellings might be considered to be highly significant. Furthermore, the absolute level of pollutant concentrations are also important in determining significance; for example, a moderate impact to a small group of dwellings might be considered highly significant if the concentrations of NO_2 were well in excess of the NAQO level, however, that same moderate impact might be considered insignificant if concentrations were well below the NAQO.

4. SCOPING

4.1. Overview

The National Planning Practice Guidance on Air Quality is explicit in stating that *"Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality".* This is reiterated in *Land-Use Planning & Development Control: Planning for Air Quality*, jointly published by the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) in May 2015 and updated in January 2017, which provided guidance on screening as to whether an air quality assessment is required and what needs to be assessed.

4.2. Impacts of the Local Area on the Development

The IAQM/EPUK Guidance suggests that whether an assessment of the impacts of the local area on the proposed development is required is a matter of judgement, but should take into account:

- *"the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular NO_2), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development."*

4.3. Impacts of the Development on the Local Area

To determine whether an assessment of the impacts of the development on the local environment is required, the IAQM/EPUK Guidance suggests a two-stage approach. The guidance states that *"The **first stage** is intended to screen out smaller development and/or developments where impacts can be considered to have insignificant effects. The **second stage** relates to specific details regarding the proposed development and the likelihood of air quality impacts."*

Figure 4.1 reproduces Stage 1 of the IAQM/EPUK Guidance' two-stage approach. In order to proceed to Stage 2, development needs to meet both one of the criteria in "A", and one of the criteria in "B". If the development fails to meet these criteria, then an air quality assessment looking at the impacts of the development on the local area will not be required.

Figure 4.2 reproduces Stage 2 of the IAQM/EPUK Guidance' two-stage approach. If the development meets the criteria contained within Stage 1, *"more specific guidance as to when an air quality assessment is likely to be required to assess the impacts of the proposed development on the local area."* If the development then meets any of the eight criteria in Stage 2, an assessment of the impacts of the proposed development on the surrounding environment will be required.

Figure 4.1: IAQM/EPUK Guidance – Stage 1 Criteria

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.

Figure 4.2: IAQM/EPUK Guidance – Stage 2 Criteria

The development will:	Indicative Criteria to Proceed to an Air Quality Assessment [a]
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
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.

4.4. Site Specific Scoping Assessment

The proposed development is not located in an Air Quality Management Area, nor are new dwellings or other sensitive receptors proposed as part of this development; therefore, **an assessment of the impacts of the local area on the development is not required**.

The proposed development consists of over 1000m^2 of floor space, plus will include a centralised combustion process; therefore Stage 1 "A" and "B" criteria are both met. As a large scale industrial process is proposed, **an assessment of the impacts of the development on the local area is required**.

5. BASELINE CONDITIONS

5.1. Air Quality Review and Assessment

Local Authorities have been required to carry out a review of local air quality within their boundaries to assess areas that may fail to achieve the NAQO's. Where these objectives are unlikely to be achieved, local authorities must designate these areas as Air Quality Management Areas (AQMA's) and prepare a written action plan to achieve the NAQO's.

The review of air quality takes on several prescribed stages, of which each stage is reported. The review of historic Air Quality Assessment reports for Newport City Council indicates that exceedances of the annual mean objective for NO_2 has been experienced across the Borough, primarily centred on the main roads, and these exceedances are predicted to continue. It is understood that exceedances of the annual mean objectives for both PM_{10} and $PM_{2.5}$ are not expected within the Borough in future years.

As a consequence of the exceedances of the NAQOs, Newport City Council have declared 12 Air Quality Management Areas encompassing various areas on the city, primarily in the centre and around the main carriageways. The nearest AQMA to the proposed development site is approximately 3.3 km to the north.

Concentrations of SO_2, Benzene, Lead and CO are not considered to be significant within the Borough. Consequently, no further consideration is given to these pollutants as it is highly unlikely that they would be of concern on the proposed development site.

5.2. Local Air Quality Monitoring

Newport City Council has conducted air quality monitoring, including at one site in the vicinity of the proposed development site. As a roadside monitoring location, it is suitable for verifying a model of road traffic pollutants. **Table 5.1** summarises the air quality monitoring data for the monitoring location over the last five years.

Table 5.1: Air Quality Monitoring

Location	Annual Mean Concentrations of NO_2 (µg/m^3)				
	2013	2014	2015	2016	2017
NCC55 – 116 Alexandra Road	36.4	33.4	35.4	34.0	33.5

5.3. Baseline Onsite Pollution Concentrations

To characterise the air quality in the vicinity of the development site at present, predictions of air pollutant concentrations have been made using the air quality model for the baseline year (2017) at five sensitive receptors likely to be most affected by emissions from the proposed development, both from the increase in road traffic and from the flue emissions.

Appendix 2 provides a description of the methodology used in the assessment, including the method to calculate NO_2 from NO_x. **Appendix 3** outlines the input data, including traffic data, background concentrations

and receptor locations. In addition, details of the verification factor applied to the predicted concentrations of NO_x can also be found in **Appendix 3**. The results of these predictions can be seen in **Table 5.2**.

Table 5.2: Baseline Air Quality Concentrations 2017 – Development Site

Receptor	NO_2 (µg/m^3)	PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)
	Annual Mean	Annual Mean	Days >50 µg/m^3	Annual Mean
17 Watch House Parade, Newport	31.24	15.20	<1	9.99
109 Alexandra Road, Newport	31.93	14.88	<1	9.81
88 Alexandra Road, Newport	24.70	14.13	<1	9.34
West Nash Farm, Nash, Newport	9.74	11.18	<1	7.44
2 The Bungalows, Farmfield Lane, Nash, Newport	8.84	10.92	<1	7.34
NAQO	**40**	**40**	**35**	**25**

If pollutant concentrations in **Table 5.2** are compared to the National Air Quality Objectives, it can be seen that on the development site at present, concentrations of NO_2 are below the National Air Quality Objectives.

6. IMPACTS OF THE LOCAL AREA ON THE DEVELOPMENT

6.1. Annual Mean Concentrations

As identified in the scoping section in **Section 4.4** of this report, the lack of sensitive receptors being introduced as part of the proposed development does not give rise to the need for an assessment of the impacts of existing air quality on the proposed development with regards to long term annual pollutant concentrations and NAQOs.

6.2. NO_2 1-hour Exposure

In order to meet the hourly Air Quality Standard on NO_2, the average hourly concentration of NO_2 must not exceed the hourly objective level of 200 µg/m^3 more than 18 times in one calendar year. If this standard is not met, there would be concern that even short duration exposure to pollutant concentrations could be prejudicial to health, which could be a concern for workers at the proposed development.

According to research conducted in 2003[1], there is only a risk that the NO_2 1-hour objective (200 µg/m^3) could be exceeded if the annual mean nitrogen dioxide concentration is greater than 60 µg/m^3. Although conditions on site have not been explicitly modelled, the large distance from any highly trafficked roads and the design of nearby industrial flues at heights to encourage dispersion make it highly unlikely that onsite pollutant concentrations would be in excess of 60 µg/m^3, especially considering the relatively low background concentrations for the region (<20 µg/m^3).

[1] Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003.

7. IMPACT ASSESSMENT – HUMAN HEALTH

7.1. Overview

To assess the impact of a proposed development on local air quality, the methodology from Land-Use Planning & Development Control: Planning for Air Quality, jointly published by the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) in May 2015 has been implemented.

Both the impact of traffic and plant associated with the proposed development has been assessed and the cumulative impact of both sources considered at all human receptors.

It should be noted that in terms of the plant emissions, only NO_X has been assessed. It has been confirmed by the operator that there will not be SO_2 emissions associated with the proposed development, barring a contamination of the gas supply. Consequently, SO2 has not been modelled as an impact on concentrations of SO_2 are not expected.

Only emissions from the four flues have been assessed as it is not anticipated that there would be any non-combustion process emissions. It is known that plasterboard manufacturing is a process that can lead to airborne particulate matter as a result of the processes used during manufacturing. The only zone within the proposed development that will feature processes than create dust will be inside the building in the solid additives area. All air that will be expelled from the factory will go through sleeve filters to collect dust so there will be no dust emitted to the outside of the building as a result of this process. Regarding gypsum, all movements will occur inside a closed area that will also vent through the filters.

7.2. Plant Emissions

It is proposed to install four flues, two each for drying (Flues 1 and 2) and calcination (Flues 3 and 4) processes. All data below has been provided by, or calculated from data provided by, the operator; and modelled output results are dependent on the data below in **Table 7.1**.

It should be noted that that the emission rates displayed below have been calculated using data provided by the operator, who have stated that the emission rates will be no greater than 35 mg/m^3 of exhaust gases for each flue. A worst-case approach has been adopted with the modelling using 35 mg/m^3 of NO_x as the emission rate for each flue.

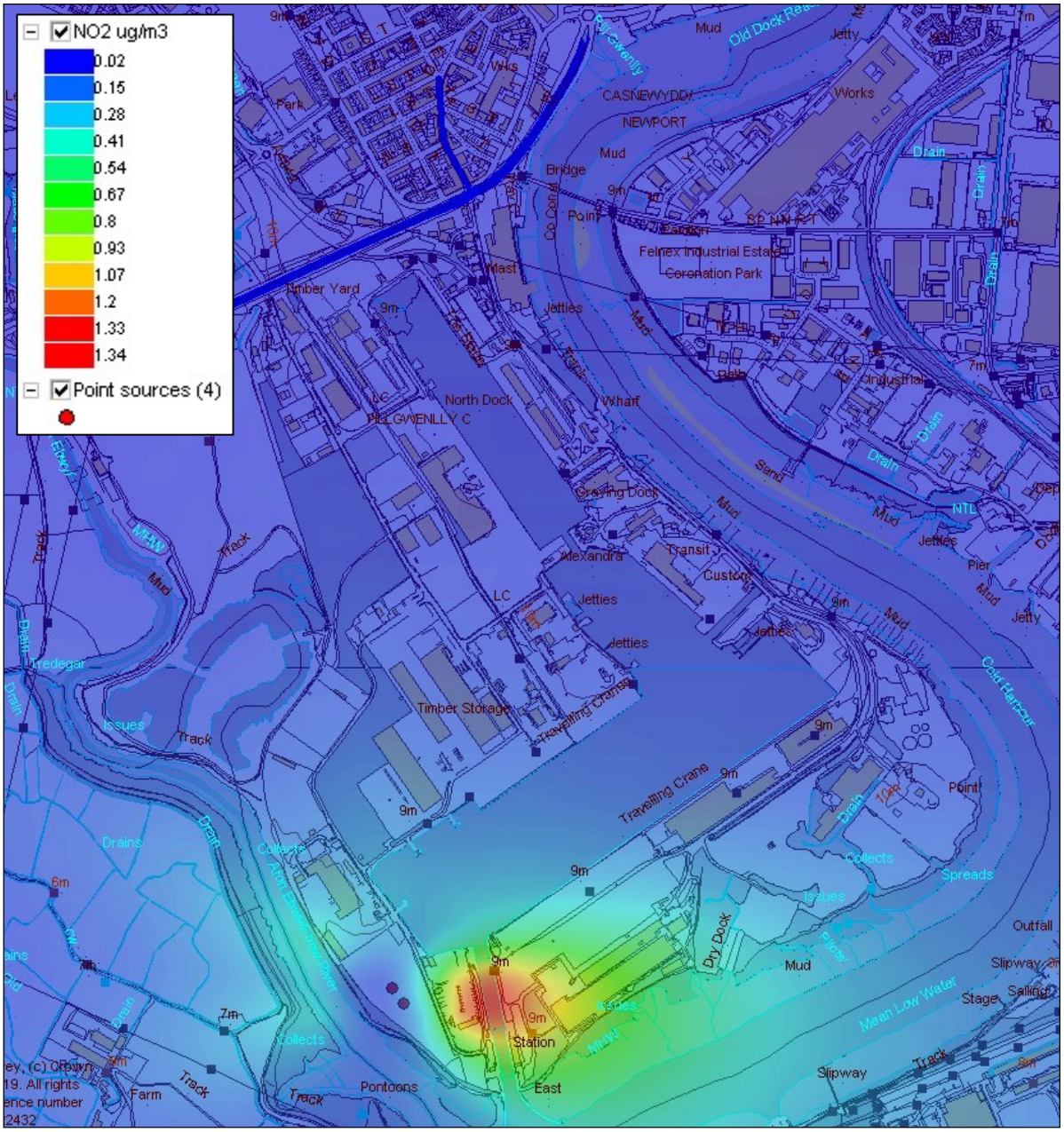
Table 7.1 Modelling input factors – Industrial Sources

Input Parameter	Input Value			
	Flue 1	Flue 2	Flue 3	Flue 4
Location (x,y)	331355, 184184	331386, 184144	331297, 184201	331300, 184198
Stack Height (m)	22	22	17	17
Stack Internal Diameter (m)	1.5	1.5	1.0	1.0
NO_X Emission Rate (g/s)	1.166	0.098	0.02916	0.02916
Exhaust Temperature (°C)	110	110	110	110
Exhaust Volume Rate (m^3/s)	33.3	2.8	0.83	0.83

7.2.1. Dispersion Modelling Output

It can be seen from **Figure 7.1** that the peak concentration of NO_2 from the industrial processes occurs approximately 250 m east of the stack, roughly over the South Lock access to the docks. This equates to approximately an annual mean of NO_2 of 1.34 µg/m^3. It should be noted that there are no sensitive receptors in this area. Impacts on ecological receptors that may be affected by the plume are discussed in **Section 8**.

Figure 7.1: Dispersion Modelling – Industrial Sources



7.3. Vehicle Emissions

A transport assessment was provided by Curtins in October 2019. To characterise the change in air quality as a consequence of the proposed development, predictions of air pollutant concentrations at sensitive receptors have been carried out for the proposed opening year of the development (2021) both with and without the expected changes in traffic flow as a result of the proposed development. **Appendix 2** provides a description of the methodology used in the assessment, including the method to calculate NO_2 from NO_x. **Appendix 3** outlines the input data, including traffic data, background concentrations. In addition, details of the verification factor applied to the predicted concentrations of NO_x can also be found in **Appendix 3**.

7.4. Assessment Results

Concentrations have been calculated for five sensitive receptors; three at locations likely to be most affected by changes in both relative and absolute traffic flows and two that are considered to be the nearest downwind of the site under the prevailing weather conditions. The results of these predictions can be seen in **Table 7.2** and **Table 7.3**, for without and with development related emissions respectively. These calculations include both the impact of plant, as well as the impact of changes in traffic flow.

The results of these predictions can be used to identify the increase in pollutant concentrations as a consequence of the proposed development. These calculations can be seen in **Table 7.4**. The results show that the impact of the increase in traffic flow and introduction of industrial emissions can be described as "*negligible*".

Table 7.2: Air Quality Concentrations 2021 – Without Development Related Emissions

Receptor	NO_2 (µg/m³)	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)
	Annual Mean	Annual Mean	Days >50 µg/m³	Annual Mean
17 Watch House Parade, Newport	27.42	15.14	<1	9.88
109 Alexandra Road, Newport	29.11	14.83	<1	9.72
88 Alexandra Road, Newport	23.18	14.11	<1	9.29
West Nash Farm, Nash, Newport	9.73	13.30	<1	8.82
2 The Bungalows, Farmfield Lane, Nash, Newport	8.83	13.30	<1	8.82
NAQO	**40**	**40**	**35**	**25**

Table 7.3: Air Quality Concentrations 2021 – With Development Related Emissions

Receptor	NO_2 (µg/m³)	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)
	Annual Mean	Annual Mean	Days >50 µg/m³	Annual Mean
17 Watch House Parade, Newport	27.57	15.15	<1	9.89
109 Alexandra Road, Newport	29.25	14.84	<1	9.73
88 Alexandra Road, Newport	23.27	14.12	<1	9.30
West Nash Farm, Nash, Newport	9.89	13.30	<1	8.82
2 The Bungalows, Farmfield Lane, Nash, Newport	8.95	13.30	<1	8.82
NAQO	**40**	**40**	**35**	**25**

Table 7.4: Assessment of the Impacts of the Development Related Emissions

Receptor	NO_2 (µg/m³) Annual Mean		% Change in Conc. Relative to Air Quality Assessment Level (AQAL)	Long-Term Average Concentration at Receptor in Assessment Year	Impact Descriptor
	Without Development	With Development			
17 Watch House Parade, Newport	27.42	27.57	0.38	69 % of AQAL	*Negligible*
109 Alexandra Road, Newport	29.11	29.25	0.35	73 % of AQAL	*Negligible*
88 Alexandra Road, Newport	23.18	23.27	0.22	58 % of AQAL	*Negligible*
West Nash Farm, Nash, Newport	9.73	9.89	0.40	25 % of AQAL	*Negligible*
2 The Bungalows, Farmfield Lane, Nash, Newport	8.83	8.95	0.31	23 % of AQAL	*Negligible*
NAQO	**40**	**40**	**-**	**-**	**-**

8. IMPACT ASSESSMENT – ECOLOGICAL RECEPTORS

8.1. Overview

The Institute of Air Quality Management's (IAQM) *Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites*, published in June 2019 covers primarily the screening stage that initially identifies the risk of the possibility of significant adverse effects on a European site which could undermine the achievement of its conservation objectives and which therefore would require further detailed examination through an "appropriate assessment". If risks which might undermine a site's conservation objectives can clearly be ruled out (based on the consideration of objective information), a proposal will have no likely significant effect and no appropriate assessment will be needed.

8.2. The Assessment of Air Quality Impacts

The assessment of ecological impacts is set out in three stages, as described below.

8.2.1. Stage 1: Scoping

It has been noted via the MAGIC website that the proposed development site is located in close proximity to the Severn Estuary Special Area of Conservation (SAC), the River Usk SAC, the Gwent Levels Site of Special Scientific Interest (SSSI), the River Usk SSSI and the Severn Estuary SSSI. Preliminary calculations indicate that the emissions from the stacks associated with the proposed development could extend over the SACs and SSSIs; therefore, it is considered that further consideration is required.

8.2.2. Stage 2: Quantification

In accordance with the IAQM guidance, the Process Contributions (PC) for both atmospheric NO_X at ground level as well as the rate of NO_X deposition have been calculated for fifteen representative points within the Severn Estuary and the River Usk SACs, as well as the Severn Estuary, River Usk and Gwent Levels SSSIs. A location plan of these receptors and the relevant ecological designations can be seen in **Figures 8.1** and **8.2** for the SACs and SSSIs respectively; with the results of the modelling shown in **Table 8.1**.

Table 8.1: Process Contributions

Ecological Receptor	Designations	Atmospheric NO_X (µg/m³) Process Contribution (All Flues)	% of Critical Level	Dry Deposition NO_X (kg/ha/y) Process Contribution (All Flues)	% of Critical Level	Wet (Acid) Deposition NO_X (kg/ha/y) Process Contribution (All Flues)	% of Critical Level	Total Deposition NO_X (kg/ha/y) Process Contribution (All Flues)	% of Critical Level
ER1	River Usk SAC/SSSI	0.95	3.16	0.58	2.90	0.40	2.00	0.97	4.85
ER2	River Usk SAC/SSSI	1.20	4.00	0.73	3.65	0.48	2.40	1.21	6.05
ER3	River Usk SAC/SSSI	1.34	4.46	0.81	4.05	0.52	2.60	1.33	6.65
ER4	River Usk SAC/SSSI	1.46	4.87	0.89	4.45	0.55	2.75	1.44	7.20
ER5	River Usk SAC/SSSI	1.25	4.18	0.76	3.80	0.44	2.20	1.20	6.00
ER6	River Usk SAC/SSSI	0.76	2.54	0.46	2.30	0.25	1.25	0.71	3.55
ER7	Severn Estuary SAC/SSSI	0.65	2.17	0.40	2.00	0.13	0.65	0.53	2.65
ER8	Severn Estuary SAC/SSSI	0.29	0.97	0.18	0.90	0.24	1.20	0.42	2.10
ER9	Boundary of Severn Estuary SAC/SSSI and Gwent Levels SSSI	0.38	1.27	0.23	1.15	0.09	0.45	0.32	1.60
ER10	Severn Estuary SAC/SSSI	0.23	0.76	0.14	0.70	0.13	0.65	0.27	1.35
ER11	River Usk SSSI	1.02	3.4	0.62	3.10	0.34	1.70	0.95	4.75

Ecological Receptor	Designations	Atmospheric NO_X (µg/m³)	% of Critical Level	Dry Deposition NO_X (kg/ha/y)	% of Critical Level	Wet (Acid) Deposition NO_X (kg/ha/y)	% of Critical Level	Total Deposition NO_X (kg/ha/y)	% of Critical Level
		Process Contribution (All Flues)		Process Contribution (All Flues)		Process Contribution (All Flues)		Process Contribution (All Flues)	
ER12	Severn Estuary SSSI	0.83	2.76	0.50	2.50	0.27	1.35	0.77	3.85
ER13	Severn Estuary SSSI	0.63	2.09	0.38	1.90	0.25	1.25	0.63	3.15
ER14	Boundary of Severn Estuary SAC/SSSI and Gwent Levels SSSI	0.54	1.81	0.33	1.65	0.10	0.50	0.43	2.15
ER15	Gwent Levels SSSI	0.53	1.76	0.32	1.60	0.14	0.70	0.46	2.30
Critical Level		**30**	**-**	**20**	**-**	**20**	**-**	**20**	**-**

The PCs for both atmospheric NO_X and NO_X deposition have then been added to the local background concentration/rate for each receptor, as obtained from the APIS database at 1km resolution for atmospheric concentrations and 5km resolution for deposition rates. This gives the Predicted Environmental Concentration/Deposition Rate. These can be seen in **Table 8.2**.

Table 8.2: Predicted Environmental Concentrations

Ecological Receptor	Designations	Atmospheric NO_X (µg/m³)	% of Critical Level	Dry Deposition NO_X (kg/ha/y)	% of Critical Level	Wet (Acid) Deposition NO_X (kg/ha/y)	% of Critical Level	Total Deposition NO_X (kg/ha/y)	% of Critical Level
		Predicted Environmental Concentration (All Flues)		Predicted Environmental Concentration (All Flues)		Predicted Environmental Concentration (All Flues)		Predicted Environmental Concentration (All Flues)	
ER1	River Usk SAC/SSSI	20.17	67.23	9.68	48.40	9.50	47.50	10.07	50.35
ER2	River Usk SAC/SSSI	23.57	78.57	9.83	49.15	9.58	47.90	10.31	51.55
ER3	River Usk SAC/SSSI	23.71	79.03	9.91	49.55	9.62	48.10	10.43	52.15
ER4	River Usk SAC/SSSI	23.83	79.43	9.99	49.95	9.65	48.25	10.54	52.70
ER5	River Usk SAC/SSSI	17.85	59.50	9.86	49.30	9.54	47.70	10.30	51.50
ER6	River Usk SAC/SSSI	17.36	57.87	9.56	47.80	9.35	46.75	9.81	49.05
ER7	Severn Estuary SAC/SSSI	23.02	76.73	9.50	47.50	9.23	46.15	9.63	48.15
ER8	Severn Estuary SAC/SSSI	22.66	75.53	9.28	46.40	9.34	46.70	9.52	47.60
ER9	Boundary of Severn Estuary SAC/SSSI and Gwent Levels SSSI	16.98	56.60	9.33	46.65	9.19	45.95	9.42	47.10
ER10	Severn Estuary SAC/SSSI	16.83	56.10	9.24	46.20	9.23	46.15	9.37	46.85

Ecological Receptor	Designations	Atmospheric NO_X ($\mu g/m^3$) Predicted Environmental Concentration (All Flues)	% of Critical Level	Dry Deposition NO_X (kg/ha/y) Predicted Environmental Concentration (All Flues)	% of Critical Level	Wet (Acid) Deposition NO_X (kg/ha/y) Predicted Environmental Concentration (All Flues)	% of Critical Level	Total Deposition NO_X (kg/ha/y) Predicted Environmental Concentration (All Flues)	% of Critical Level
ER11	River Usk SSSI	17.62	58.73	9.72	48.60	9.44	47.20	10.05	50.25
ER12	Severn Estuary SSSI	17.43	58.10	9.60	48.00	9.37	46.85	9.87	49.35
ER13	Severn Estuary SSSI	17.23	57.43	9.48	47.40	9.35	46.75	9.73	48.65
ER14	Boundary of Severn Estuary SAC/SSSI and Gwent Levels SSSI	22.91	76.37	9.43	47.15	9.20	46.00	9.53	47.65
ER15	Gwent Levels SSSI	22.90	76.33	9.42	47.10	9.24	46.20	9.56	47.80
Critical Level		**30**	**-**	**20**	**-**	**20**	**-**	**20**	**-**

8.2.3. Stage 3: Screening

Impacts of Atmospheric Concentrations

In accordance with the IAQM guidance, if the long-term PC is less than 1% of the long-term environmental standard at a European designated site, no further assessment is required. The long-term environmental standard for atmospheric concentrations of NO_X is considered to the be critical load, which is 30 µg/m^3 of NO_x. Since it can be noted in **Table 8.1** that the increase in NO_X is greater than 0.3 µg/m^3 of NO_x (i.e. more than 1% of the critical load), further assessment is required.

The Environmental Agency risk assessment guidance states that if the PEC is less then 70% of the long-term criterion, it can be deemed to be insignificant, regardless of the PC. However, it can be seen from **Table 8.2**, that impacts cannot be deemed insignificant at this stage, specifically in regard to atmospheric concentrations of NO_X.

Impacts of Deposition Rates

A critical deposition level of 20 kg/ha/y has been used above as this is the lower bound of the range quoted for Estuary feature in the APIS database. Although the predicted total deposition rates are less than 70% of this level, it should be noted that for many features shown for the Severn Estuary SAC, as well as all of those shown for the River Usk SAC and the three SSSIs, no Critical Level is given. It therefore requires the opinion of the Ecological Consultant to determine whether these impacts are significant or not.

Summary

At this stage, the impacts of the proposed development on the River Usk SAC, the Severn Estuary SAC; nor the SSSIs can be ruled out. The impacts are further considered within the Ecological Impact Assessment and Habitat Regulations Assessment prepared by Wardall Armstrong.

As previously discussed, the emission rates used in this assessment have been calculated using data provided by the operator, who have stated that the emission rates will be no greater than 35 mg/m^3 of exhaust gases for each of the four flues. A worst-case approach has been adopted with the modelling using 35 mg/m^3 of NO_x as the emission rate for each flue. If it is possible that the actual emission rate is lower, then subsequently any impact could also be lower.

Figure 8.1: Plume dispersion at ground level with modelled Ecological Receptors and SAC boundaries

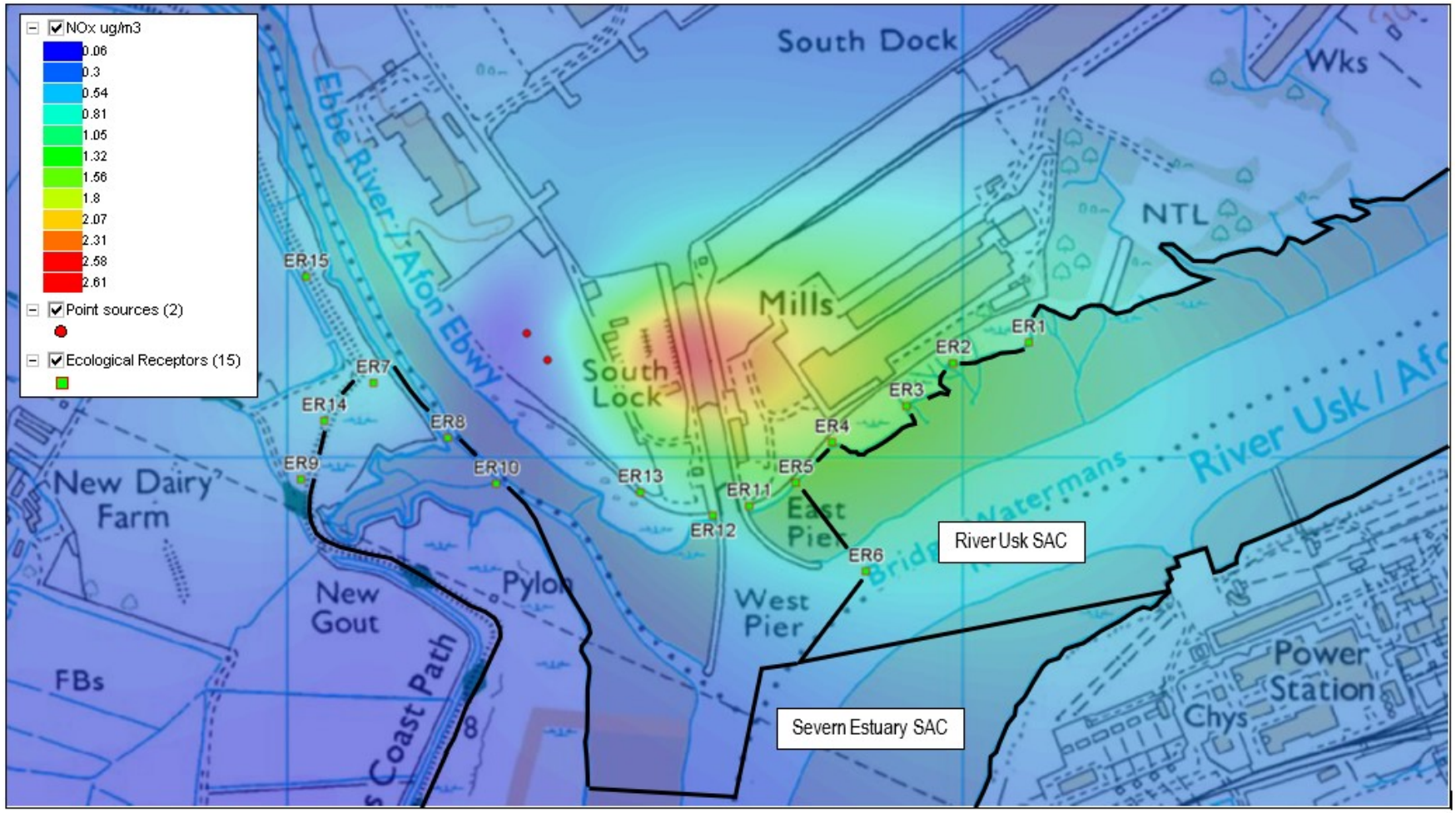
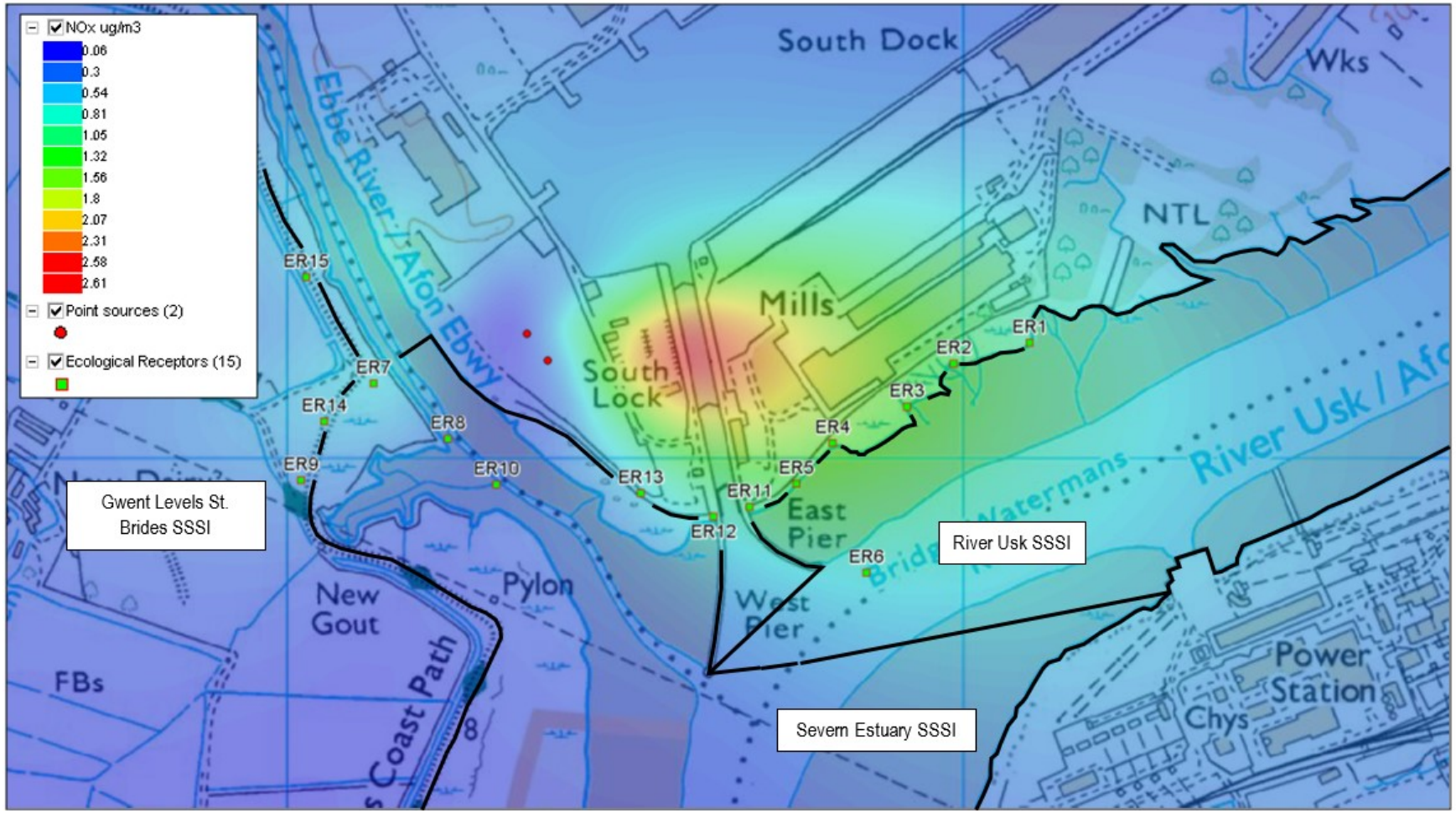


Figure 8.2: Plume dispersion at ground level with modelled Ecological Receptors and SSSI boundaries



9. IN-COMBINATION EFFECTS (CUMULATIVE EFFECTS)

A list of consented developments that require consideration of the cumulative impacts have been provided by the Planning Consultant which were used in connection with the M4 relief road. They are as follows:

- **Newport City Council Planning Application: 18/0911** - Land to south of Balwins Crane Hire, West Way Road, Alexandra Docks, Newport – Non material amendment to Permission 17/1185 for variation of conditions relation to permission 15/1513 for the bulk drying and pelleting facility with onsite energy centre, and other ancillary works. Amendment to proposed internal firing system.
- **Newport City Council Planning Application: 15/0775** - Land Formerly Known As Whitehead Works, Mendalgief Road, Newport – Construction of 529no. residential units, 24no. assisted living units, pub/restaurant, retail units, primary school and associated landscape and highway infrastructure.
- **Newport City Council Planning Application: 14/1172** - 3, West Way Road, Alexandra Docks, Newport – Installation and operation of a small biomass gasification plant processing untreated wood into producer gas, to produce 280 kWe of electrical energy and 400 kW of thermal energy.
- **Newport City Council Planning Application: 18/0360** - 16, West Way Road, Alexandra Docks, Newport – Erection of an asphalt plan and associated ancillary development.
- **Natural Resources Wales – Marine Licencing - DML1636v1** - Application for a renewal of a non-EIA Marine Licence for the maintenance and dredge disposal at Newport Docks

Upon consideration of the developments, all five are not considered to have air quality impacts that require the assessment of in-combination effects.

At Land to south of Balwins Crane Hire, West Way Road (ref. 18/0911), this consent is a variation of a planning consent (ref. 10/1238) which was accompanied by an Environmental Statement. The original Environmental Statement included a detailed assessment of the air quality impacts and showed that the air quality impacts would be very small at surrounding receptors, including ecological receptors. Whilst the details of the application have changed slightly since the original Environmental Statement, subsequent assessment has shown that the variations to the development have not significantly altered the air quality impact. Whilst the proposed development will increase pollutant concentrations, the increases are small and these increases are not generally in the geographical area where impacts are predicted in relation to the plasterboard manufacturing site. Consequently, cumulative impacts are not expected.

Regarding the development at Land Formerly Known As Whitehead Works, the air quality assessment associated with the planning application notes that there will be only small increases in pollution concentrations associated with increases in traffic generation. The results show that roadside receptors are expected to have absolute concentrations well below the National Air Quality Objective levels and therefore the cumulative impacts of traffic are unlikely to be significant. This development does not have any industrial processes as part of the application and therefore will not have any impact on the SACs or SSSIs.

At the biomass gasification plant at 3 West Way Road, the application was accompanied by an air quality assessment, which showed that in the River Usk, where concentrations of pollutants from the plasterboard manufacturing plant are at their highest, annual mean nitrogen deposition will be less than 0.001 kg/ha/yr and

the annual mean process contribution of NO_2 will be less than 0.01 µg/m^3. Given that increases in pollutant concentrations are likely to be very small, in combination effects would not be anticipated.

With regards to the asphalt plant at 16 West Way Road, an air quality assessment was not carried out in connection with the application, as the air quality impacts were considered to be minimal, given its small size and the separation distance between the plant and any receptors. This approach was accepted by Newport City Council's Environmental Health Department. Consequently, it is considered that any in-combination effects are likely to be very small.

With reference to the marine licencing application, this is in relation to dredging and emissions to air are not anticipated.

Consequently, it is not anticipated that any of the above developments would have a measurable impact at any receptors (human or ecological) affected by the proposed plasterboard manufacturing site. Consequently, cumulative impacts are not expected.

10. CONSTRUCTION DUST IMPACT ASSESSMENT

10.1. Overview

The main air quality impacts that may arise during construction activities are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes; and
- An increase in concentrations of airborne particles (e.g. PM_{10}, $PM_{2.5}$) and nitrogen dioxide due to exhaust emissions from site plant and traffic that can impact adversely on human health.

The most common impacts are dust soiling and increased ambient PM_{10} concentrations due to dust arising from the site. Most of this PM_{10} is likely to be in the $PM_{2.5-10}$ fraction, known as coarse particles.

It is very difficult to quantify emissions of dust from construction activities. It is, therefore, common practice to provide a qualitative assessment of potential impacts. The Institute of Air Quality Management's *Guidance on the assessment of dust from demolition and construction (February 2014)* contains a complex methodology for determining the significance of construction impacts on air quality. The following sections outline the steps outlined in the IAQM methodology.

10.2. Step 1 – Screening the Need for a Detailed Assessment

The IAQM guidance states that:

"An assessment will normally be required where there is:

- *a 'human receptor' within:*
    - *350 m of the boundary of the site; or*
    - *50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).*
- *an 'ecological receptor' within:*
    - *50 m of the boundary of the site; or*
    - *50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s)."*

There are existing ecological receptors within 50 m of the boundary of the development site. Therefore, a detailed assessment is required to determine potential dust impacts. There are no receptors within 50 m of the haul routes up to 500 m from the site entrances.

Step 1 Summary:

A detailed assessment is required to determine potential dust impacts.

10.3. Step 2 – Assess the Risks of Dust Impacts

The IAQM guidance states that:

"The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk.

A site is allocated to a risk category based on two factors:

- *the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (STEP 2A); and*
- *the sensitivity of the area to dust impacts (STEP 2B), which is defined as low, medium or high sensitivity.*

These two factors are combined in STEP 2C to determine the risk of dust impacts with no mitigation applied. The risk category assigned to the site can be different for each of the four potential activities (demolition, earthworks, construction and trackout). More than one of these activities may occur on a site at any one time."

10.3.1. Step 2a – Dust Emission Magnitude

The first step (Step 2a) is therefore to assess the magnitude of the anticipated works. **Table 10.1** summarises the dust emission magnitude for each activity.

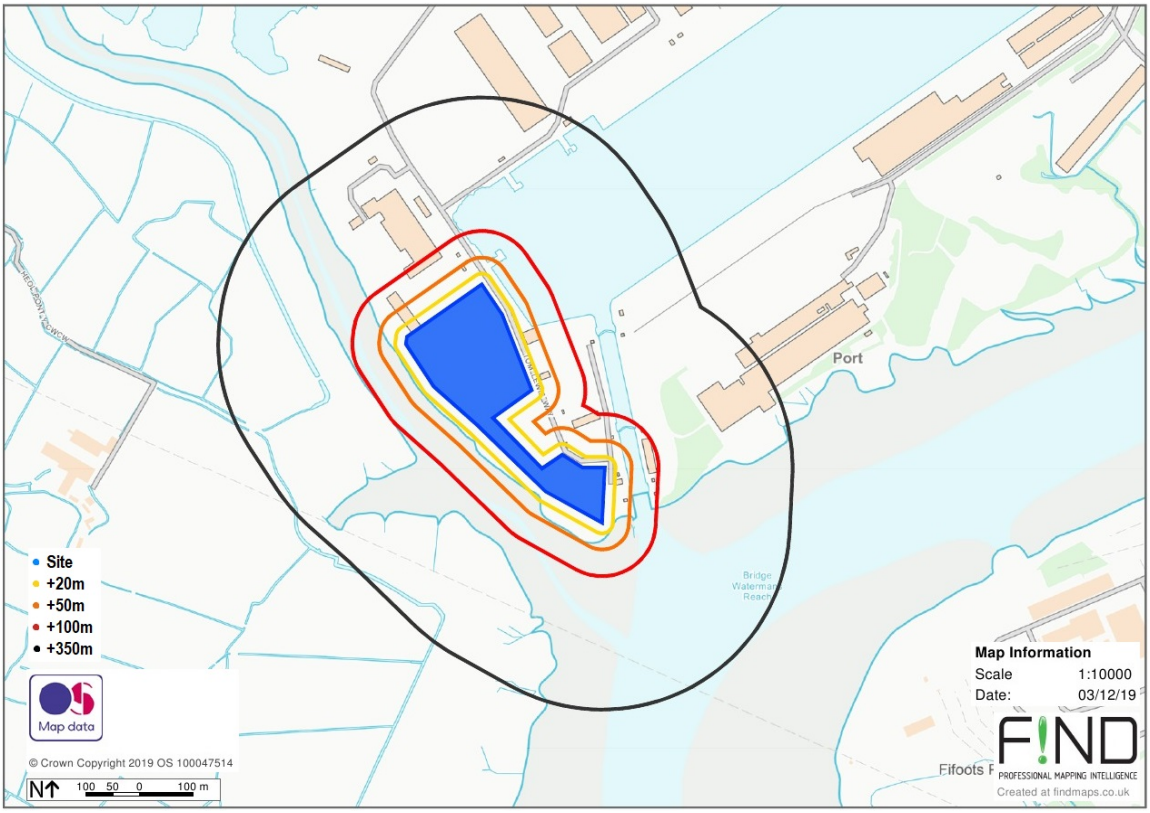
Table 10.1: Dust Emission Magnitude

Activity	Dust Emission Magnitude	Justification
Demolition	**N/A**	*The site is currently cleared ground.*
Earthworks	**Large**	*The total site area is in excess of 10,000 m^2, although typically wet the soil is clayey in nature and >10 HGV movements at a time may be expected.*
Construction	**Large**	*Building volume to exceed 100,000 m^3, processes such as concrete batching and sandblasting could be expected.*
Trackout	**Large**	*Clayey soil type and large lengths of unpaved road in excess of 100 m.*

10.3.2. Step 2b – Sensitivity of the Area

The next step (Step 2b) is therefore to assess the sensitivity of the area that could be affected by the anticipated works. **Figure 10.1** shows the distance bands into which receptors fall as described in the guidance, in terms of distance from the site boundary (20, 50, 100 and 350 metres).

Figure 10.1: Receptor distance bands from proposed development site



There are no existing dwellings in the area that are considered to be high sensitivity receptors, even up to 350 m from the site boundary; therefore, the sensitivity to dust soiling effects on people and property is *"low"* for all activities.

The annual mean concentration of PM_{10} is less than 24 µg/m^3; this combined with the lack of high sensitivity receptors outlined above results in a *"low"* sensitivity of the area to human health impacts for all activities.

The Severn Estuary Site of Scientific Interest lies within 50 m of the site boundary, although not its haul routes. This is classed as high sensitivity receptor; therefore, the sensitivity to ecological impacts is rated as "*high*" for earthworks and construction, and "*low*" for trackout.

Table 10.2 summarises the sensitivity of the area for each activity.

Table 10.2: Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Low	Low	Low
Human Health	N/A	Low	Low	Low
Ecological	N/A	High	High	Low

10.3.3. Step 2c – Define the Risks

The next step (Step 2c) is to assign the level of risk for each activity, based on the receptor sensitivity and the dust emission magnitude. **Table 10.3** summarises the dust risk for each activity.

Table 10.3: Summary Dust Risk Table to Define Site-Specific Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Low	Low	Low
Human Health	N/A	Low	Low	Low
Ecological	N/A	High	High	Low

Step 2 Summary:

- *Dust Emission Magnitude is "Large" for earthworks, construction and trackout.*
- *The Sensitivity of the area of is "High" for ecological impacts from earthworks and construction, but "Low" for trackout.*
- *The site is considered a "High Risk Site" in respect of earthworks and construction and a "Low Risk Site" in relation to trackout. It is therefore considered a "High Risk Site" overall.*

10.4. Step 3 – Site Specific Mitigation

Stage 2 determines that the site is a *"High Risk Site*" in respect of earthworks and construction and a "*Low Risk Site*" in relation to trackout. It is therefore considered a "*High Risk Site*" overall.

The IAQM guidance provides a list of potential mitigation measures and suggests where these measures are highly recommended, desirable or not required based upon the risk of the site. For all sites that are a *"High Risk Site*", a Dust Management Plan is highly recommended and should incorporate the mitigation measures recommended based on the site risk.

The IAQM's Guidance states that the following measures are highly recommended or desirable as mitigation for all high risk sites:

- Communications: Develop and implement a stakeholder communications plan that includes community engagement before work commences.
- Communications: Display the name and contact details of person(s) accountable for air quality and dust issues on the Site boundary.
- Communications: Display the head or regional office contact information.

- Communications: Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LPA. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the Site. In London, additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.
- Site management: Hold regular liaison meetings with other high-risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
- Site management: Record all dust and air quality complaints, identify the cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Site management: Make the complaints log available to the local authority when asked.
- Site management: Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- Monitoring: Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the LPA when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of Site boundary, with cleaning to be provided if necessary.
- Monitoring: Carry out regular Site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Monitoring: Increase the frequency of Site inspections by the person accountable for air quality and dust issues on-site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Monitoring: Agree on dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on-site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
- Preparing and maintaining the Site: Plan Site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Preparing and maintaining the Site: Erect solid screens or barriers around dusty activities (or the Site boundary) that are at least as high as any stockpiles on-site.
- Preparing and maintaining the Site: Fully enclose Site or specific operations where there is a high potential for dust production and the Site is actives for an extensive period.
- Preparing and maintaining the Site: Avoid Site runoff of water or mud.

- Preparing and maintaining the Site: Keep Site fencing, barriers and scaffolding clean using wet methods.
- Preparing and maintaining the Site: Remove materials that have a potential to produce dust from Site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Preparing and maintaining the Site: Cover, seed or fence stockpiles to prevent wind whipping.
- Operating vehicle/machinery and sustainable travel: Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable.
- Operating vehicle/machinery and sustainable travel: Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Operating vehicle/machinery and sustainable travel: Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Operating vehicle / machinery and sustainable travel: Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long-haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)
- Operating vehicle/machinery and sustainable travel: Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Operating vehicle/machinery and sustainable travel: Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
- Operations: Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Operations: Ensure an adequate water supply on the Site for effective dust / particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Operations: Use enclosed chutes and conveyors and covered skips.
- Operations: Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Operations: Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- Waste management: Avoid bonfires and burning of waste materials.

The IAQM's Guidance states that the following measures are highly recommended or desirable as mitigation for all high risk sites in relation to earthworks:

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.

- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

The IAQM's Guidance states that the following measures are highly recommended or desirable as mitigation for all high risk sites in relation to construction:

- Avoid scabbing (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent the escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

The IAQM's Guidance states that the following measures are highly recommended or desirable as mitigation for all low risk sites in relation to trackout:

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

Step 3 Summary:

The site is considered a "High Risk Site" overall and a Dust Management Plan is recommended incorporating a number of specific mitigation measures based on the site-specific risks.

10.5. Step 4 – Determining Significant Effects

The site is considered a *"High Risk Site"* overall and if appropriate mitigation measures are put in place, as identified in Step 3, significant effects on receptors are unlikely to occur. Considering both the construction details and the specific characteristics of the site, it is anticipated that effective mitigation will be possible and residual effects will not be considered significant.

Step 4 Summary:

With risk appropriate mitigation, residual effects will not be considered significant.

10.6. Step 5 – Dust Assessment Report

Step 5 Summary:

Dust and other pollutant emissions from the construction, demolition, earthworks and trackout phases of the construction of the proposed development will see the site designated a "High Risk Site". However, with risk-appropriate mitigation, residual effects will not be considered significant.

11. MITIGATION

As a consequence of the proposed development, there will not be a significant increase in pollutant concentrations and therefore mitigation is not seen to be necessary, other than those routinely used to control construction dust, as detailed in the previous section. In addition, the ecological impacts on the River Usk SAC and, to a lesser extent, the Severn Estuary SAC cannot be ruled out. This is assessed further within the Ecological Impact Assessment and Habitat Regulations Assessment Reports prepared by Wardall Armstrong..

12. CONCLUSIONS & SUMMARY

An air quality assessment has been undertaken in accordance with the Department of Environment, Food and Rural Affairs' (Defra) current *Technical Guidance on Local Air Quality Management (LAQM) (TG16)* and addresses the effects of air pollutant emissions from traffic using the adjacent roads, and emissions associated with the development of the site. In addition, a risk-based assessment of the likely impact of construction on the air quality of the local environment has been conducted in accordance with the Institute of Air Quality Management's 2014 edition of the *Guidance on the assessment of dust from demolition and construction.*

In order to assess the impact of the proposed development on local air quality, the IAQM/EPUK Guidance *Land-Use Planning & Development Control: Planning for Air Quality* has been utilised. The assessment has shown that due to limited traffic generation, as well as a flue design that disperses pollutants before they reach sensitive receptors, the impact of emissions from the proposed development is considered to be *"negligible*". It is considered based on the proposed design scheme that emissions associated with the operational phase (i.e. dust from manufacturing processes) will be captured and filtered within the indoor premises.

The impacts on European designated ecological sites from the industrial processes emitted from the four flues cannot be screened out and further assessment by an ecologist will be required.

Pollutant concentrations on-site have not been explicitly modelled due to a lack of proposed high sensitivity receptors; however given the low regional background concentrations, distance from highly trafficked roads, and height of nearby industrial flues to encourage dispersion, it is highly unlikely that on-site pollutant concentrations would exceed either long or short term air quality objectives.

With regards to the impacts of construction on air quality, dust and other pollutant emissions from the construction and demolition phases of the construction of the proposed development will see the site designated a "*Medium Risk Site"*. However, with risk-appropriate mitigation, residual effects will not be considered significant.

It has been shown that the proposed development meets the guidance contained within *Technical Guidance on Local Air Quality Management (LAQM) (TG16),* IAQM/EPUK's *Land-Use Planning & Development Control: Planning for Air Quality* and IAQM's *Guidance on the assessment of dust from demolition and construction*.

Appendix 1
Glossary of Terms

Appendix 1: Glossary of Terms

Air Quality Standard/Air Quality Objective: The concentrations of pollutants in the atmosphere, which can broadly be taken to achieve a certain level of environmental quality. The standards are based on an assessment of the effects of each pollutant on human health including the effects on sensitive subgroups.

Annual mean: The average of the concentrations measured for each pollutant for one year. In the case of the Air Quality Objectives, this is for a calendar year.

Air Quality Management Area (AQMA): An area that a local authority has designated for action, based upon predicted exceedances of Air Quality Objectives.

Concentration: The amount of a (polluting) substance in a volume (of air), typically expressed as a mass of pollutant per unit volume of air (for example, microgrammes per cubic metre, µg/m^3) or a volume of gaseous pollutant per unit volume of air (parts per million, ppm).

Exceedance: A period of time where the concentration of a pollutant is greater than the appropriate Air Quality Objective.

Nitrogen Oxides: Nitric oxide (NO) is mainly derived from road transport emissions and other combustion processes such as the electricity supply industry. NO is not considered to be harmful to health. However, once released into the atmosphere, NO is usually very rapidly oxidised to nitrogen dioxide (NO_2), which is harmful to health. NO_2 and NO are both oxides of nitrogen and together are referred to as nitrogen oxides (NO_x).

Particulate Matter: Fine Particles are composed of a wide range of materials arising from a variety of sources including combustion sources (mainly road traffic), and coarse particles, suspended soils and dust from construction work. Particles are measured in a number of different size fractions according to their mean aerodynamic diameter. Most monitoring is currently focused on PM_{10} (less than 10 microns in diameter), but the finer fractions such as $PM_{2.5}$ (less than 2.5 microns in diameter) is becoming of increasing interest in terms of health effects.

µg/m^3 microgrammes per cubic metre of air: A measure of concentration in terms of mass per unit volume. A concentration of 1 µg/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

Appendix 2
Air Quality Model

Appendix 2: Air Quality Model

ADMS-Roads

In the UK, the Department for Environment, Food & Rural Affairs (Defra) provides guidance on the most appropriate methods to estimate pollutant concentrations for use in Local Air Quality Management (LAQM). Defra regularly updates its Technical Guidance, with the latest LAQM Technical Guidance TG16 published in 2016.

The methodology in TG16 directs air quality professionals to a number of tools published by Defra to predict and manage air quality. One of the main tools for modelling air pollutants is ADMS-Roads, which is a refined air dispersion model produced by Cambridge Environmental Research Consultants. ADMS-Roads has been specifically developed for use with UK roads and as such is considered to be one of the most appropriate tools for use in UK air quality modelling and therefore is widely used in the UK.

ADMS-Roads is an air dispersion modelling suite that predicts the air quality impacts of nitrogen dioxide, particulate matter and other inert pollutant concentrations from moving and idling motor vehicles at or alongside roads and junctions.

The methodology utilised by ADMS-Roads is significantly more advanced than that of most other air dispersion models, such as CALINE, which Breeze Roads is based upon, which is the other commonly used detailed air dispersion model in the UK. ADMS-Roads incorporates the latest understanding of the boundary layer structure and goes beyond the simplistic Pasquill-Gifford stability categories method used in other dispersion models and utilises the Monin-Obukhov length for greater accuracy. The model also uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

Unlike the 'DMRB Screening Method', ADMS-Roads can take into account annualised meteorological data; it can take into account source, receiver and terrain heights; canyon effects can be modelled, and the model can calculate hourly concentrations.

TG16 provides detailed guidance on the modelling of air pollutants and in particular highlights a procedure to validate models. The procedure discusses the comparison of modelled results against measured levels, either from diffusion tubes (for NO_2) or continuous monitors (for NO_2 or PM_{10}).

Model verification and subsequent adjustment for oxides of nitrogen is undertaken based upon NO_X as most models (including ADMS-Roads) predict NO_2 based upon its relationship to NO_x. Consequently, the verification process requires conversion to NO_x of any measurements of NO_2 in order to compare against modelled levels of NO_x.

Defra has published in 2009 a methodology to calculate NO_x from NO_2 and as part of its LAQM toolkit[2]. The calculation method allows local authorities and air quality consultants to derive NO_2 and NO_x wherever NO_x is predicted by modelling emissions from roads. The calculation method incorporates the impact of expected changes in the fraction of NO_x emitted as NO_2 (f – NO_2) and changes in regional concentrations of NO_x, NO_2 and O_3.

[2] http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

Background concentrations for various pollutants are published and updated regularly by Defra, so it is possible to calculate the contribution of NO_x from road traffic at a particular location. If the ratio of the monitored road traffic contribution to the modelled road traffic contribution of NO_x is calculated, this factor can be applied to the component derived from road traffic emissions for any predictions of NO_x in the area. Therefore, it is possible to validate the model such that predictions should be within 10% of air quality measurements.

Appendix 3
Modelling Procedure and Input Data

Appendix 3: Modelling Procedure and Input Data

The following Appendix summarises the input data and assumptions used in the modelling of air pollutants.

Model Input Data

Traffic flows in the vicinity of the site have been attained from the Department for Transport's traffic database for the year 2017. High traffic growth factors have been applied to this data to predict traffic flows for the proposed opening year (2021).

Since lower traffic speeds increase emissions from vehicles, it is necessary to take into account the reduction in traffic speeds around junctions. TG16 suggests that *"there is no simple factor that can be applied to the average speed to calculate a speed applicable to congested periods"* and that one should exercise professional judgement when taking into account congestion and decreasing speeds around junctions. However, in the absence of any more detailed site-specific information, TG16 does suggest that that *"For a busy junction, assume that traffic approaching the junction slows to an average of 20kph …(for) approach distances of approximately 25m"*. This is the approach adopted at this site.

Input road links, traffic flows, the percentage of Heavy Goods Vehicles (HGVs) and traffic speeds are shown below.

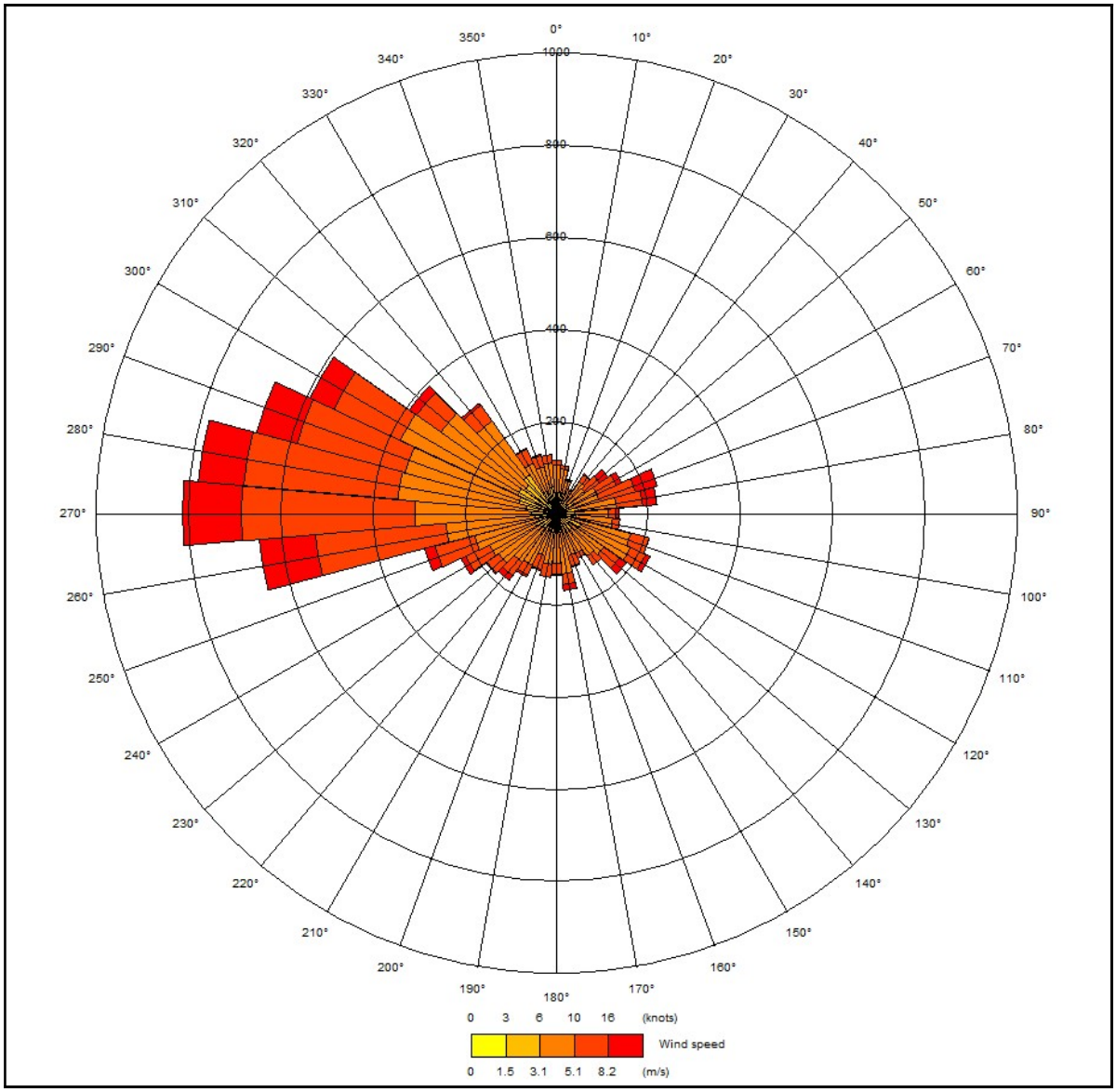
Model Input Data

Road	AADT 2017	AADT 2021	AADT 2021 + Development Traffic	% HGV	Speed km/h
A48 80	29110	30896	31025	6.9	80
A48 48	29111	30897	31025	6.9	48
A48 20	29112	30898	31025	6.9	20
A48 48 2	29113	30899	31025	6.9	48
A48 64	29114	30901	31025	6.9	64
Alexandra Road 20	5000	5307	5342	3.0	20
Alexandra Road 48	5000	5307	5342	3.0	48

Meteorological Data

TG16 suggests that a single year's meteorological data will be sufficient to predict air pollution concentrations. Meteorological data was obtained for the nearest meteorological station to the proposed development site, which is situated at Cardiff Rhoose Airport. The meteorological data consists of hourly sequential data of wind speed, wind direction, surface temperature, precipitation rate and cloud cover data. This data was used for both model verification and future year scenarios. The figure below shows the wind rose data used in the modelling.

Wind Rose – Cardiff Rhoose Airport



Advanced Modelling Parameters

The following modelling parameters have been used in the ADMS-Roads Model:

Parameter	Value	Justification
Latitude	51.5 ˚	Latitude of site
Surface Roughness Note 1	0.3 m	Between parkland and agricultural roughness
Minimum Monin-Obukhov Length	30 m	Recommended for mixed industrial zones
Surface Albedo	0.23	The default for non-snow-covered ground
Priestley-Taylor Parameter	1.0	Model default

Note 1: The same surface roughness has been applied to both the dispersion site and the meteorological measurement site, as both are considered to be located in similar environments.

Background Concentration of Air Pollutants

The only background monitoring carried out in Newport is carried out within 100 m of the M4 Motorway and is therefore not considered truly representative of background concentrations for air quality modelling purposes. Background concentrations of air pollutants for the modelling were instead obtained from the UK National Air Quality Information Archive, in accordance with Local Air Quality Management Technical Guidance TG16. The background values at the receptors modelled are shown in the table below.

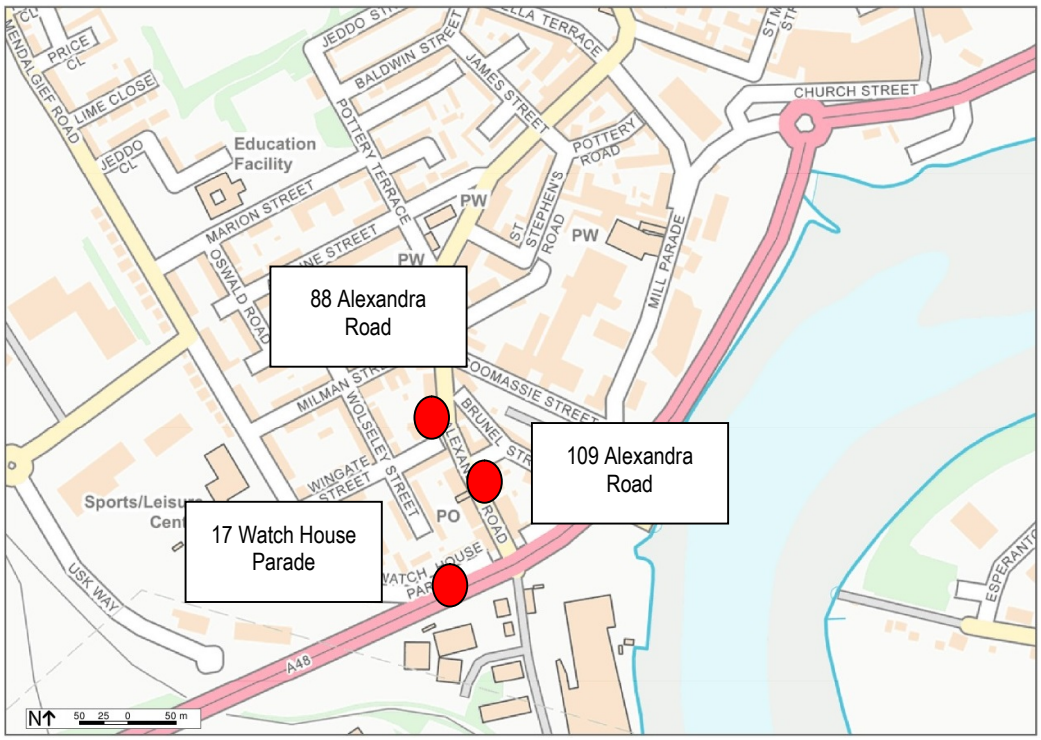
Receptors	Grid Square	Background Concentration (µg/m³)			
		NO_X	NO_2	PM10	PM2.5
17 Watch House Parade, Newport	331500, 186500	23.22	16.51	13.29	8.81
109 Alexandra Road, Newport					
88 Alexandra Road, Newport					
West Nash Farm, Nash, Newport	333500, 183500	13.65	9.70	11.17	7.44
2 The Bungalows, Farmfield Lane, Nash, Newport	334500, 183500	12.38	8.80	10.91	7.33

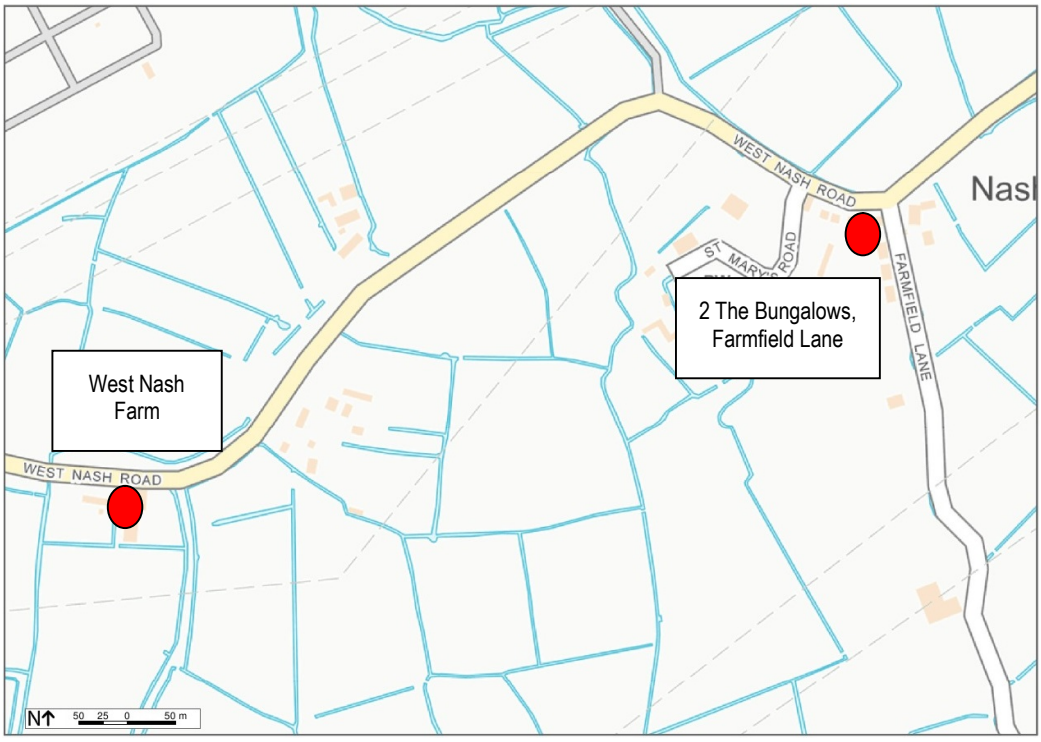
In order to avoid 'double counting', major road sources within the grid square identified were removed from the total background as they have been explicitly modelled as part of the assessment.

The above background concentrations have been used in all modelling scenarios (current and future) in order to show a worst-case scenario, i.e. future concentrations assuming that background levels stay constant and do not decrease as expected.

Receptor Locations

The plans below shows the locations of the sample sensitive receptor locations used within the modelling:

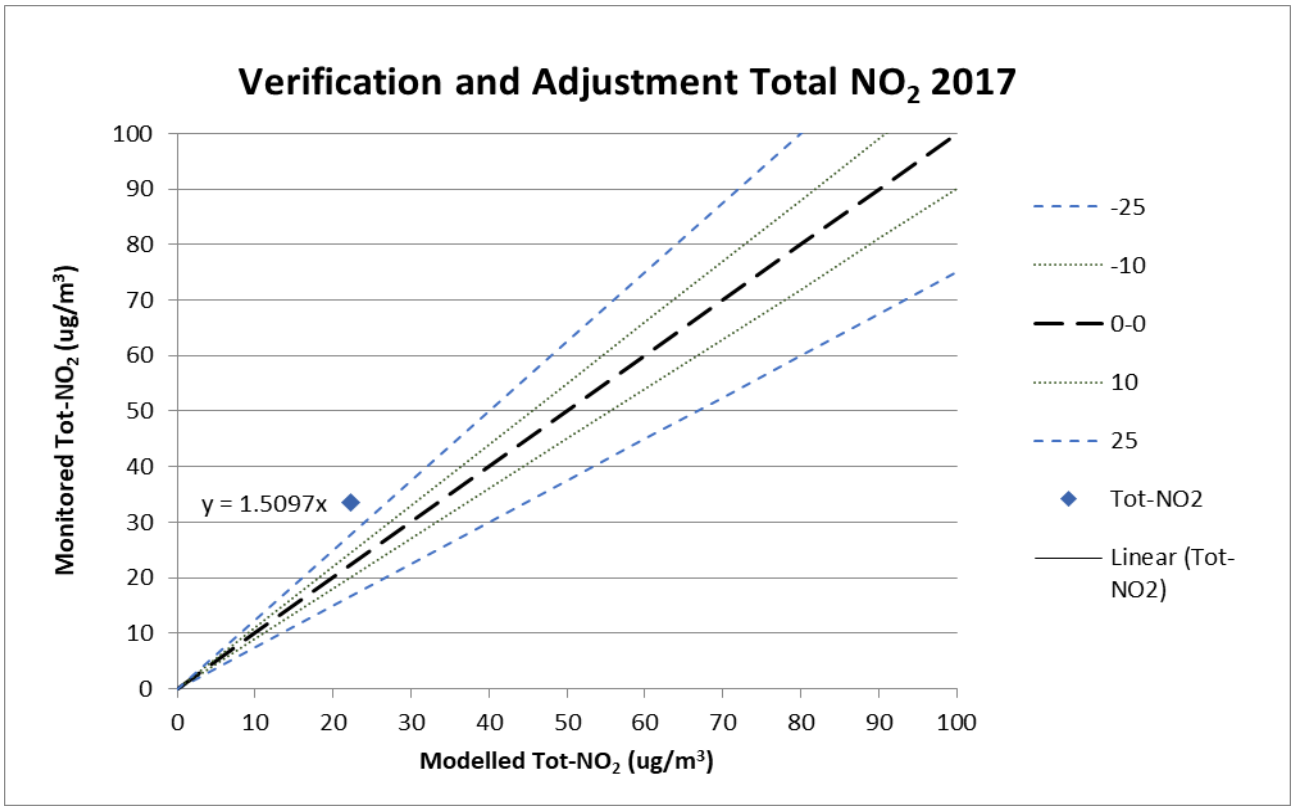


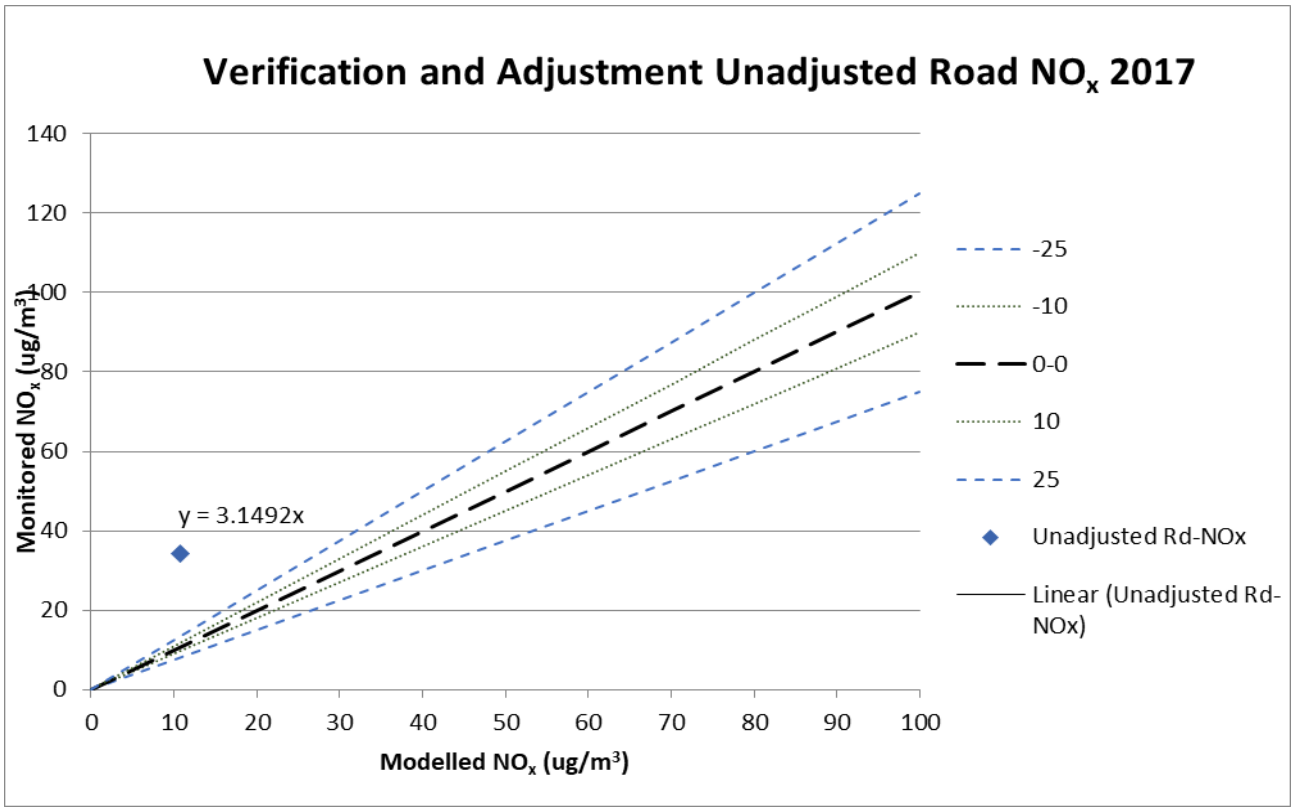


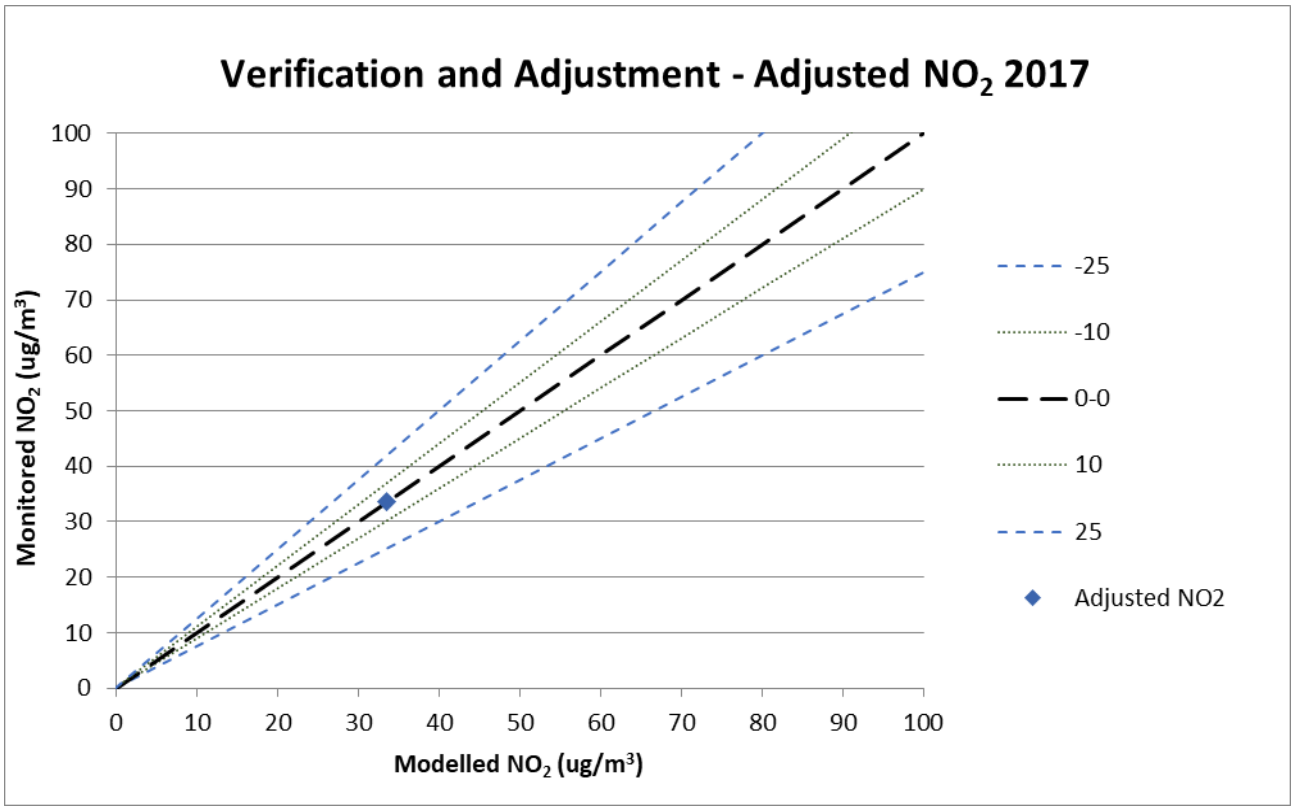
Verification and Adjustment

Verification of the air pollutant model was carried out in accordance with LAQM Technical Guidance TG16 using the data from the diffusion tube located in the vicinity of the site for 2017. The exercise required the modelling of the diffusion tube location for 2017 and comparing the modelled results with the monitoring results. The verification data is summarised below and shows that pollutant concentrations where under predicted using the model; therefore, an adjustment factor of 3.1492 was applied to the model contribution of NO_x.

	Modelled Rds NO_x	Modelled Tot-NO_2	Monitored Tot-NO_2	%Diff Mod/Mon Tot-NO_2	Modelled Rd-NO_x	Monitored Rd-NO_x	NO_x ADJ Corr1	Adj Mod Rd-NO_x	Adj Mod Tot-NO_2	Monitored Tot-NO_2	%Diff Mod/Mon Adj Tot-NO_2
NCC55 - 116 Alexandra Road	10.83	22.19	33.5	-33.76	10.83	34.1	3.15	34.10	33.5	33.50	0.00


Verification and Adjustment Total NO2 2017
Monitored Tot-NO2 (ug/m3)
Modelled Tot-NO2 (ug/m3)
y = 1.5097x
-25
-10
0-0
10
25
Tot-NO2
Linear (Tot-NO2)


Verification and Adjustment Unadjusted Road NOx 2017
Monitored NOx (ug/m3)
Modelled NOx (ug/m3)
y = 3.1492x
-25
-10
0-0
10
25
Unadjusted Rd-NOx
Linear (Unadjusted Rd-NOx)


Verification and Adjustment - Adjusted NO2 2017
Monitored NO2 (ug/m3)
Modelled NO2 (ug/m3)
0
10
20
30
40
50
60
70
80
90
100
-25
-10
0-0
10
25
Adjusted NO2

Model Uncertainty

TG16 recommends the use of statistical parameters to assess uncertainty in the verified model. The table below describes the three parameters it recommends and the corresponding value for the verified model at this site.

Parameter	Value	Description
Correlation Coefficient	1.0	Used to measure the linear relationship between predicted an observed data. The ideal value (an absolute relationship) is 1.
Root Mean Square Coefficient	0.0	RMSE defines the average error/uncertainty of the model verification and is in the same units as the model outputs (µg/m^3). Values should be <10µg/m^3 or ideally <4µg/m^3 where concentrations are near the AQO. The ideal value is 0µg/m^3.
Fractional Bias	0.00	Identifies if the model shows a systematic tendency to over/under predict concentrations. The ideal value is 0 and range between +/- 2. Negative values suggest an over prediction whilst positive values suggest under prediction.

TG16 notes that the Correlation Coefficient is a less reliable indicator when validating with a small dataset; therefore, for sites such as this validated with smaller datasets, the Root Mean Square Coefficient is the main parameter used. However, as the model has only been verified against one monitoring location, all statistical parameters are, by default, ideal. This hides a level of uncertainty in the model which is impossible to quantify given the lack of additional data points with which to verify the model. The model should very accurately predict concentrations in the vicinity of the monitoring location and given the proximity of the proposed development site to this location, the conditions at the proposed site are expected to be representative and the level of uncertainty is expected to be low. The model has been robustly built with particular consideration given to the distances between roads and the monitoring/receptor locations.

PM_{10} Exceedances

The number of exceedances of 50 µg/m^3 as a 24-hour mean PM_{10} concentration has been calculated from the modelled total annual mean concentration following the relationship advised by Defra:

$A = -18.5 + 0.00145 B^3 + 206/B$

where A is the number of exceedances of 50 µg/m^3 as a 24-hour mean PM_{10} concentration and B is the annual mean PM_{10} concentration.