REPORT NO 70018501-004

ROCKFIELD FARM STRATEGIC DEVELOPMENT SITES

AIR QUALITY ASSESSMENT

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AIR QUALITY ASSESSMENT

Monmouthshire County Council

Final Version 2

Project no: 70018501
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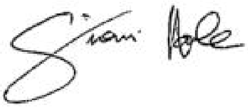
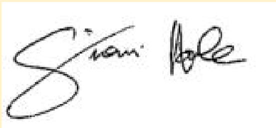
Signature				
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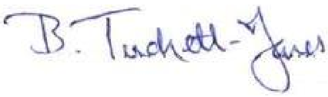
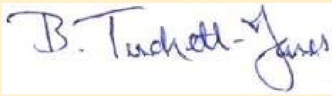
Signature				
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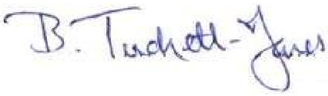
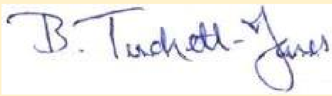
Signature				
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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

1.1.1 WSP | Parsons Brinckerhoff was commissioned to undertake an air quality assessment for the proposed development at the Rockfield, Magor.

1.1.2 Air quality across Monmouthshire is currently good, although small pockets of poor air quality exist. Monmouthshire County Council (MCC) has declared Air Quality Management Areas (AQMA) within Usk and Chepstow, although the proposed development will not affect these AQMA.

1.2 METHODOLOGY

1.2.1 Impacts during construction of the development were assessed using a qualitative risk based approach, considering the likely magnitude of dust generating activities and their proximity to local sensitive receptors.

1.2.2 The impacts of the operation of the proposed development at Rockfield were investigated using detailed dispersion modelling for NO_2 based on modelled traffic flows for the baseline scenario (2016), and future year scenarios (2018 and 2026). The impacts were assessed by comparing the future year with development scenario with the without development scenario for the same year. In addition, a scenario was modelled including the impacts of the proposed improvements to the M4 – specifically, the “Corridor Around Newport” (CAN) extending from J29 to J23.

1.2.3 The study area for the assessment covered Magor and Undy, including the M4 from J23 to J23A. Air quality was modelled at sensitive receptors in the study area, selected to be representative of existing residential properties and future properties on the proposed development site.

1.3 ASSESSMENT FINDINGS

1.3.1 There is a risk of dust impacts during construction of the development, but these can be mitigated through the implementation of a Dust Management Plan, and no significant effects are anticipated.

1.3.2 The operation of the proposed development results in an increase in pollutant concentrations across the entire study area. However, no exceedances of any air quality objectives for NO_2 (human health) or NO_X (ecosystem health) were modelled at existing or future sensitive receptors. As a result, no significant health or ecological effects are anticipated with the development, whether or not the M4 relief road is operational.

1.4 CONCLUSIONS

1.4.1 The development is compliant with all national and local planning policies in relation to air quality.

2 PROJECT BACKGROUND

2.1 INTRODUCTION

2.1.1 WSP|Parsons Brinckerhoff (WSP|PB) has been commissioned by Monmouthshire County Council (MCC) to undertake an air quality assessment in support of the Planning Application for the development of Rockfield Farm, Magor/Undy as a Mixed-Use site (Figure 1).

2.1.2 The proposed development consists of the following:

- 266 residential properties
- 5,575m^2 of employment (B1) land-use
- New access road from the B4245 near Rockfield Grove

2.1.3 The assessment undertaken in this report considers the traffic impacts from 345 housing units and 5,575 employment (B1) land use, and is therefore considered robust.

Figure 1: Site location and indicative boundary

2.1.4 The development has the potential to affect ambient air quality through the generation of dust and particulate matter during construction and through increased emissions from vehicles on the local road network during operation. The development does not include any provision for site-wide energy generation and, as such, impacts are only likely to arise from changes to road transport.

2.2 SCOPE

2.2.1 The air quality assessment has the following scope:-

- An assessment of baseline air quality in the vicinity of the development site

- A qualitative assessment of the impacts of the construction of the proposed development on dust and particulate matter
- A quantitative assessment of the impacts of the development on future air quality, taking into consideration the traffic generated by the development
- A screening assessment of the development impacts with the operation of the M4 Relief Road (Corridor Around Newport (CAN))

2.2.2 The redline boundary set out in Figure 1 has been taken as the extent of the site and is considered as the area in which members of the public might be regularly present (and exposed to air pollution) in the future.

3 LEGISLATION AND POLICY CONTEXT

3.1 INTRODUCTION

3.1.1 Action to manage and improve air quality in the UK is driven by a combination of European (EU) and national legislation:

EU Legislation	The EU ambient air quality directive sets legally binding limits for the concentration of certain pollutants in outdoor air. The directive requires EU member states to meet these standards in the shortest possible time. Responsibility for meeting the limit values is the responsibility of the Secretary of State in England and Defra co-ordinates assessment and air quality plans for the UK as a whole
UK Regulations	The UK has developed a national Air Quality Strategy that sets objectives for the concentration of pollutants in outdoor air. **Local Authorities** are required to review air quality in their area and to designate air quality management areas with associated air quality action plans if improvements are necessary

3.1.2 The UK government has published an Air Quality Strategy (AQS)[1] which sets out air quality objectives and policy options to further improve air quality from today into the long term. The air quality objectives are policy targets, expressed as a maximum ambient (outdoor) concentration not to be exceeded, either without exception or with a permitted number of exceedences within a specified timescale. The aim of the AQS is to achieve steady improvement in air quality over the objective implementation time scales. The AQS air quality objectives were set into regulation in the Air Quality (Wales) Regulations 2000[2] and Air Quality (Amendment) (Wales) Regulations 2002[3].

3.1.3 European Union air quality directives set limit values for the concentration of pollutants in air. These are comparable with the objectives. However, in contrast to the objectives, which are policy targets only, the limit values are legally binding and were transcribed into law in 2010[4].

3.1.4 The planning system has a major role to play in the management of air quality. The main tiers of the Welsh planning system relevant to this assessment are:

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[1] The Air Quality Strategy for England Scotland Wales and Northern Ireland, Department for Environment, Food and Rural Affairs, July 2007

[2] Statutory Instrument 2000 No 1940 (W.138) Environmental Protection, Wales

[3] Statutory Instrument 2002 No 3182 (W.298) Environmental Protection, Wales

[4] Statutory Instrument 2010 No 1433 (W.126) Environmental Protection, Wales

Planning Policy Wales	Planning Policy Wales provides a set of national planning policies covering economic, social and environmental aspects of development. The policies may be a 'material consideration' deciding planning applications. It is based on a presumption in favour of sustainable development and safeguards the natural environment but does not dictate planning decisions
Local Planning Policy	Local Plans are the documents that set out the local planning authority's vision for development in their area. The Local Plan provides a framework for guidance on individual planning applications and should also safeguard the local environment

3.1.5 With the exception of nationally significant infrastructure projects and planning appeals, local authorities retain responsibility for planning decisions. The local planning authority must determine applications taking a balanced view of various factors including economic, social and environmental considerations.

3.1.6 In relation to air quality, key considerations for the authority include:

- → Will the development affect compliance with national air quality objectives and of EU limit values
- → Will the development result in an overall degradation or improvement in local air quality
- → Will the development interfere with an air quality action plan
- → Will the development introduce or worsen public exposure to poor air quality

3.2 NATIONAL POLICY

3.2.1 Planning Policy Wales (PPW) sets out the Welsh Government's planning policies and how they are expected to be applied. Paragraph 13.10.1 of PPW states that

> "*The planning system should determine whether a development is an acceptable use of land and should control other development in proximity to potential sources of pollution rather than seeking to control the processes or substances used in any particular development.*"

3.2.2 Furthermore, PPW (para 13.12.1) states that

> "*Material considerations in determining applications for potentially polluting development are likely to include….:*
>
> > *the risk and impact of potential pollution from the development, insofar as this might have an effect on the use of other land and the surrounding environment ... particularly if the development would impact on an Air Quality Management Area*
> >
> > *impact on the road and other transport networks, and in particular on traffic generation*"

3.2.3 For the proposed development, this statement demonstrates that its operation should not adversely affect the current compliance with air quality objectives/limit values within Magor and Undy, particularly at roadside locations.

3.2.4 As a principle, para 13.12.3 states

> *"Proposed development should be designed wherever possible to prevent adverse effect to the environment but as a minimum to limit or constrain any effects that do occur."*

3.2.5 This implies that the development should be designed to minimise emissions to air and to minimise exposure to air pollution.

3.3 LOCAL PLANNING POLICY

3.3.1 Monmouthshire County Council's Local Development Plan was adopted in 2014 and contains policies designed to protect the environment and promote sustainable development.

3.3.2 In relation to air quality, the LDP seeks to ensure that the location of new development does not worsen conditions in existing Air Quality Management Areas or result in new ones coming into being.

3.3.3 Specifically, Policy EP1 seeks to prevent development proposals that would result in unacceptable risk or harm due to air, light, noise or water pollution, unless it can be demonstrated that measures can be taken to prevent significant risk.

3.4 AIR QUALITY STANDARDS

3.4.1 The air quality objectives and limit values relevant to this assessment are set out in Table 1. Air quality standards are the concentrations of pollutants in outdoor air that provide zero or minimal risk to human health (or the health of ecosystems). Objectives and limit values are based on the standards but also take account of technical feasibility and practicality.

Table 1: Air quality objectives and limit values

Pollutant	Objective / Limit Value	Averaging Period	Comment
Nitrogen Dioxide	40µg/m^3	Annual Mean	Over a calendar year
	200µg/m^3	Hourly Mean	18 permitted exceedances per calendar year
Particulate Matter as PM_{10}	40µg/m^3	Annual Mean	Over a calendar year
	50µg/m^3	Daily Mean	35 permitted exceedances per calendar year
$PM_{2.5}$	20µg/m^3	Annual Mean	Over a calendar year, to be achieved by 2020. Target value only (not legally binding)

4 METHODOLOGY

4.1 INTRODUCTION

4.1.1 The air quality assessment has been undertaken using the following methodology and guidance:

Phase	Methodology	Guidance
Baseline	Desk study of monitoring undertaken by Monmouthshire County Council and Newport City Council and national mapped data provided by Defra; Detailed dispersion modelling of baseline conditions	LAQM Technical Guidance TG(16)
Construction	Qualitative risk-based assessment based on the likely magnitude of emissions of dust and the sensitivity of the area to dust and particulate matter impacts	IAQM Guidance on the assessment of dust from demolition and construction (2014)
Operation	Detailed assessment based on dispersion modelling for baseline and future years to identify areas potentially at risk of exceedance of objectives in the future	LAQM Technical Guidance TG(16) IAQM/EPUK Guidance on Land-Use Planning & Development Control: Planning for Air Quality (2015)

4.1.2 The following scenarios have been assessed for the proposed development:

- ***Baseline*** 2015/2016 Existing conditions on site
- ***Construction*** 2018 - completion Construction period of several years
- ***Operation***
  - ***Opening Year*** 2018 Earliest likely occupation
  - ***Full Development*** 2026 Likely time of full occupation (No M4 Relief Road
  - ***With M4 Relief Road*** 2026 Full occupation with M4 Relief Road

4.2 STUDY AREA

4.2.1 The impacts from the proposed development have been assessed at relevant human and ecological receptors.

4.2.2 Exposure to air pollution can lead to adverse impacts on human health. A ‘human receptor’ therefore refers to any location where a member of the public may experience changes in air quality as a result of the proposed development. Following LAQM technical guidance TG(16)[5], impacts need only be assessed where exposure likely over a time period relevant to the air quality standard e.g. façades of residential properties, schools and hospitals are considered locations of relevant exposure in relation to both short term (hourly/daily) and long term (annual) air quality standards whereas other outdoor areas where the public might reasonably be expected to spend one hour of longer e.g. public spaces, bus stations etc may only be relevant in relation to short term exposure.

4.2.3 Ecological receptors are any sites designated for nature conservation with habitats potentially affected by dust soiling and/or nitrogen deposition.

CONSTRUCTION PHASE

4.2.4 During the construction phase, the primary pollutant of concern is particulate matter, due to the nature of the works undertaken at site. According to IAQM guidance, a construction dust 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)

4.2.5 As such, dwellings along the south-west border of the development site have been identified as the human receptors most at risk of exposure to construction dust, due to their proximity to the redline boundary.

4.2.6 During the scoping stage for ecological receptors, the Gwent Levels (Magor and Undy) SSSI was identified as the nearest ecologically significant site. However, the SSSI boundary does not lie within 50m of the site, or 50m of routes used by construction vehicles within 500m of the site entrance. Consequently, an ecological assessment of the construction dust impacts for the site is not required.

OPERATIONAL PHASE

4.2.7 During the operational phase, the primary pollutant of concern is nitrogen dioxide (NO_2) resulting from increased traffic flow. Particulate matter (PM_{10} and $PM_{2.5}$) is also of concern but, in areas where the principal source of pollution is road traffic and background concentrations are well within the air quality standard (as will be demonstrated to be the case at Magor), it is reasonable to scope particulate matter out of the quantitative assessment.

4.2.8 Due to the nature of the development, increased traffic is expected throughout Magor during operation. In accordance with DMRB guidance[6], properties and Designated Sites within 200m of roads affected by the project have been considered. At greater distance from the roadside, impacts can reasonably be expected to be negligible.

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[5] Box 1.1, LAQM TG(16)
[6] DMRB Air Quality Volume 11: http://www.standardsforhighways.co.uk/dmrb/vol11/section3/ha20707.pdf

4.2.9 Human receptors were chosen to be indicative of locations where increased exposure is likely.as a result of the development. The receptors were selected to be representative of both typical and worst case roadside exposure at existing and future receptors.

4.2.10 The Gwent Levels SSSI lies within 200m of the B4245 to the south of the site. As such, ecological receptors, as a transect perpendicular to the roadside, have been chosen in order to assess the impacts of the scheme out to 200m from the road.

4.3 CONSTRUCTION PHASE ASSESSMENT

4.3.1 Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause ‘soiling’ and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

4.3.2 The smaller particles of dust (less than 10µm in aerodynamic diameter) are known as particulate matter (PM_{10}) and represent only a small proportion of total dust released; this includes a finer fraction, known as $PM_{2.5}$ (with an aerodynamic diameter less than 2.5µm). As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles, and can therefore be transported by wind over a wider area. PM_{10} and $PM_{2.5}$ are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health.

4.3.3 An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken using: the relevant assessment methodology published by the IAQM; the available information for this phase of the Proposed Development provided by the Client and Project Team; and, professional judgement.

4.3.4 The IAQM methodology assesses the risk of potential dust and PM_{10} impacts from the following four sources: demolition; earthworks; general construction activities and track-out. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels. Risks are described in terms of there being a low, medium or high risk of potential for dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined.

4.3.5 In addition to impacts on local air quality due to on-site construction activities, exhaust emissions from construction vehicles and plant may also have an impact on local air quality adjacent to the routes used by these vehicles to access the Site and in the vicinity of the Site itself. As information on the number of vehicles and plant associated with the construction phase was not available at the time of writing, a qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:

- → The number and type of construction traffic and plant likely to be generated by this scale of development;
- → The number and proximity of sensitive receptors to the Site and along the likely routes to be used by construction vehicles; and
- → The likely duration of the construction phase and the nature of the construction activities undertaken

4.3.6 The criteria and dust assessment are provided in **Appendix B**.

4.4 OPERATIONAL PHASE ASSESSMENT

MODELLING OVERVIEW

4.4.1 Impacts during operation were assessed using the ADMS Roads detailed dispersion model (v4.0.2). The model uses information regarding traffic flows on the local road network, surface roughness, and local meteorological conditions to predict pollutant concentrations at specific receptor locations.

4.4.2 Of the pollutants included in the AQS, only concentrations of NO_2 have been considered in relation to operational impacts. Road traffic is the major source of this pollutant in the study area and it is the only metric at risk of exceeding the objective.

4.4.3 Detailed traffic data for the development were provided, by the WSP| Parsons Brinckerhoff transportation team for a selection of roads within the vicinity of the site. As such, the spatial extent of the air quality modelling reflects the extent of the traffic assessment undertaken by WSP| Parsons Brinckerhoff. Traffic data were supplied in the form of Annual Average Daily Traffic and percentage of Heavy Goods Vehicles for significant links in the proximity of the development, and included projected traffic from nearby committed developments for the future year scenarios. The full traffic dataset has been included within Appendix A of this report.

4.4.4 Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data for the study were obtained from the Met Office observing station at Cardiff Airport in 2015. This station is considered to provide representative data for the assessment since it is representative of conditions in south-east Wales.

4.4.5 In January 2016, Air Quality Consultants Ltd (AQC) published a report on emissions of nitrogen oxides from modern diesel vehicles[7]. The report provided a summary of the latest monitoring of emissions from Euro 5/V and Euro 6/VI diesel cars and heavy duty vehicles undertaken by, amongst others, TU Graz, TNO, Transport for London, University of York and Emissions Analytics, together with a recommended approach to take into account future trends in emissions The monitoring studies included on-road tests, with emissions monitored in the tail pipe and using remote sensing and, therefore, take into account real world driving conditions. The key messages from the report were:

- Euro 6 diesel cars, on average, perform significantly better than earlier vehicles, achieving 50% to 70% reductions in comparison to Euro 5.
- Over all drive cycles, Euro 6 diesel cars emit, on average, 3.9 times the emission standard
- There is good evidence that Euro VI engine emissions for heavy duty vehicles are consistently better than those for Euro V and earlier vehicles.

4.4.6 In addition, the Department for Transport (DfT) published their own evidence on vehicle emissions testing in April 20168, which also indicates that Euro 6/VI vehicles will emit considerably less than Euro 5/V vehicles.

4.4.7 Furthermore, whilst there is no robust evidence currently available in relation to the impact of improved and more stringent vehicle emissions testing (Real Drive Emissions, RDE), both the

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[7] Emissions of Nitrogen Oxdies from Modern Diesel Vehicles, Jan 2016, Air Quality Consultants Ltd
[8] https://www.gov.uk/government/publications/vehicle-emissions-testing-programme-conclusions

AQC and DfT reports make clear that it is reasonable to expect the introduction of Euro 6c (vehicles subject to RDE test cycle) will further reduce fleet average emissions from Euro 6 vehicles in relation to current levels.

4.4.8 Taking this evidence base into account, vehicle emission factors for this assessment were taken from the Calculator Using Realistic Emissions for Diesels (CURED)9 version 1A, published in 2016 by Air Quality Consultants Ltd (AQC).

4.4.9 The AQC CURED approach recommends that two sets of model runs are completed. In the first set of runs, vehicle emissions are allowed to decrease in line with national forecasts, as projected by Defra's Emission Factor Toolkit (EfT v 6.0.2). A second set of runs should then be undertaken using emissions from the CURED calculator in which emissions from Euro 6 vehicles are adjusted (increased) to reflect current emissions monitoring data. These model runs represent the best likely and worst likely cases for future vehicle emissions. The most likely scenario for emissions sits between these two cases. To ensure a conservative assessment, for the proposed development, only the results from the CURED sensitivity model runs are reported. Impacts modelled using the national forecasts are negligible everywhere.

4.4.10 This approach to modelling future vehicle emissions factors is robust in that it provides an upper limit on the potential range of future concentrations that is not overly pessimistic. That is to say, it is based on the latest available data relating to monitored emissions from Euro 6/VI vehicles rather than arbitrary assumptions.

4.4.11 Background pollutant concentrations for the modelling were taken from the national maps provided on the Defra website and adjusted in accordance with the CURED approach. Background concentrations were used with the contribution from major roads removed since these are explicitly modelled.

4.4.12 Existing human receptors were chosen to be a representative sample of the residences along each modelled road link, in order to account for variation in traffic throughout the study area. In addition, 5 transects of receptors were modelled across the Rockfield site to assess the air quality likely to be experienced by future occupiers of the development. Finally, a transect of ecological receptors was placed along the section of the Gwent Levels SSSI, perpendicular to and closest to the B4245 through Magor (Newport Road).

4.4.13 Figure 2, below, shows the location of all modelled existing human receptors. The transects modelled across the site are shown in Figure 3. A table of the locations of receptors selected for modelling is included within **Appendix A** of this report.

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[9] Calculator Using Realistic Emissions for Diesels. Available at http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/Deriving-Background-Concentrations-of-NOx-and-NO2-April-2016.pdf.aspx

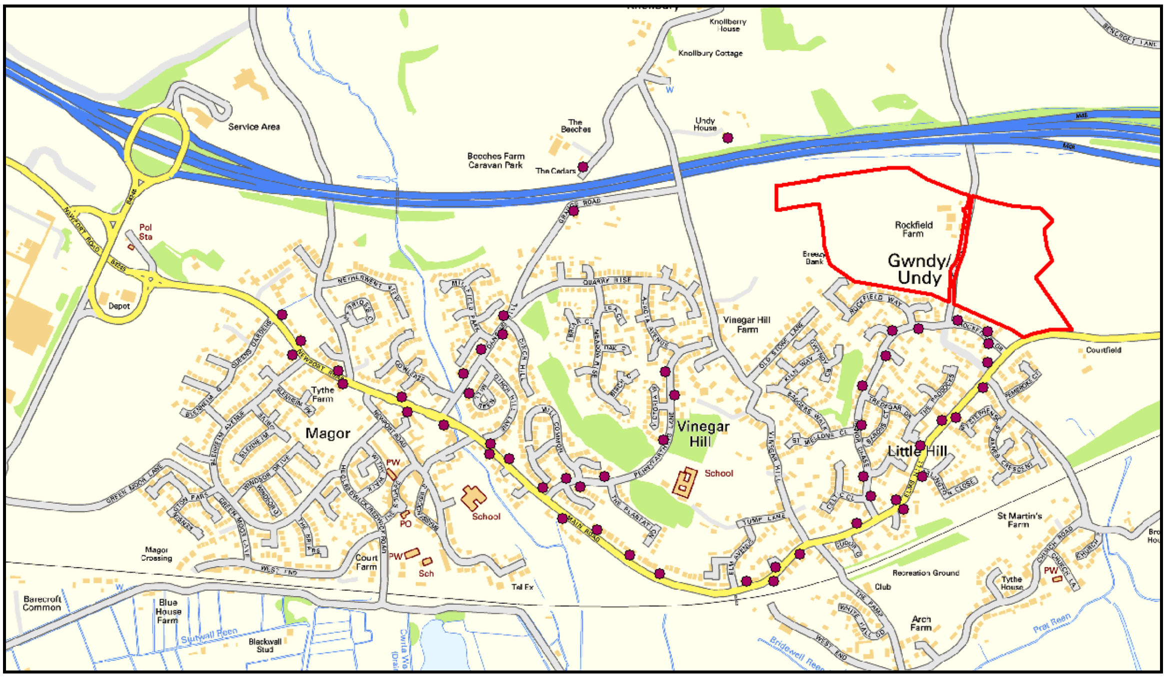

Figure 2: Locations of modelled human receptors.

MODEL VERIFICATION

4.4.14 The ADMS Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. However, in most cases, the validation studies performed by model developers are unlikely to have been undertaken in the area being considered. Therefore, it is necessary to perform a comparison of the modelled versus monitoring results at relevant locations (model verification) whereby development/location-specific uncertainties are investigated and, where possible, minimised. The results of this comparison are included in Appendix A of this Assessment.

4.4.15 The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons:

- Estimates of background concentrations;
- Meteorological data uncertainties;
- Uncertainties in source activity data such as traffic flows and emissions factors;
- Model input parameters such as roughness length, minimum Monin-Obukhov; and overall model limitations; and
- Uncertainties associated with monitoring data, including locations.

In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

4.4.16 To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out. Since no monitoring is undertaken by MCC near Magor, NCC monitoring alongside the M4 in Newport, along with traffic data taken from DfT count points, was used for model verification. Given the dominant impact of traffic on the M4 on air quality at the development site, the NCC monitoring was considered to better represent conditions in the study area than monitoring undertaken by MCC in other towns within their district including Monmouth and Chepstow.

4.4.17 The process of verification aims to minimise modelling uncertainty by correcting modelled results by an adjustment factor to ensure that systematic errors are taken into account. For this assessment, verification was carried out following the methodology specified in Chapter 7, Section 4, of LAQM TG(16).

4.4.18 Details of the verification factor calculations are presented in **Appendix A**. The verification factors were applied to the model road-NOx outputs prior to conversion to annual mean NO_2 concentrations utilising the NO_x to NO_2 calculator (version 4.1, released June 2014) provided by Defra[10].

4.1 M4 CORRIDOR AROUND NEWPORT

4.1.1 The Welsh Government announced the Plan for the M4 Corridor around Newport (CAN) in 2014. This assessment considers the impact of the CAN on air quality in the vicinity of the development, based on the Welsh Government's 2014 modified Preferred Route (TR111). This scheme comprises the construction of a new section of 3-lane motorway between Junctions 23 and 29 (Magor to Castleton), including a new crossing of the River Usk south of Newport. The route corridor of this option is shown in Appendix A of this report.

4.1.2 The impact of the M4 CAN has been included within this assessment as an indicative sensitivity test in the 2026 future year scenario. Traffic flows for this scenario were supplied by the WSP| Parsons Brinckerhoff transport team and include Rockfield Farm and all committed developments.

4.2 SIGNIFICANCE CRITERIA

4.2.1 The consideration of whether the impact of the proposed development on local air quality is significant depends on the magnitude of the impact, the importance of the affected resource or population group (receptors), and the total ambient pollution levels. Even a small impact on a valuable receptor, such as a residential property, may be considered significant, particularly where total pollution levels are already high.

4.2.2 Whilst there are no universally accepted criteria for assessing the significance of air quality impacts, for this assessment the criteria proposed by Environmental Protection UK (EPUK) and IAQM were adopted. The change in concentration is provided as a magnitude of change (imperceptible, very small, small, medium or large) based on the percentage of the relevant air quality objective or limit value (Table 2). The severity of the effect is then assessed in relation to the total predicted pollutant concentration which is, effectively, a measure of the sensitivity of the receptor. Receptor-specific mitigation is considered necessary where an effect of moderate adverse significance or greater is predicted

4.2.3 The EPUK/IAQM guidance notes that the criteria in Table 2 should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement the overall significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- 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.

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10 DEFRA NOx to NO2 Calculator. Available at: http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc

Table 2: Impact severity criteria for air quality impacts from traffic assessed at individual receptors.

Long Term Average Concentration at Receptors in Assessment Year	% Change in Concentration (Magnitude) Relative to Air Quality Assessment Level (AQAL)			
	1% Very Small	2-5% Small	5-10% Medium	>10% Large
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% 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
Notes AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives. When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase. Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.				

4.2.4 The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the severity of impacts. The guidance does not include criteria for determining the significance of the effect on hourly mean NO_2 concentrations or daily mean PM_{10} concentrations. The significance of effects of hourly mean NO_2 and daily mean PM_{10} concentrations arising from the operational phase have therefore been determined qualitatively using professional judgement.

4.2.5 For the qualitative assessment of dust impacts during construction, the criteria proposed by IAQM are used (Table 3). The significance is a function of the sensitivity of the potential receptors for impacts and the scale of risk of the works giving rise to dust effects.

Table 3: Significance criteria for air quality impacts from construction dust

Receptor Sensitivity	Risk of Site Giving Rise to Dust Effects		
	Low	Medium	High
Prior to Mitigation			
Very High	Moderate Adverse	Moderate Adverse	Substantial Adverse
High	Slight Adverse	Moderate Adverse	Moderate Adverse
Medium	Negligible	Slight Adverse	Moderate Adverse
Low	Negligible	Negligible	Slight Adverse
With Mitigation Measures			
Very High	Negligible	Slight Adverse	Slight Adverse
High	Negligible	Negligible	Slight Adverse
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

5 BASELINE AIR QUALITY

5.1 INTRODUCTION

5.1.1 An initial air quality assessment has been undertaken using available monitoring and modelled/mapped background concentrations. To provide site-specific information, baseline dispersion modelling was also undertaken.

5.2 BASELINE MONITORING (LOCAL AUTHORITY DATA)

5.2.1 Air quality across Monmouthshire is currently good, although small pockets of poor air quality exist. MCC currently undertake diffusion tube monitoring within Monmouth, Abergavenney, Usk and Chepstow - with Air Quality Management Areas (AQMAs) declared within Usk and Chepstow[11] for exceedances of the objective for annual mean NO_2. These AQMA will not be affected by the development.

5.2.2 There is no monitoring in the vicinity of the planned development to indicate the current pollution levels at the site; to a degree this provides an initial indication that concentrations are likely to be within air quality objectives. Of the sites monitored by MCC, the nearest available dataset is within Chepstow, along the A48 at Hardwick Hill. Due to both the distance from the site and the exposure environment of the tubes used for this monitoring, these data do not provide a relevant baseline for the air quality at site.

5.2.3 Newport City Council (NCC) undertakes NO_2 monitoring to the west of the site, along the M4 corridor around junction 25A[12]. The baseline data are presented in Table 4, below.

5.2.4 Measured concentrations in 2014 show some exceedance of the air quality objective, specifically at NCC21D/NCC 23E and NCC31 – this is likely due to the proximity of the monitored location to the M4 motorway. The monitored concentrations at the urban background site (NCC 37-39) are well below the air quality objective across all monitored years.

5.2.5 Urban background sites indicate the NO_2 concentration away from the roadside, and provide a conservative estimate of the likely background concentration at the Rockfield site (conservative since the proposed site is currently rural rather than urban in character).

5.2.6 It is acknowledged that the concentrations monitored at roadside locations along the M4 in Newport may also represent an overestimate of concentrations at the Rockfield site. This is due to the likely greater influence of congestion (with elevated vehicle emissions) on the motorway around Newport in comparison to the M4 around Magor. They are, however, included within this report for use in model verification and their use is robust in that they ensure a conservative assessment of the impacts of the proposed development.

[11] Taken from the 2014 Monmouthshire County Council Progress Report for Air Quality: http://www.monmouthshire.gov.uk/app/uploads/2013/06/2014-Progress-Report.pdf

[12] Taken from the 2015 Updating and Screening Assessment for Newport City Council, published February 2016.

Table 4: Summary of NCC NO2 diffusion tube monitoring results in Newport.

Site Id	Location	Site Type	Annual Mean NO_2 Concentration (μg/m^3)					
			2009	**2010**	**2011**	**2012**	**2013**	**2014**
NCC16A	40 Denbigh Road	R	36.02	32.2	35.8	34.8	**40.5**	36.7
NCC21D	M4 Groundhog 1 (Old Barn)	R	-	-	-	-	**55.8**	**58.3**
NCC23E	M4 Groundhog 2 (Old Barn)	R	-	-	-	-	**58.6**	**57.6**
NCC25B	41 Denbigh Road (M4 slip road)	R	-	26.3	28.7	27.8	32.1	29.4
NCC31	Buckland Cottage	F	30.5	34.2	40.0	**40.9**	**45.9**	**43.0**
NCC37	St. Julians School 1	UB	-	23.7	19.4	21.1	24.4	21.5
NCC38	St. Julians School 2	UB	-	24.9	22.1	21.2	23.6	19.7
NCC39	St. Julians School 3	UB	21.5	25.1	23.2	19.3	23.5	21.5
Objective			**40**					

- UB – Urban Background; R – Roadside; F - Facade
- Exceedences highlighted in **bold**

5.3 NATIONAL MAPPED BACKGROUND AIR QUALITY

5.3.1 The background pollutant concentrations were taken from Defra's national modelling. Table 5, below, summarises the background pollutant concentrations for 2015 - 2026. The concentrations are well below the relevant objectives for the protection of both human health and ecosystems, and it is predicted that they will improve over time. This is the result of a predicted overall reduction in emissions from all emission sources from all sectors, both in the UK and in Europe.

5.3.2 Defra's mapped data also include information on the contribution from different emissions sectors e.g. industry, roads etc. Since the contribution from the local road network is implicitly modelled in the dispersion model, the background concentrations used in the modelled are taken from the mapped data with the contribution from local major roads removed. In addition, the background data for use in the modelling are adjusted following the AQC CURED approach[7].

5.3.3 No monitoring for particulate matter is undertaken in the study area. However, Defra's background mapping data indicate that existing concentrations of PM_{10} and $PM_{2.5}$ are well within their respective objectives.

Table 5: Background pollutant concentrations from Defra Mapped Data, shown as a range across the study area.

YEAR	ANNUAL MEAN BACKGROUND CONCENTRATION µG/M3			
	PM10 RANGE	PM2.5 RANGE	NITROGEN OXIDES RANGE	NITROGEN DIOXIDE RANGE
BACKGROUND CONCENTRATIONS (ALL SECTORS)				
2015	14.7 – 16.3	10.0 – 10.8	20.9 – 25.3	15.2 – 18.2
2018	14.3 – 15.9	9.6 – 10.5	18.3 – 21.9	13.5 – 15.9
2026	13.8 – 15.4	9.2 – 10.0	15.0 – 17.9	11.3 – 13.3
BACKGROUND CONCENTRATIONS FOR MODELLING (TRAFFIC SECTOR REMOVED; CURED***)				
2015	-	-	19.1 – 20.9	-
2018	-	-	17.2 – 19.1	-
2026	-	-	15.5 – 17.7	-
Objective/Target	**40 µg/m^{3} ****	**25 µg/m^{3} ****	**30 µg/m^{3} ***	**40 µg/m^{3} ****

- * – For the protection of ecosystems
- ** - For the protection of human health
- *** - These data are as used in the dispersion modelling. The contribution from local traffic sources has been removed and the concentrations adjusted as per CURED approach

5.4 BASELINE MODELLING (PROJECT SPECIFIC)

5.4.1 Modelling of the baseline scenario was undertaken in order to validate modelled data and to establish existing pollution levels in the study area. The results of this modelling are shown in Figure 3, below. The model results are tabulated in Appendix A.

5.4.2 Pollutant concentrations in the immediate vicinity of the motorway are likely to be close to or exceeding the air quality objective for annual mean NO_2. The maximum modelled concentration is 43.6µg/m^3, on Grange Road immediately to the south of the motorway. However, more widely throughout Magor, pollutant concentrations are within or well within the air quality objective.

5.4.3 On the development site, baseline NO_2 levels are generally well within the air quality objective for annual mean concentrations. At its closest approach to the motorway, the maximum modelled concentration is 35.9µg/m^3; within 40m of the northern site boundary, modelled NO_2 concentrations fall to less than 30µg/m^3.

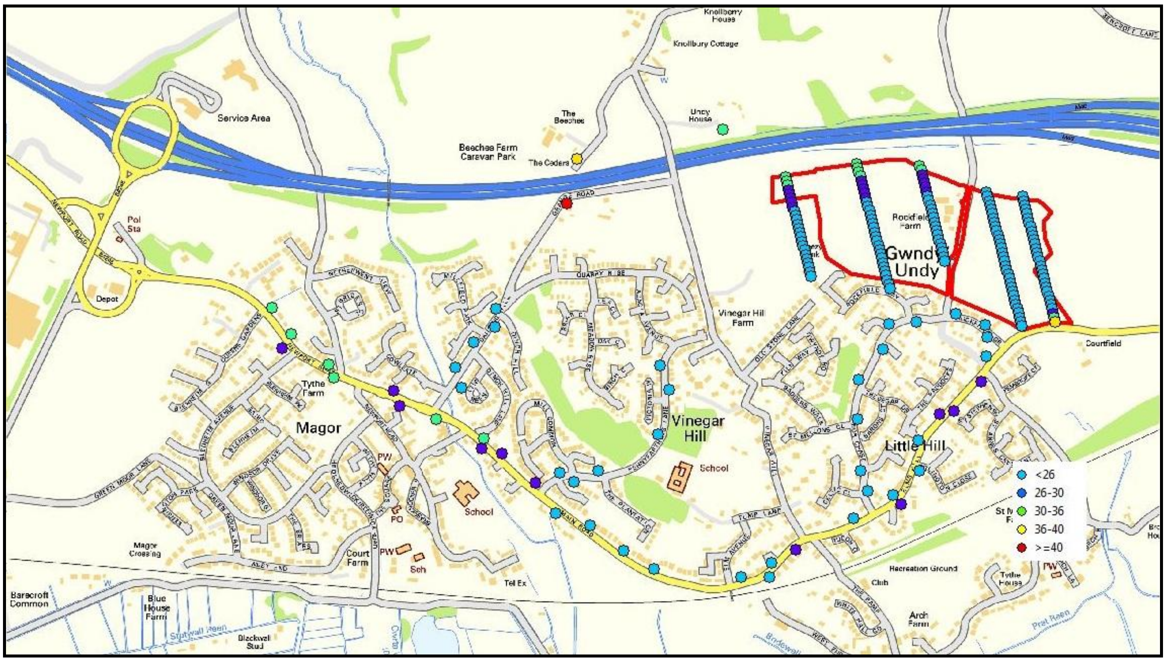

Figure 3: Annual mean NO_2 concentrations at selected receptors throughout Magor in the Base year (2015) scenario. All concentrations shown in the key are in $\mu g/m^3$.

6 ASSESSMENT FINDINGS

6.1 SUMMARY

6.1.1 A summary of the results of the assessment, including all future year modelling, is presented within this section. A complete set of model results is provided in Appendix A.

6.1.2 The results demonstrate that the impacts of the construction and operation of the proposed development on air quality at existing receptors are likely to be negligible everywhere and pollutant concentrations on site are within the air quality objectives.

6.2 CONSTRUCTION PHASE

DUST AND PM_{10} ARISING FROM ON-SITE ACTIVITIES

6.2.1 Construction activities that have the potential to generate and/or re-suspend dust and PM10. include:

- Site clearance and preparation;
- Preparation of temporary access/egress to the development site and haulage routes;
- Earthworks;
- Materials handling, storage, stockpiling, spillage and disposal;
- Movement of vehicles and construction traffic within the development (including excavators and dumper trucks);
- Use of crushing and screening equipment/plant;
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- Construction of buildings, roads and areas of hardstanding alongside fabrication processes;
- Internal and external finishing and refurbishment; and
- Site landscaping after completion.

6.2.2 The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

ASSESSMENT OF POTENTIAL DUST EMISSION MAGNITUDE

6.2.3 The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM10 sources: demolition; earthworks; construction; and, trackout. The findings of the assessment are presented below.

DEMOLITION

6.2.4 As there few existing properties on the site, the potential dust emissions magnitude is considered to be small for demolition activities.

EARTHWORKS

6.2.5 The total area of the proposed development site is more than 10,000m2, the soil type is potentially dusty, and the total material that will be moved is estimated to be more than 100,000 tonnes. It is also estimated that more than 10 heavy earth moving vehicles will be active at any one time. Therefore, the potential dust emission magnitude is considered to be large for earthwork activities

CONSTRUCTION

6.2.6 The total volume of buildings to be constructed on the development will be more than 100,000m3, potentially with site concrete batching and sand blasting activities being undertaken. Therefore, the potential dust emission magnitude is considered to be large for construction activities.

TRACKOUT

6.2.7 Information on construction traffic is unavailable. However, given the scale of the proposed development, it is possible that at the peak of activity there will be more than 50 HDV (>3.5t) outward movements in any one day travelling on potentially dusty, unconsolidated surface materials. Therefore, the potential dust emission magnitude is considered to be large for trackout.

6.2.8 Table 6 provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 6: Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction Activities	Large
Trackout	Large

ASSESSMENT OF SENSITIVITY OF THE STUDY AREA

6.2.9 Given the proximity of residential receptors to the south-western boundary of the site, the sensitivity of the area to dust from earthworks and construction works is considered high. On the assumption that construction plant will leave the site to the south and travel through Magor, onto the B4245, the sensitivity to track-out is lower (Table 7). There are no sensitive ecological receptors within the study area and their sensitivity is, therefore, negligible.

Table 7: Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	High	High	Medium
Human Health	Low	Low	Low	Low
Ecological	Low	Low	Low	Low

RISK OF IMPACTS

6.2.10 The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. Table 8 below provides a summary of the risk of dust impacts for the Proposed Development. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table 8: Summary Dust Risk Table to Define Site Specific Mitigation

POTENTIAL IMPACT	RISK			
	DEMOLITION	EARTHWORKS	CONSTRUCTION	TRACKOUT
Dust Soiling	Negligible	High	High	Medium
Human Health	Negligible	Low	Low	Low
Ecological	Negligible	Negligible	Negligible	Negligible

6.2.11 However, it must be borne in mind that risks will not be high at all times. Specific risks will depend on the activities being undertaken, the location of the activities and prevailing meteorological conditions.

CONSTRUCTION VEHICLES & PLANT

6.2.12 The greatest impact on air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the site access. It is anticipated that construction traffic will access the site via B4245. Due to the size of the site, it is considered likely that the construction traffic will be relatively high in comparison to the existing traffic flows on these roads.

6.3 OPERATIONAL PHASE

6.3.1 As previously discussed, the primary pollutant of concern during the operational phase is NO_2, generated from increased traffic flow about the site. Modelling has taken place at local sensitive receptors, as well as across the development site.

6.3.2 Table 9, below shows a summary of the magnitude and severity of impacts with the proposed development across the assessed human receptors. In both 2018 and 2026, the severity of the impact of the development is negligible everywhere. Furthermore, the magnitude of the impact decreases over time as vehicle emissions improve.

Table 9: Severity and Magnitude of impacts of the proposed development in 2018 and 2026

YEAR	2018	2026
MAGNITUDE		
Imperceptible	18	22
Very Small	22	29
Small	13	2
SEVERITY		
Negligible	53	53
Slight Adverse	0	0
Moderate Adverse	0	0

6.3.3 Table 10, below shows a summary of the impacts of each scenario on pollutant concentrations at the selected receptors. A table of the modelled concentrations at each receptor has been included within Appendix A of this report. In 2018, modelled concentrations are well within the air quality objective at all but a single property in the study area (on Grange Road).

Table 10: Impacts of the proposed development upon the number of human receptors exceeding, at risk of exceeding, and not at risk of exceeding the AAQS, for each assessed scenario.

SCENARIO:	2018		2026		
CONCENTRATION RANGE ($\mu g/m^3$)	DM	DS	DM	DS	DS WITH CAN
Above 40	1	1	0	0	0
38 to 40	0	0	0	0	0
36 to 38	0	0	0	0	0
20 to 36	32	34	15	16	31
Below 20	20	18	38	37	20
Total	53	53	53	53	51*
* Two receptors removed from the assessment of the "with CAN" scenario, due to proposed road layout					

6.3.4 At existing receptors, the impact of the development on the annual mean NO_2 concentration at the most affected receptor is 0. 9µg/m^3 (less than 2.5% of the annual mean Air Quality Standard (AQS) of 40µg/m^3) – on the B4245 in Magor to the south-west of the site access road. This impact occurs where the modelled pollutant concentration is less than 70% of the AQS (27.7µg/m^3 in 2018), resulting in a negligible overall effect.

6.3.5 Figure 4 and Figure 5, below show the distribution of annual mean nitrogen dioxide concentrations at selected receptors throughout Magor, including the transects across the site. In 2018, the maximum modelled annual mean NO_2 is 43.5µg/m^3. At this property, the impact of the development is imperceptible in magnitude (0.1µg/m^3) and of negligible severity. By 2026, concentrations at this receptor are predicted to decrease to 30.3µg/m^3 whilst impacts remain imperceptible and of negligible severity. Overall therefore, no significant effects on human health are expected with the operation of the development.

6.3.6 On site, in 2018, maximum NO_2 concentrations along the site northern boundary are 35.5µg/m^3. Given the conservative nature of the development, the risk of exceedance of the air quality objective on site is low. By 2026, the maximum concentration decreases to 24.9µg/m^3.

6.3.7 Table 11, below shows the impact with the proposed development upon the Gwent Levels SSSI. A table of the modelled concentrations at each receptor has been included within Appendix A. The modelled concentrations are within the relevant air quality objectives in both years. By 30m from the roadside, the impacts of the development are imperceptible in magnitude, i.e. less than 0.3 µg/m^3 for annual mean NO_X and less than 7.5 µg/m^3 for daily mean NO_X. As such, no significant effects on the Gwent Levels will occur with the operation of the development.

6.3.8 The introduction of the CAN results in an increase in pollutant concentration across the site, as well as at existing sensitive receptors, when compared to the do-something scenario without CAN. As previously discussed, the CAN development is not scheduled until 2026, wherein NO_2 concentrations are expected to be considerably lower than at present. As such, there are no modelled exceedences, or risk of exceedences within the red line boundary in either the "with CAN" or "without CAN" do-something scenarios.

6.3.9 Since annual mean NO_2 concentrations are within the air quality objective, no exceedances of the hourly mean objective are expected with the development.

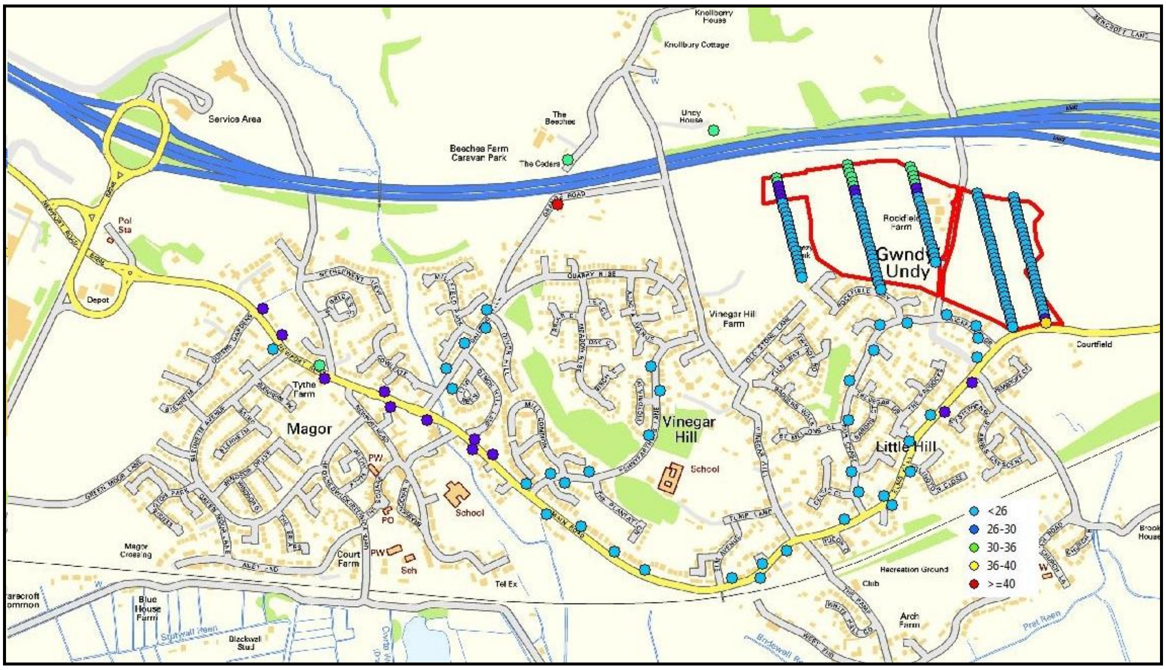

Figure 4: Concentrations at selected receptors throughout Magor in the Do Something (2018) scenario. All concentrations shown in the key are in µg/m^3.

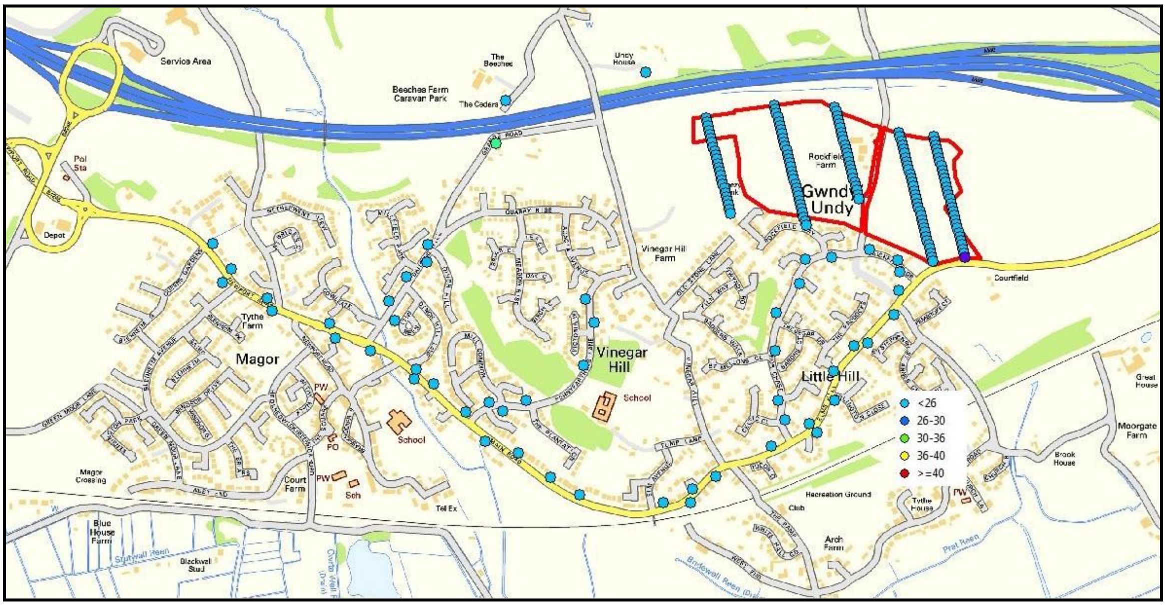

Figure 5: Concentrations at selected receptors throughout Magor in the Do Something (2026) scenario. All concentrations shown in the key are in µg/m^3.

Table 11: Modelled impacts of the proposed development to Annual Mean NOx, Daily Mean NOx and Nitrogen deposition within the Gwent Levels SSSI.

Distance from SSSI boundary	2018		2026	
	Annual Mean NOx (mgm$^{-3)}$	Daily Mean NOx (mgm-3)	Annual Mean NOx (mgm$^{-3)}$	Daily Mean NOx (mgm-3)
Impact of the Development				
0	0.46	2.13	0.27	1.33
5	0.42	2.13	0.25	1.06
10	0.38	1.86	0.23	1.06
15	0.35	2.13	0.21	1.06
20	0.33	1.60	0.20	1.06
25	0.31	1.86	0.18	1.06
50	0.23	1.33	0.14	0.85
100	0.16	1.06	0.10	0.64
200	0.10	0.80	0.06	0.43
Total Pollutant Concentration / Deposition				
0	25.3	69.8	19.8	46.9
5	24.7	67.9	19.5	45.6
10	24.3	66.1	19.2	44.5
15	23.9	64.7	19.0	43.7
20	23.6	63.1	18.8	42.9
25	23.3	62.1	18.6	42.1
50	22.3	57.3	18.0	39.2
100	21.2	51.7	17.3	35.7
200	20.3	45.9	16.8	32.1

6.4 MITIGATION

6.4.1 The high risk of impacts during construction indicates that a dust management plan will be required for the site. It is un-necessary to specify the measures to be included in the plan at this stage, but the focus of the plan should be to reduce impacts on residential properties close to the south-western boundary of the site and to reduce the trackout of dust onto the B4245 through Magor. With mitigation, the significance of any impacts with be slight adverse at worst.

6.4.2 No site-specific air quality mitigation measures are required during operation. However, with the principal impact of the development being traffic related, measures should be developed to encourage sustainable travel.

7 CONCLUSIONS/DISCUSSION

7.1 OVERVIEW

7.1.1 The air quality assessment, based on a desk study of baseline monitoring, detailed dispersion modelling and a qualitative assessment of risks during construction, has demonstrated that air quality is unlikely to place a constraint on the development of the site and that air quality at existing receptors near the site will not be significantly affected by the development

7.1.2 With mitigation during the construction phase, no significant effects are expected.

7.1.3 With reference to the key considerations for the local planning authority, the following conclusions are drawn

- Will the development affect compliance with national air quality objectives and of EU limit values
  - **The development is unlikely to affect compliance with either national or EU standards for air quality. Only a single property has been identified in the study area as being at risk of exceeding air quality standards, and the impact of the development at this location is imperceptible.**
- Will the development result in an overall degradation or improvement in local air quality
  - **The development will have a negligible impact on pollutant concentrations in Magor and Undy. Measures for sustainable travel will further reduce the impacts.**
- Will the development interfere with an air quality action plan
  - **The development will have no impact on any of Monmouthshire's Air Quality Action Plans, since it will not affect an AQMA. Similarly, no significant effects will occur on the M4 corridor and AQMA in Newport.**
- Will the development introduce or worsen public exposure to poor air quality
  - **The development will not worsen or introduce public exposure to poor air quality. In particular, air quality on the site is good.**

In conclusion, therefore, air quality should not present a constraint to the development of the Site.

7.2 CONSTRUCTION DUST ASSESSMENT

7.2.1 The risk of dust soiling effects is largely medium to low risk over the study area, but at a limited number of properties, the risk must be considered to be high due to their proximity to the site and the scale of the works required for the development.

7.2.2 However, it should be noted that dust risk levels will not remain high at all times. Actual risks on any given day will depend on the activities being undertaken, the meteorological conditions and the proximity of receptors to activities with high dust generating potential. This variability is particularly relevant to the Scheme which will not have construction activities across the whole site for the whole construction period. The assessment is therefore conservative and indicative of the maximum potential impact of construction related dust at any given time.

7.2.3 Sensitivity to human health impacts and to ecological receptors during construction is low. This is a result of low background concentrations of PM_{10} (~16µg/m^3 in 2015) and no sensitive ecological receptors close to dust generating activities. Therefore, the risks of impacts on human health are low and on ecology are negligible.

7.3 OPERATIONAL PHASE

7.3.1 Overall, the operation of the development has a negligible effect on air quality within Magor and Undy. The impacts are, at worst, small in magnitude and negligible in severity.

7.3.2 At existing receptors where current nitrogen dioxide concentrations are elevated (near the M4), the impact of the development is imperceptible. At receptors where the impact of the development is at a maximum (small in magnitude, on the B4245 through Magor), the total pollutant concentration is well within the air quality objective and no significant effects are anticipated.

7.3.3 On the development site, concentrations across the site generally fall with increased distance from the motorway. In both 2018 and 2026, there is a very low risk that pollutant concentration on site will exceed the air quality objective for NO_2, even at the northern boundary.

7.3.4 With the development in operation, NO_X concentrations over the Gwent Levels SSSI are within the annual mean and daily mean critical levels. The impact of the development is imperceptible within 30m of the roadside.

7.3.5 The introduction of the CAN results in an increase in pollutant concentration across the site, as well as at existing sensitive receptors when compared to the do-something scenario without CAN. As previously discussed, the CAN development is not scheduled until 2026, wherein NO_2 concentrations are expected to be considerably lower than at present. As such, there are no modelled exceedences, or risk of exceedences within the red line boundary in either the “with CAN” or “without CAN” do-something scenarios.

7.4 DISCUSSION

7.4.1 The air quality assessment of operational impacts has been undertaken using a conservative estimation of future vehicle emissions (the CURED approach). This takes into account the most recent emissions testing of diesel vehicles.

7.4.2 Due to the absence of monitoring data in Magor, it was necessary to use monitoring data alongside the M4 in Newport to verify the dispersion modelling. Since the M4 experiences significant congestion within Newport this may have led to concentrations in the vicinity of the development site to be overestimated. In order to mitigate this uncertainty, it is recommended that a limited duration diffusion tube monitoring be undertaken within the vicinity of the site.

Appendix A

MODEL VERIFICATION AND RESULTS

- Detailed air quality modelling has been undertaken within the study area, using the ADMS-Roads 4.0.1 dispersion model.
- The methodology and input parameters used for the detailed modelling were:
    - o All roads within the study area were digitised from the centreline data provided by OS maps.
    - o Vehicle emissions on each road link were calculated using the CURED worksheet, taken from the Air Quality Consultants website.
    - o Traffic data were taken from Department for Transportation estimates, as AADT.
    - o Annual mean nitrogen dioxide concentrations were calculated, for all scenarios, at the facades of a selection of sensitive (residential) receptors in the Air Quality Assessment and shown in Table A within this appendix.
    - o Meteorological data from Cardiff Airport (Rhoose) for 2015 have been used in the modelling.
    - o Background pollutant concentrations for nitrogen oxides and particulate matter were taken from the Defra mapped data, with the major roads sectors removed, 2015. The 1km x 1km mapped averages were linearly interpolated to the individual receptor locations.
    - o For comparison with the air quality objectives, the conversion of nitrogen oxide (NO_x) to nitrogen dioxide (NO_2) must be taken into account. The modelled NO_x concentrations were converted to NO_2 using the updated methodology and calculator for computing roadside and total nitrogen dioxide. In using the calculator, Monmouthshire has been selected as the relevant local authority and the fraction of nitrogen oxides emitted as primary nitrogen dioxide has been based on the default parameters for All non-urban UK traffic.
    - o The model results for the baseline year in the detailed modelling were verified against monitored data taken from Newport City Council monitoring.
        - ▪ Not all of the available results undertaken by NCC were suitable for the verification process, due to the type of exposure and availability of traffic data on nearby roads.
        - ▪ Diffusion Tubes NCC16A, NCC25B and NCC31 were identified as suitable for model verification, in that sufficient traffic data were available for the nearest significant roads, the distance to the roads were well defined, and there were no direct barriers to pollutant distribution from the centre line of the roads. All other diffusion tube data within the NCC report were considered unsuitable for use in the verification process.
        - ▪ Automatic monitoring sites identified within the NCC report were also considered within the model verification process, however, both of the two sites that were available were discounted:
            - The St. Julians AURN is an Urban Background site
            - Junction 25A M4 is a road side site
    - o All results in the report are presented as verified data. The verification methodology is provided below.
- Dispersion modelling is an inherently uncertain procedure with potential errors in the model output arising from either, or both, systematic or random errors.
    - o Systematic errors occur where a distinct trend is apparent in the model output i.e. a tendency to under or over predict known values. This type of error may arise where emissions have been underestimated, or unrepresentative meteorological data used.

Whilst it is rarely possible to identify a specific reason for the systematic error, the errors can be quantified and allowed for by comparing modelled concentrations against monitored concentrations in order to derive a scaling factor. Monitored data itself has an associated uncertainty. Therefore, in the adjustment for systematic errors, it is best to calculate the scaling factor using the most appropriate monitoring sites in the area.

- Random errors, as the name suggests, do not show a distinct trend and result in a scatter of modelled concentrations about monitored data even after an allowance for systematic error has been made. The degree of uncertainty i.e. random error, in the model results may be estimated by calculating the standard deviation of the verified modelled results.
- Since the correction of the modelled results relates to the road-side component of the pollutant only, the scaling factor is calculated by first removing the background contribution to the monitored and modelled concentrations and then comparing the roadside components only.

- Figure A 1, below shows a plot of monitored road NO_x v modelled road NO_x. used in the verification process.

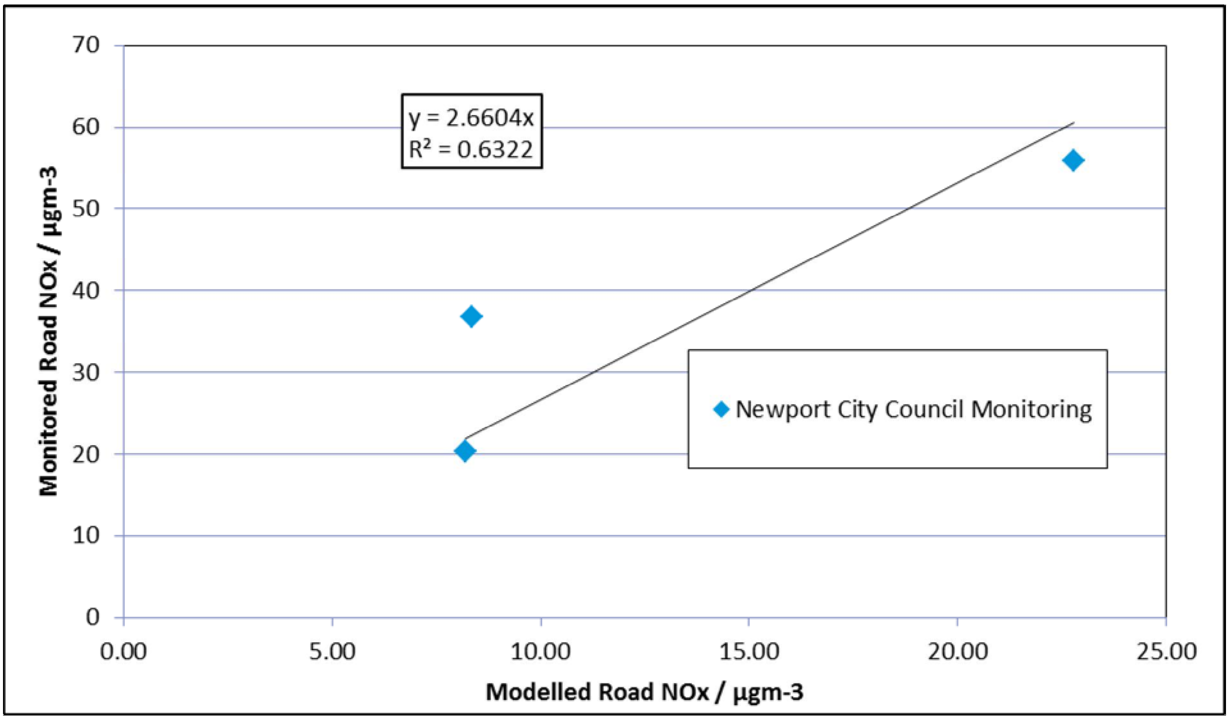

Figure A 1: A graph showing the verification factor derived using NCC monitoring data and the modelled road NOx from the ADMS model

- A verification factor of 2.6604 was applied to all modelled values before processing. As previously stated, all values quoted within the report are presented as verified data.

Table A.1, below gives the locations of all modelled human receptors assessed within the model.

Table A.1: All modelled receptor locations. *Cedars and Undy removed from "with CAN" scenario, due to proposed road layout of scheme.

Receptor name	X(m)	Y(m)	Z(m)
AURN	332424.16	189602.14	0
B4245-01	342238.47	187524.73	0
B4245-02	342261.62	187433.8	0
B4245-03	342280.47	187466.53	0
B4245-04	342364.81	187398.73	0
B4245-05	342375.88	187368.06	0
B4245-06	342510.16	187340.02	0
B4245-07	342522.94	187305.97	0
B4245-08	342604.75	187276.53	0
B4245-09	342708.47	187209.55	0
B4245-10	342711.22	187233.98	0
B4245-11	342752.88	187198.77	0
B4245-12	342828.72	187133	0
B4245-13	342873.69	187064.72	0
B4245-14	342950.84	187038.38	0
B4245-15	343026.41	186982.02	0
B4245-16	343093.56	186939.16	0
B4245-17	343289.62	186921.69	0
B4245-18	343352.81	186922	0
B4245-19	343355.81	186954.06	0
B4245-20	343412	186984.23	0
B4245-21	343540.09	187052.56	0
B4245-22	343629.94	187105.42	0
B4245-23	343646.28	187085.73	0
B4245-24	343684.59	187229.48	0
B4245-25	343687.81	187159.77	0
B4245-26	343733.22	187286.97	0
B4245-27	343764.56	187293.19	0
B4245-28	343827	187359.98	0
B4245-29	343836.94	187417.7	0
Dancing-01	342649.69	187392.41	0
Dancing-02	342662.12	187346.62	0
Dancing-03	342688.84	187447.95	0
Dancing-04	342738.06	187481.81	0
Dancing-05	342740.16	187522.84	0
Pennyfarthing-01	342882.44	187155.77	0
Pennyfarthing-02	342914.19	187135.27	0
Pennyfarthing-03	342967.78	187160.06	0
Pennyfarthing-04	343102.56	187241.78	0
Pennyfarthing-05	343107	187396.41	0
Pennyfarthing-06	343127.75	187342.64	0
Rockfield/Manor-01	343572.75	187115.69	0
Rockfield/Manor-02	343556.06	187159.34	0
Rockfield/Manor-03	343550.34	187276.5	0
Rockfield/Manor-04	343552.56	187363.97	0

Rockfield/Manor-05	343606.22	187432.55	0
Rockfield/Manor-06	343620.38	187490.19	0
Rockfield/Manor-07	343680.84	187493.03	0
Rockfield/Manor-08	343768.78	187512.23	0
Rockfield/Manor-09	343835.62	187486.84	0
Rockfield/Manor-10	343839.12	187458.73	0
*Cedars	342920.12	187859.02	0
*Undy	343247.31	187924.95	0
Grange Rd	342899.16	187760.22	0
Eco_00	343276.1	186859.4	0
Eco_05	343276.1	186854.4	0
Eco_10	343276.1	186849.4	0
Eco_15	343276.1	186844.4	0
Eco_20	343276.1	186839.4	0
Eco_25	343276.1	186834.4	0
Eco_30	343276.1	186829.4	0
Eco_40	343276.1	186819.4	0
Eco_50	343276.1	186809.4	0
Eco_60	343276.1	186799.4	0
Eco_70	343276.1	186789.4	0
Eco_80	343276.1	186779.4	0
Eco_90	343276.1	186769.4	0
Eco_100	343276.1	186759.4	0
Eco_120	343276.1	186739.4	0
Eco_140	343276.1	186719.4	0
Eco_160	343276.1	186699.4	0
Eco_180	343276.1	186679.4	0
Eco_200	343276.1	186659.4	0

Figure A2 – A5, below show the modelled links, and their respective locations throughout the model. Table A.2, also below, shows the modelled flow per link as AADT and HDV%, as provided by WSP| Parsons Brinckerhoff transport engineers.

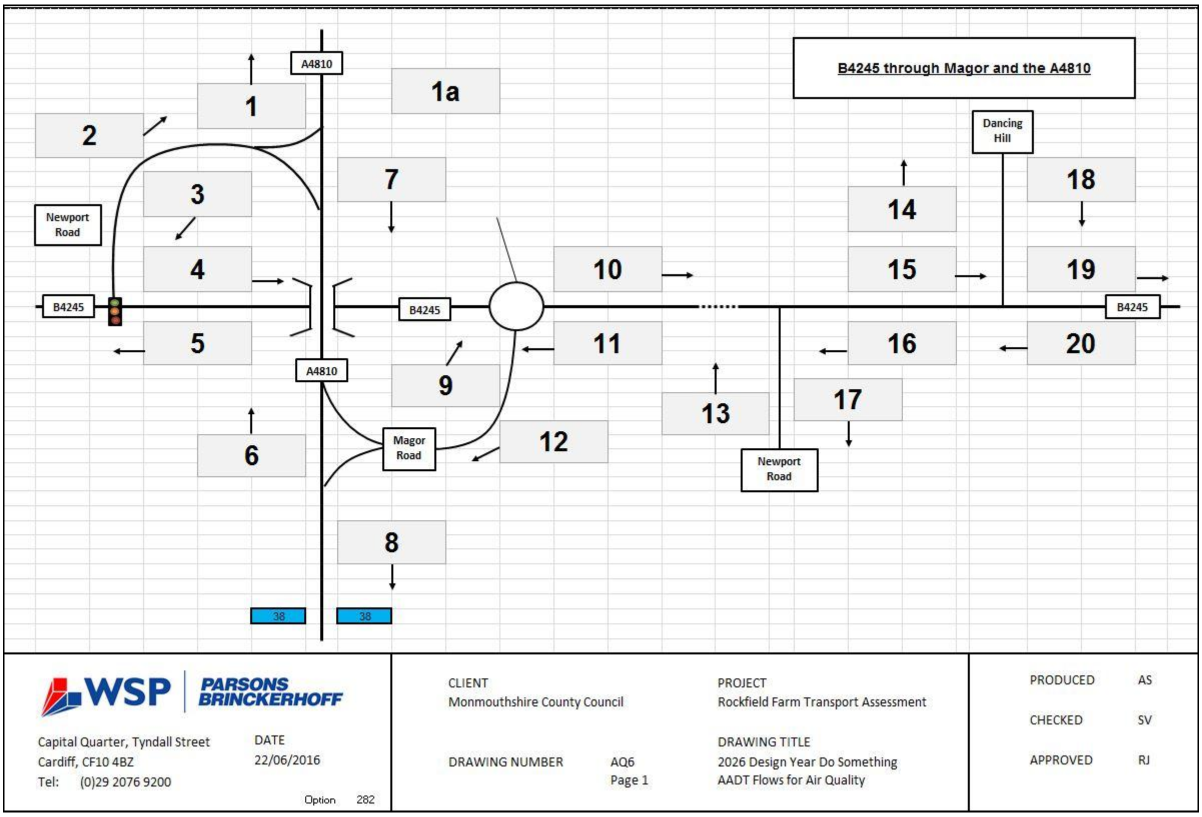

Figure A 2: Traffic link diagram of the modelled roads within Magor, to the West of the site

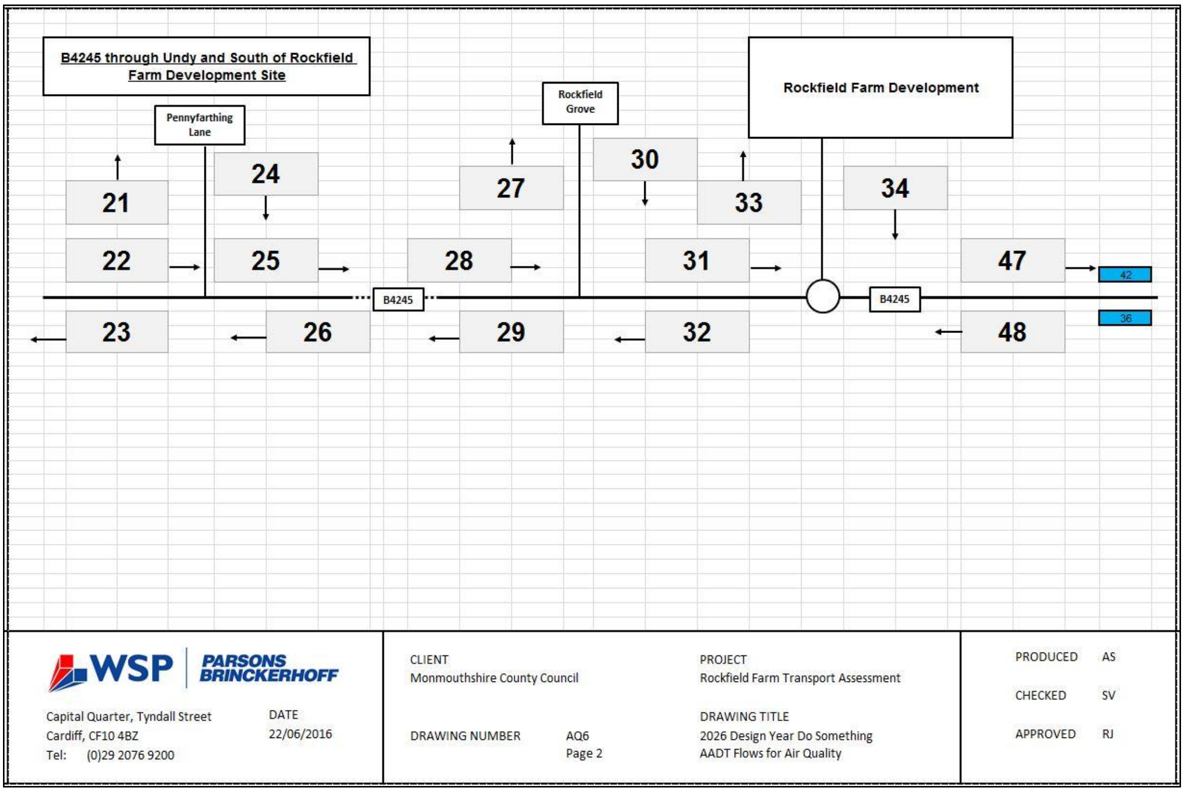

Figure A 3: Traffic link diagram of the modelled roads within Magor, to the West of the site

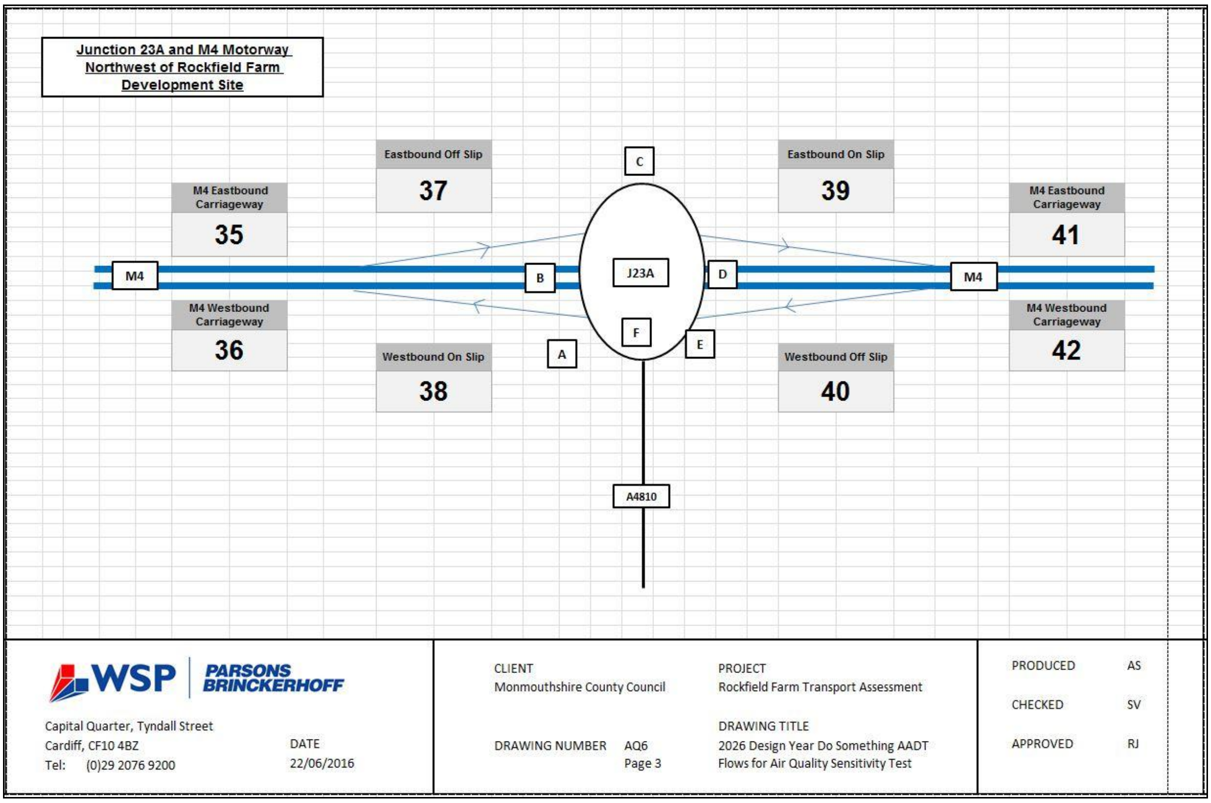

Figure A 4: Traffic link diagram of the modelled roads around Junction 23A of the M4

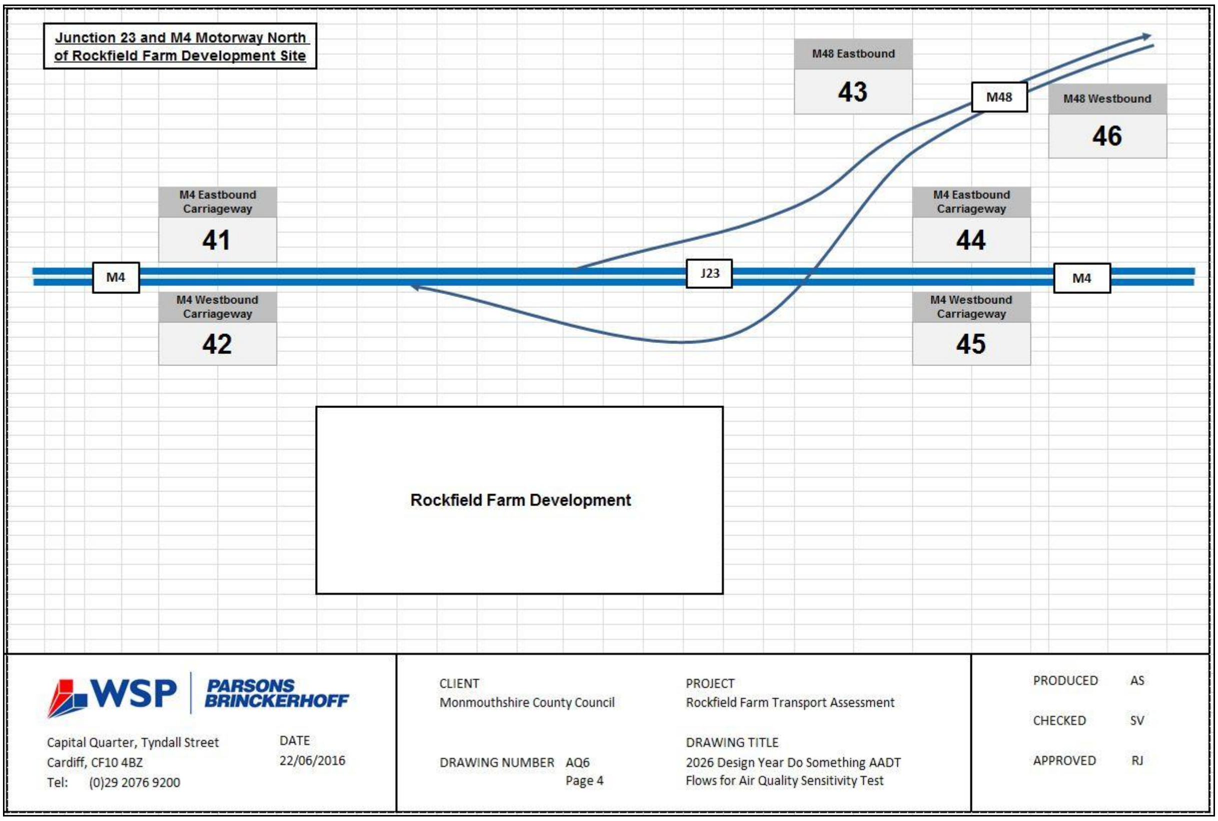

Figure A 5: Traffic link diagram of the modelled roads around Junction 23 of the M4 (without CAN)

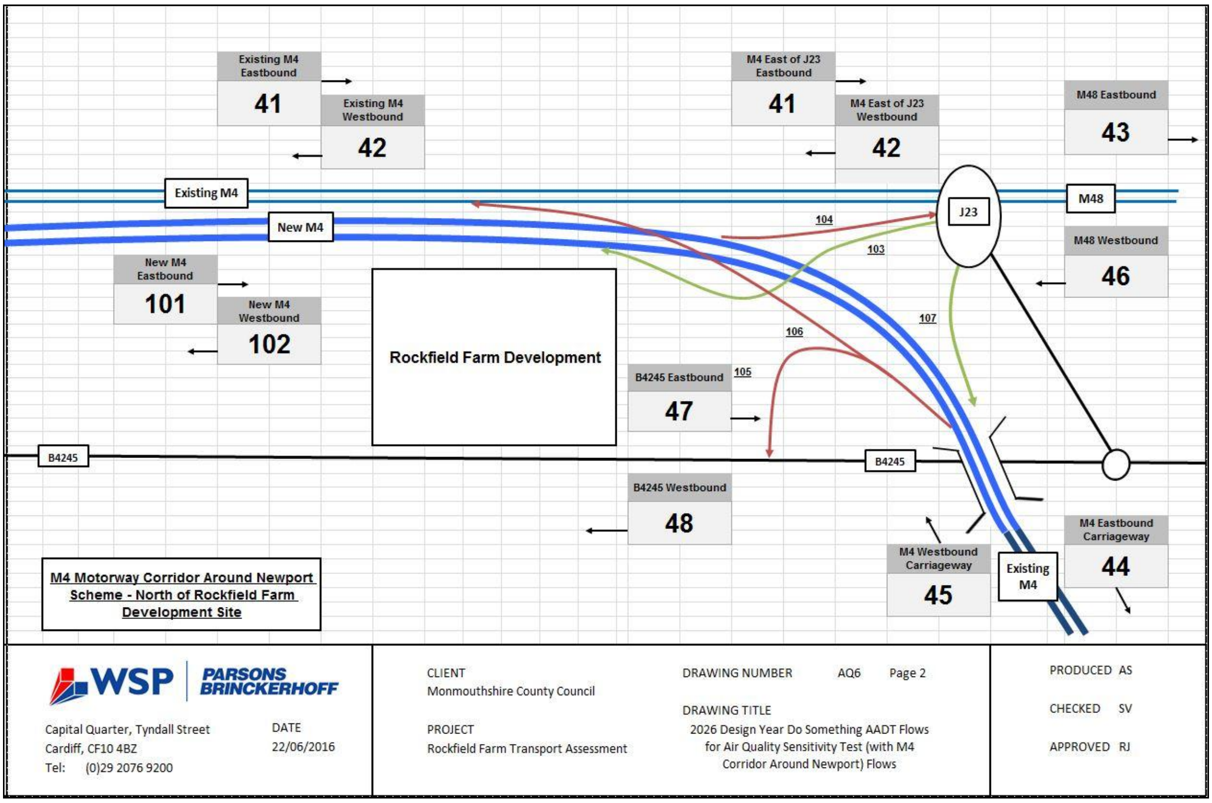

Figure A 6: Traffic link diagram of the modelled roads around Junction 23 of the M4 (with CAN)

Table A.2: Traffic Data as AADT and HGV%, supplied by the WSP| Parsons Brinckerhoff Transport Team

Link ID	2016 Base		DM 2018		DS 2018		DM 2026		DS 2026		Speed (kph)
	AADT	HDV%	AADT	HDV%	AADT	HDV%	AADT	HDV%	AADT	HDV%	
1	401.2	8.2	426.6	6.0	440.5	5.8	451.6	6.0	465.5	5.8	48
2	266.2	1.4	291.4	1.2	305.1	1.2	308.1	1.3	321.8	1.2	48
3	98.1	2.6	103.8	2.5	107.9	2.4	109.6	2.5	113.7	2.4	48
1a	168.1	0.6	187.6	0.6	197.2	0.5	198.5	0.6	208.0	0.5	48
4	138.3	2.2	153.4	2.0	160.3	1.9	161.7	2.0	168.7	1.9	48
5	309.0	2.1	350.0	1.8	368.9	1.7	369.3	1.9	388.2	1.8	48
6	233.1	13.6	239.0	10.2	243.3	10.0	253.2	10.2	257.4	10.1	48
7	374.6	9.4	400.6	7.4	411.7	7.2	423.4	7.4	434.6	7.2	48
7a	146.1	20.4	146.9	16.5	147.5	16.5	156.0	16.5	156.6	16.5	48
8	213.6	14.6	220.6	11.6	225.5	11.4	233.9	11.6	238.7	11.4	48
9	228.5	2.3	253.6	2.1	264.2	2.0	267.4	2.1	278.0	2.0	48
10	312.1	1.5	351.9	1.4	369.3	1.3	370.7	1.4	388.1	1.3	48
11	313.3	1.4	358.1	1.2	380.5	1.1	377.8	1.2	400.1	1.1	48
12	67.5	1.9	73.7	1.8	77.9	1.7	77.9	1.8	82.2	1.7	48
13	45.1	2.4	46.3	2.3	47.4	2.3	49.1	2.3	50.1	2.3	48
17	41.3	1.1	42.2	1.0	43.1	1.0	44.7	1.0	45.6	1.0	48
17	41.3	1.1	42.2	1.0	43.1	1.0	44.7	1.0	45.6	1.0	48
14	62.1	0.7	64.5	0.7	66.7	0.6	68.2	0.7	70.4	0.6	48
15	293.9	1.7	334.9	1.5	353.2	1.4	352.7	1.5	371.0	1.4	48
16	282.8	1.2	328.4	1.0	351.5	1.0	346.1	1.1	369.2	1.0	48
16	282.8	1.2	328.4	1.0	351.5	1.0	346.1	1.1	369.2	1.0	48
18	67.0	0.3	69.1	0.3	70.9	0.3	73.3	0.3	75.1	0.3	48
19	281.2	1.7	324.2	1.5	344.4	1.4	341.3	1.5	361.5	1.4	48
20	265.4	1.3	313.4	1.1	338.7	1.0	329.9	1.1	355.2	1.0	48
20	265.4	1.3	313.4	1.1	338.7	1.0	329.9	1.1	355.2	1.0	48
21	27.0	0.8	28.3	0.7	29.6	0.7	29.9	0.7	31.3	0.7	48
21	27.0	0.8	28.3	0.7	29.6	0.7	29.9	0.7	31.3	0.7	48
24	27.5	1.5	28.7	1.5	29.8	1.4	30.4	1.5	31.5	1.4	48
24	27.5	1.5	28.7	1.5	29.8	1.4	30.4	1.5	31.5	1.4	48
25	27.4	1.5	28.7	1.5	29.8	1.4	30.4	1.5	31.5	1.4	48
25	27.4	1.5	28.7	1.5	29.8	1.4	30.4	1.5	31.5	1.4	48
26	276.6	1.4	328.3	1.2	357.5	1.1	345.5	1.2	374.7	1.1	48
26	276.6	1.4	328.3	1.2	357.5	1.1	345.5	1.2	374.7	1.1	48
F	186.2	15.4	187.2	15.3	186.5	15.3	183.3	15.3	182.7	15.3	48
A	658.2	15.4	683.6	15.3	697.5	15.3	708.6	15.3	722.5	15.3	48
B	251.0	15.4	263.8	15.3	269.1	15.3	271.6	15.3	276.9	15.3	48
C	660.6	15.4	692.0	15.3	707.1	15.3	717.1	15.3	732.3	15.3	48
D	226.9	15.4	244.2	15.3	248.6	15.3	250.6	15.3	255.0	15.3	48
E	560.8	15.4	587.7	15.3	598.3	15.3	606.7	15.3	617.2	15.3	48
28	227.8	1.8	273.2	1.5	295.4	1.4	287.1	1.5	309.3	1.4	48
29	224.5	1.3	276.3	1.1	305.5	1.0	290.1	1.1	319.3	1.0	48
27	14.9	1.4	16.2	1.3	17.4	1.2	17.1	1.3	18.3	1.2	48
30	26.0	0.0	27.8	0.0	29.4	0.0	29.4	0.0	31.0	0.0	48
30a	19.5	0.0	20.8	0.0	22.1	0.0	22.0	0.0	23.3	0.0	48
27a	11.2	1.4	12.1	1.3	13.0	1.2	12.8	1.3	13.7	1.2	48
35	1694.2	11.1	1886.0	11.1	1893.9	11.1	2106.0	11.1	2114.1	11.1	96

Link ID	2016 Base		DM 2018		DS 2018		DM 2026		DS 2026		Speed (kph)
	AADT	HDV%	AADT	HDV%	AADT	HDV%	AADT	HDV%	AADT	HDV%	
36	1684.0	9.7	1847.7	9.7	1853.9	9.7	2046.0	9.7	2052.2	9.7	96
37	281.0	11.4	299.7	11.4	309.5	11.4	317.1	11.4	326.8	11.4	72
38	278.6	8.9	291.4	8.9	299.8	8.9	308.6	8.9	317.0	8.9	72
39	305.2	20.6	319.3	20.6	330.0	20.6	338.1	20.6	348.8	20.6	72
40	205.4	20.8	215.0	20.8	221.1	20.8	227.6	20.8	233.8	20.8	72
41	1686.8	11.9	1930.7	11.9	1938.2	11.9	2162.7	11.9	2170.5	11.9	96
42	1513.8	12.0	1709.2	12.0	1714.0	12.0	1886.7	12.0	1891.4	12.0	96
35a	1413.1	11.0	1586.3	11.0	1584.4	11.0	1788.9	11.0	1787.3	11.0	96
36a	1308.4	10.6	1494.2	10.8	1492.9	10.7	1659.0	10.8	1657.7	10.8	96
43	268.4	11.9	323.8	11.9	325.6	11.9	364.7	11.9	366.5	11.9	96
46	317.0	14.6	351.8	14.6	353.6	14.6	415.9	14.6	417.7	14.6	96
44	1418.5	11.9	1606.9	11.9	1612.6	11.9	1797.9	11.9	1804.0	11.9	96
45	1196.7	11.3	1357.4	11.3	1360.4	11.3	1470.8	11.3	1473.8	11.3	96
31	239.7	1.7	286.9	1.5	310.7	1.3	301.6	1.5	325.4	1.4	48
32	225.4	1.4	278.4	1.2	308.8	1.0	292.3	1.2	322.7	1.1	48
47	226.1	0.9	271.9	0.9	298.9	0.8	285.7	0.9	312.7	0.8	48
48	229.0	1.1	277.4	0.5	298.7	0.4	291.5	0.5	312.8	0.4	48
33	0.0	0.0	38.1	0.0	82.8	0.0	38.1	0.0	82.8	0.0	48
34	0.0	0.0	43.3	0.0	101.4	0.0	43.3	0.0	101.4	0.0	48
10500a	2108.5	8.6	1881.2	8.6	1881.2	8.6	1691.3	8.6	1691.3	8.6	96
10500b	2108.5	8.6	1881.2	8.6	1881.2	8.6	1691.3	8.6	1691.3	8.6	96
70057a	2292.4	9.8	2045.3	9.8	2045.3	9.8	1838.8	9.8	1838.8	9.8	96
70057b	2292.4	9.8	2045.3	9.8	2045.3	9.8	1838.8	9.8	1838.8	9.8	96
40500a	1676.2	9.4	1495.5	9.4	1495.5	9.4	1344.6	9.4	1344.6	9.4	96
40500b	1676.2	9.4	1495.5	9.4	1495.5	9.4	1344.6	9.4	1344.6	9.4	96
70058	1449.8	3.4	1293.6	3.4	1293.6	3.4	1163.0	3.4	1163.0	3.4	96

Table A.3: Modelled NO_2 concentrations for the 2018 model year at all receptors in µg/m^3

Receptor	Base	DM	DS	Change	Magnitude	Severity
AURN	42.6	39.1	39.1	0.0	Imperceptible	Imperceptible/Negligible
B4245-01	30.9	27.9	28.3	0.4	Very Small	Negligible
B4245-02	26.8	24.2	24.5	0.3	Very Small	Negligible
B4245-03	32.4	29.1	29.6	0.5	Very Small	Negligible
B4245-04	33.2	29.7	30.3	0.6	Very Small	Negligible
B4245-05	31.4	28.2	28.8	0.6	Very Small	Negligible
B4245-06	29.8	26.8	27.3	0.5	Very Small	Negligible
B4245-07	29.5	26.5	27.1	0.5	Very Small	Negligible
B4245-08	30.1	27.2	27.8	0.6	Small	Negligible
B4245-09	29.5	26.6	27.3	0.7	Small	Negligible
B4245-10	31.7	28.5	29.3	0.7	Small	Negligible
B4245-11	29.4	26.5	27.1	0.6	Small	Negligible
B4245-12	26.8	24.1	24.6	0.5	Very Small	Negligible
B4245-13	24.9	22.5	23.1	0.5	Very Small	Negligible
B4245-14	22.1	20.0	20.3	0.4	Very Small	Negligible
B4245-15	21.6	19.6	19.9	0.3	Very Small	Negligible

Receptor	Base	DM	DS	Change	Magnitude	Severity
B4245-16	22.4	20.2	20.6	0.4	Very Small	Negligible
B4245-17	20.9	18.8	19.2	0.3	Very Small	Negligible
B4245-18	25.9	23.4	24.1	0.7	Small	Negligible
B4245-19	21.8	19.7	20.1	0.4	Very Small	Negligible
B4245-20	27.4	24.7	25.5	0.8	Small	Negligible
B4245-21	24.7	22.4	23.0	0.6	Small	Negligible
B4245-22	25.2	22.9	23.6	0.6	Small	Negligible
B4245-23	26.3	24.0	24.8	0.8	Small	Negligible
B4245-24	24.1	22.0	22.5	0.6	Very Small	Negligible
B4245-25	25.7	23.5	24.2	0.7	Small	Negligible
B4245-26	26.8	24.5	25.2	0.7	Small	Negligible
B4245-27	29.2	26.8	27.7	0.9	Small	Negligible
B4245-28	28.3	25.9	26.8	0.9	Small	Negligible
B4245-29	23.3	21.3	21.8	0.5	Very Small	Negligible
Dancing-01	22.2	20.2	20.3	0.1	Imperceptible	Imperceptible/Negligible
Dancing-02	22.6	20.4	20.6	0.2	Imperceptible	Imperceptible/Negligible
Dancing-03	22.6	20.6	20.7	0.1	Imperceptible	Imperceptible/Negligible
Dancing-04	24.4	22.1	22.2	0.1	Imperceptible	Imperceptible/Negligible
Dancing-05	23.7	21.7	21.8	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-01	20.5	18.5	18.7	0.2	Very Small	Negligible
Pennyfarthing-02	20.3	18.4	18.6	0.2	Imperceptible	Imperceptible/Negligible
Pennyfarthing-03	19.3	17.5	17.7	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-04	19.2	17.5	17.6	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-05	19.9	18.3	18.4	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-06	20.0	18.3	18.4	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-01	19.8	18.0	18.2	0.3	Very Small	Negligible
Rockfield/Manor-02	18.8	17.2	17.3	0.2	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-03	18.9	17.3	17.4	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-04	18.9	17.3	17.4	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-05	19.4	17.9	18.0	0.2	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-06	19.8	18.3	18.4	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-07	20.2	18.6	18.8	0.2	Very Small	Negligible
Rockfield/Manor-08	20.3	18.7	18.9	0.2	Very Small	Negligible
Rockfield/Manor-09	21.0	19.3	19.6	0.3	Very Small	Negligible
Rockfield/Manor-10	21.3	19.5	19.9	0.4	Very Small	Negligible
Cedars	36.4	35.2	35.3	0.1	Imperceptible	Imperceptible/Negligible
Undy	34.7	33.4	33.5	0.1	Imperceptible	Imperceptible/Negligible
Grange Rd	43.6	43.4	43.5	0.1	Imperceptible	Imperceptible/Negligible
T1-01	24.7	23.4	23.6			
T1-02	24.2	22.9	23.1			
T1-03	23.8	22.5	22.7			
T1-04	23.4	22.1	22.3			
T1-05	23.1	21.7	21.9			
T1-06	22.7	21.4	21.6			
T1-07	22.4	21.1	21.3			
T1-08	22.2	20.8	21.1			
T1-09	21.9	20.6	20.8			
T1-10	21.7	20.4	20.6	Not Applicable		

Receptor	Base	DM	DS	Change	Magnitude	Severity
T1-11	21.5	20.2	20.5			
T1-12	21.3	20.0	20.3			
T1-13	21.1	19.8	20.2			
T1-14	21.0	19.7	20.1			
T1-15	20.8	19.6	20.1			
T1-16	20.7	19.6	20.1			
T1-17	20.6	19.6	20.2			
T1-18	20.5	19.6	20.4			
T1-19	20.5	19.7	20.7			
T1-20	20.5	19.8	21.0			
T1-21	20.5	19.9	21.2			
T1-22	20.5	19.9	21.2			
T1-23	20.7	19.9	21.0			
T1-24	21.0	20.0	21.0			
T1-25	21.4	20.3	21.2			
T1-26	22.2	20.8	21.7			
T1-27	23.6	22.0	22.8			
T1-28	26.1	24.1	25.0			
T1-29	31.1	28.5	29.6			
T2-01	25.5	24.2	24.5			
T2-02	24.9	23.6	23.9			
T2-03	24.4	23.1	23.4			
T2-04	24.0	22.7	23.0			
T2-05	23.5	22.3	22.6			
T2-06	23.2	21.9	22.2			
T2-07	22.8	21.6	21.9			
T2-08	22.5	21.3	21.6			
T2-09	22.2	21.0	21.4			
T2-10	21.9	20.7	21.2			
T2-11	21.7	20.5	21.0			
T2-12	21.5	20.3	20.8			
T2-13	21.3	20.2	20.8			
T2-14	21.1	20.1	20.7			
T2-15	20.9	20.0	20.9			
T2-16	20.8	20.1	21.3			
T2-17	20.6	20.7	22.7			
T2-18	20.5	21.9	25.6			
T2-19	20.4	20.3	22.0			
T2-20	20.3	19.6	20.7			
T2-21	20.2	19.3	20.1			
T2-22	20.2	19.1	19.8			
T2-23	20.2	19.0	19.6			
T2-24	20.2	19.0	19.5			
T2-25	20.3	19.0	19.5			
T2-26	20.4	19.0	19.5			
T2-27	20.6	19.2	19.7			
T2-28	20.9	19.5	20.0			
T2-29	21.4	19.9	20.4			

Receptor	Base	DM	DS	Change	Magnitude	Severity
T2-30	22.2	20.6	21.1			
T2-31	23.4	21.6	22.2			
T2-32	25.6	23.6	24.3			
T3-01	34.0	33.1	33.2			
T3-02	32.3	31.2	31.4			
T3-03	30.9	29.7	29.8			
T3-04	29.7	28.5	28.6			
T3-05	28.6	27.4	27.5			
T3-06	27.7	26.4	26.5			
T3-07	27.0	25.6	25.7			
T3-08	26.3	24.9	25.0			
T3-09	25.6	24.2	24.3			
T3-10	25.1	23.7	23.8			
T3-11	24.6	23.1	23.3			
T3-12	24.1	22.7	22.8			
T3-13	23.7	22.2	22.3			
T3-14	23.3	21.8	22.0			
T3-15	22.9	21.5	21.6			
T3-16	22.6	21.2	21.3			
T3-17	22.3	20.8	20.9			
T3-18	22.0	20.6	20.7			
T3-19	21.7	20.3	20.4			
T3-20	21.5	20.1	20.2			
T3-21	21.3	19.8	19.9			
T3-22	21.0	19.6	19.7			
T3-23	20.8	19.4	19.5			
T3-24	20.6	19.2	19.3			
T4-01	35.9	35.3	35.5			
T4-02	33.8	33.0	33.3			
T4-03	32.1	31.3	31.7			
T4-04	30.7	29.9	30.5			
T4-05	29.5	29.1	30.2			
T4-06	28.4	29.7	32.9			
T4-07	27.6	27.6	29.3			
T4-08	26.8	26.1	27.2			
T4-09	26.1	25.2	25.9			
T4-10	25.5	24.4	24.9			
T4-11	24.9	23.7	24.1			
T4-12	24.4	23.2	23.5			
T4-13	24.0	22.7	23.0			
T4-14	23.5	22.2	22.5			
T4-15	23.1	21.8	22.0			
T4-16	22.8	21.4	21.7			
T4-17	22.5	21.1	21.3			
T4-18	22.2	20.8	21.0			
T4-19	21.9	20.5	20.7			
T4-20	21.6	20.2	20.4			
T4-21	21.4	20.0	20.2			

Receptor	Base	DM	DS	Change	Magnitude	Severity
T4-22	21.2	19.8	19.9			
T4-23	21.0	19.6	19.7			
T4-24	20.8	19.4	19.5			
T4-25	20.6	19.2	19.3			
T4-26	20.4	19.0	19.1			
T4-27	20.2	18.8	18.9			
T4-28	20.0	18.6	18.7			
T4-29	19.8	18.3	18.5			
T4-30	19.5	18.1	18.2			
T5-01	32.3	31.7	32.3			
T5-02	30.8	30.4	31.4			
T5-03	29.6	29.8	31.8			
T5-04	28.5	29.8	32.9			
T5-05	27.6	28.0	30.2			
T5-06	26.8	26.5	27.8			
T5-07	26.1	25.5	26.6			
T5-08	25.5	24.7	25.7			
T5-09	24.9	24.1	24.9			
T5-10	24.4	23.5	24.3			
T5-11	23.9	23.0	23.8			
T5-12	23.5	22.5	23.3			
T5-13	23.1	22.1	22.8			
T5-14	22.8	21.7	22.4			
T5-15	22.5	21.4	22.0			
T5-16	22.2	21.1	21.6			
T5-17	21.9	20.8	21.3			
T5-18	21.6	20.5	21.0			
T5-19	21.4	20.2	20.7			
T5-20	21.2	20.0	20.4			
T5-21	21.0	19.8	20.1			
T5-22	20.8	19.5	19.9			
T5-23	20.6	19.4	19.7			

TableA.4: Modelled NO_2 concentrations for the 2026 model year at all receptors in µg/m^3

Receptor	Base	DM	DS	Change	Magnitude	Severity
AURN	42.6	26.8	26.8	0.0	Imperceptible	Imperceptible/Negligible
B4245-01	30.9	21.7	22.0	0.3	Very Small	Negligible
B4245-02	26.8	19.1	19.4	0.3	Very Small	Negligible
B4245-03	32.4	22.7	23.1	0.4	Very Small	Negligible
B4245-04	33.2	23.3	23.7	0.4	Very Small	Negligible
B4245-05	31.4	22.2	22.6	0.4	Very Small	Negligible
B4245-06	29.8	21.1	21.5	0.4	Very Small	Negligible
B4245-07	29.5	21.0	21.4	0.4	Very Small	Negligible
B4245-08	30.1	21.6	22.0	0.4	Very Small	Negligible
B4245-09	29.5	21.1	21.6	0.5	Very Small	Negligible
B4245-10	31.7	22.5	23.1	0.5	Very Small	Negligible
B4245-11	29.4	21.0	21.4	0.5	Very Small	Negligible

Receptor	Base	DM	DS	Change	Magnitude	Severity
B4245-12	26.8	19.2	19.6	0.4	Very Small	Negligible
B4245-13	24.9	18.1	18.5	0.4	Very Small	Negligible
B4245-14	22.1	16.2	16.5	0.3	Very Small	Negligible
B4245-15	21.6	15.9	16.2	0.3	Very Small	Negligible
B4245-16	22.4	16.4	16.7	0.3	Very Small	Negligible
B4245-17	20.9	15.3	15.6	0.2	Very Small	Negligible
B4245-18	25.9	18.8	19.2	0.5	Very Small	Negligible
B4245-19	21.8	16.0	16.3	0.3	Very Small	Negligible
B4245-20	27.4	19.7	20.3	0.6	Very Small	Negligible
B4245-21	24.7	17.9	18.3	0.4	Very Small	Negligible
B4245-22	25.2	18.2	18.7	0.5	Very Small	Negligible
B4245-23	26.3	19.1	19.6	0.6	Very Small	Negligible
B4245-24	24.1	17.5	17.9	0.4	Very Small	Negligible
B4245-25	25.7	18.6	19.2	0.5	Very Small	Negligible
B4245-26	26.8	19.3	19.8	0.5	Very Small	Negligible
B4245-27	29.2	21.0	21.7	0.7	Small	Negligible
B4245-28	28.3	20.3	21.0	0.7	Small	Negligible
B4245-29	23.3	16.8	17.2	0.4	Very Small	Negligible
Dancing-01	22.2	16.2	16.3	0.1	Imperceptible	Imperceptible/Negligible
Dancing-02	22.6	16.4	16.5	0.1	Imperceptible	Imperceptible/Negligible
Dancing-03	22.6	16.3	16.4	0.1	Imperceptible	Imperceptible/Negligible
Dancing-04	24.4	17.4	17.5	0.1	Imperceptible	Imperceptible/Negligible
Dancing-05	23.7	17.0	17.0	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-01	20.5	15.1	15.2	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-02	20.3	15.0	15.1	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-03	19.3	14.3	14.4	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-04	19.2	14.3	14.3	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-05	19.9	14.6	14.7	0.1	Imperceptible	Imperceptible/Negligible
Pennyfarthing-06	20.0	14.7	14.8	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-01	19.8	14.6	14.8	0.2	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-02	18.8	14.0	14.1	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-03	18.9	14.0	14.1	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-04	18.9	14.0	14.0	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-05	19.4	14.3	14.4	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-06	19.8	14.5	14.6	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-07	20.2	14.7	14.8	0.1	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-08	20.3	14.8	14.9	0.2	Imperceptible	Imperceptible/Negligible
Rockfield/Manor-09	21.0	15.2	15.4	0.2	Very Small	Negligible
Rockfield/Manor-10	21.3	15.4	15.7	0.3	Very Small	Negligible
Cedars	36.4	24.8	24.8	0.1	Imperceptible	Imperceptible/Negligible
Undy	34.7	23.5	23.6	0.1	Imperceptible	Imperceptible/Negligible
Grange Rd	43.6	30.2	30.3	0.1	Imperceptible	Imperceptible/Negligible
T1-01	24.7	17.2	17.4			
T1-02	24.2	17.0	17.1			
T1-03	23.8	16.7	16.8			
T1-04	23.4	16.5	16.6			
T1-05	23.1	16.2	16.4			
T1-06	22.7	16.1	16.2	Not Applicable		

Receptor	Base	DM	DS	Change	Magnitude	Severity
T1-07	22.4	15.9	16.1			
T1-08	22.2	15.7	15.9			
T1-09	21.9	15.6	15.8			
T1-10	21.7	15.5	15.7			
T1-11	21.5	15.4	15.6			
T1-12	21.3	15.3	15.5			
T1-13	21.1	15.2	15.5			
T1-14	21.0	15.1	15.4			
T1-15	20.8	15.1	15.4			
T1-16	20.7	15.1	15.5			
T1-17	20.6	15.1	15.6			
T1-18	20.5	15.1	15.8			
T1-19	20.5	15.2	16.0			
T1-20	20.5	15.3	16.2			
T1-21	20.5	15.4	16.4			
T1-22	20.5	15.4	16.4			
T1-23	20.7	15.5	16.3			
T1-24	21.0	15.5	16.3			
T1-25	21.4	15.8	16.5			
T1-26	22.2	16.2	16.9			
T1-27	23.6	17.1	17.7			
T1-28	26.1	18.7	19.4			
T1-29	31.1	22.1	23.0			
T2-01	25.5	17.8	17.9			
T2-02	24.9	17.4	17.6			
T2-03	24.4	17.1	17.3			
T2-04	24.0	16.8	17.1			
T2-05	23.5	16.6	16.8			
T2-06	23.2	16.4	16.6			
T2-07	22.8	16.2	16.4			
T2-08	22.5	16.0	16.3			
T2-09	22.2	15.8	16.1			
T2-10	21.9	15.7	16.0			
T2-11	21.7	15.6	15.9			
T2-12	21.5	15.5	15.9			
T2-13	21.3	15.4	15.8			
T2-14	21.1	15.3	15.8			
T2-15	20.9	15.3	16.0			
T2-16	20.8	15.4	16.3			
T2-17	20.6	15.9	17.4			
T2-18	20.5	16.9	19.6			
T2-19	20.4	15.6	16.9			
T2-20	20.3	15.2	16.0			
T2-21	20.2	15.0	15.6			
T2-22	20.2	14.8	15.3			
T2-23	20.2	14.8	15.2			
T2-24	20.2	14.8	15.2			
T2-25	20.3	14.8	15.2			

Receptor	Base	DM	DS	Change	Magnitude	Severity
T2-26	20.4	14.9	15.2			
T2-27	20.6	15.0	15.3			
T2-28	20.9	15.2	15.6			
T2-29	21.4	15.5	15.9			
T2-30	22.2	16.1	16.5			
T2-31	23.4	16.8	17.3			
T2-32	25.6	18.3	18.9			
T3-01	34.0	23.3	23.4			
T3-02	32.3	22.2	22.2			
T3-03	30.9	21.2	21.3			
T3-04	29.7	20.4	20.5			
T3-05	28.6	19.7	19.8			
T3-06	27.7	19.2	19.2			
T3-07	27.0	18.7	18.7			
T3-08	26.3	18.2	18.3			
T3-09	25.6	17.8	17.9			
T3-10	25.1	17.5	17.6			
T3-11	24.6	17.2	17.2			
T3-12	24.1	16.9	17.0			
T3-13	23.7	16.6	16.7			
T3-14	23.3	16.4	16.5			
T3-15	22.9	16.2	16.2			
T3-16	22.6	16.0	16.1			
T3-17	22.3	15.8	15.9			
T3-18	22.0	15.6	15.7			
T3-19	21.7	15.5	15.5			
T3-20	21.5	15.3	15.4			
T3-21	21.3	15.2	15.3			
T3-22	21.0	15.1	15.1			
T3-23	20.8	14.9	15.0			
T3-24	20.6	14.8	14.9			
T4-01	35.9	24.7	24.9			
T4-02	33.8	23.3	23.5			
T4-03	32.1	22.2	22.5			
T4-04	30.7	21.3	21.8			
T4-05	29.5	20.9	21.7			
T4-06	28.4	21.5	24.0			
T4-07	27.6	20.0	21.4			
T4-08	26.8	19.1	19.8			
T4-09	26.1	18.4	18.9			
T4-10	25.5	17.9	18.3			
T4-11	24.9	17.5	17.8			
T4-12	24.4	17.2	17.4			
T4-13	24.0	16.9	17.1			
T4-14	23.5	16.6	16.8			
T4-15	23.1	16.3	16.5			
T4-16	22.8	16.1	16.3			
T4-17	22.5	15.9	16.1			

Receptor	Base	DM	DS	Change	Magnitude	Severity
T4-18	22.2	15.7	15.9			
T4-19	21.9	15.6	15.7			
T4-20	21.6	15.4	15.5			
T4-21	21.4	15.2	15.4			
T4-22	21.2	15.1	15.2			
T4-23	21.0	15.0	15.1			
T4-24	20.8	14.9	15.0			
T4-25	20.6	14.8	14.9			
T4-26	20.4	14.7	14.8			
T4-27	20.2	14.5	14.6			
T4-28	20.0	14.4	14.5			
T4-29	19.8	14.3	14.4			
T4-30	19.5	14.1	14.2			
T5-01	32.3	22.4	22.9			
T5-02	30.8	21.7	22.4			
T5-03	29.6	21.4	22.9			
T5-04	28.5	21.5	24.0			
T5-05	27.6	20.3	22.0			
T5-06	26.8	19.3	20.3			
T5-07	26.1	18.6	19.4			
T5-08	25.5	18.1	18.9			
T5-09	24.9	17.7	18.4			
T5-10	24.4	17.4	18.0			
T5-11	23.9	17.1	17.6			
T5-12	23.5	16.8	17.3			
T5-13	23.1	16.5	17.0			
T5-14	22.8	16.3	16.8			
T5-15	22.5	16.1	16.5			
T5-16	22.2	15.9	16.3			
T5-17	21.9	15.7	16.1			
T5-18	21.6	15.5	15.9			
T5-19	21.4	15.4	15.7			
T5-20	21.2	15.2	15.5			
T5-21	21.0	15.1	15.4			
T5-22	20.8	15.0	15.3			
T5-23	20.6	14.9	15.1			

TableA.5: Result of Ecological modelling for the Gwent Levels SSSI (Magor and Undy) for Annual Mean NO_x, Daily Mean NO_x, and Nitrogen Deposition.

Receptor name	DM 2018			DS 2018			DM 2026			DS 2026		
	Annual Mean NOx (µgm^{-3})	Nitrogen Deposition (keq/ha/yr)	Daily Mean NOx (µgm^{-3})	Annual Mean NOx (µgm^{-3})	Nitrogen Deposition (keq/ha/yr)	Daily Mean NOx (µgm-3)	Annual Mean NOx (µgm^{-3})	Nitrogen Deposition (keq/ha/yr)	Daily Mean NOx (µgm-3)	Annual Mean NOx (µgm^{-3})	Nitrogen Deposition (keq/ha/yr)	Daily Mean NOx (µgm-3)
Eco_00	24.84	1.56	40.88	25.30	1.58	41.33	19.54	1.22	33.71	19.81	1.24	33.98
Eco_05	24.33	1.53	40.37	24.75	1.55	40.78	19.22	1.21	33.40	19.47	1.22	33.65
Eco_10	23.91	1.51	39.94	24.29	1.53	40.33	18.96	1.20	33.14	19.19	1.21	33.37
Eco_15	23.55	1.49	39.59	23.90	1.51	39.94	18.74	1.18	32.92	18.95	1.20	33.13
Eco_20	23.24	1.48	39.28	23.57	1.49	39.61	18.56	1.18	32.74	18.75	1.18	32.93
Eco_25	22.98	1.46	39.02	23.28	1.48	39.32	18.39	1.17	32.57	18.58	1.18	32.76
Eco_30	22.74	1.45	38.78	23.03	1.47	39.07	18.25	1.16	32.43	18.42	1.17	32.60
Eco_40	22.35	1.43	38.40	22.61	1.44	38.65	18.01	1.15	32.20	18.16	1.16	32.35
Eco_50	22.04	1.41	38.08	22.27	1.43	38.32	17.82	1.14	32.01	17.96	1.14	32.15
Eco_60	21.78	1.40	37.83	21.99	1.41	38.04	17.66	1.13	31.85	17.79	1.14	31.98
Eco_70	21.56	1.39	37.61	21.76	1.40	37.80	17.53	1.12	31.72	17.64	1.13	31.84
Eco_80	21.37	1.38	37.42	21.55	1.39	37.60	17.41	1.12	31.61	17.52	1.12	31.72
Eco_90	21.21	1.37	37.26	21.38	1.38	37.43	17.32	1.11	31.52	17.42	1.12	31.62
Eco_100	21.06	1.36	37.12	21.22	1.37	37.28	17.23	1.11	31.43	17.32	1.11	31.53
Eco_120	20.82	1.35	36.88	20.96	1.36	37.02	17.08	1.10	31.30	17.17	1.10	31.38
Eco_140	20.62	1.34	36.68	20.75	1.35	36.81	16.96	1.09	31.18	17.04	1.10	31.26
Eco_160	20.45	1.33	36.52	20.57	1.34	36.64	16.86	1.09	31.09	16.93	1.09	31.16
Eco_180	20.30	1.32	36.37	20.41	1.33	36.48	16.78	1.09	31.01	16.84	1.09	31.08
Eco_200	20.17	1.32	36.25	20.28	1.32	36.35	16.70	1.08	30.94	16.77	1.08	31.00

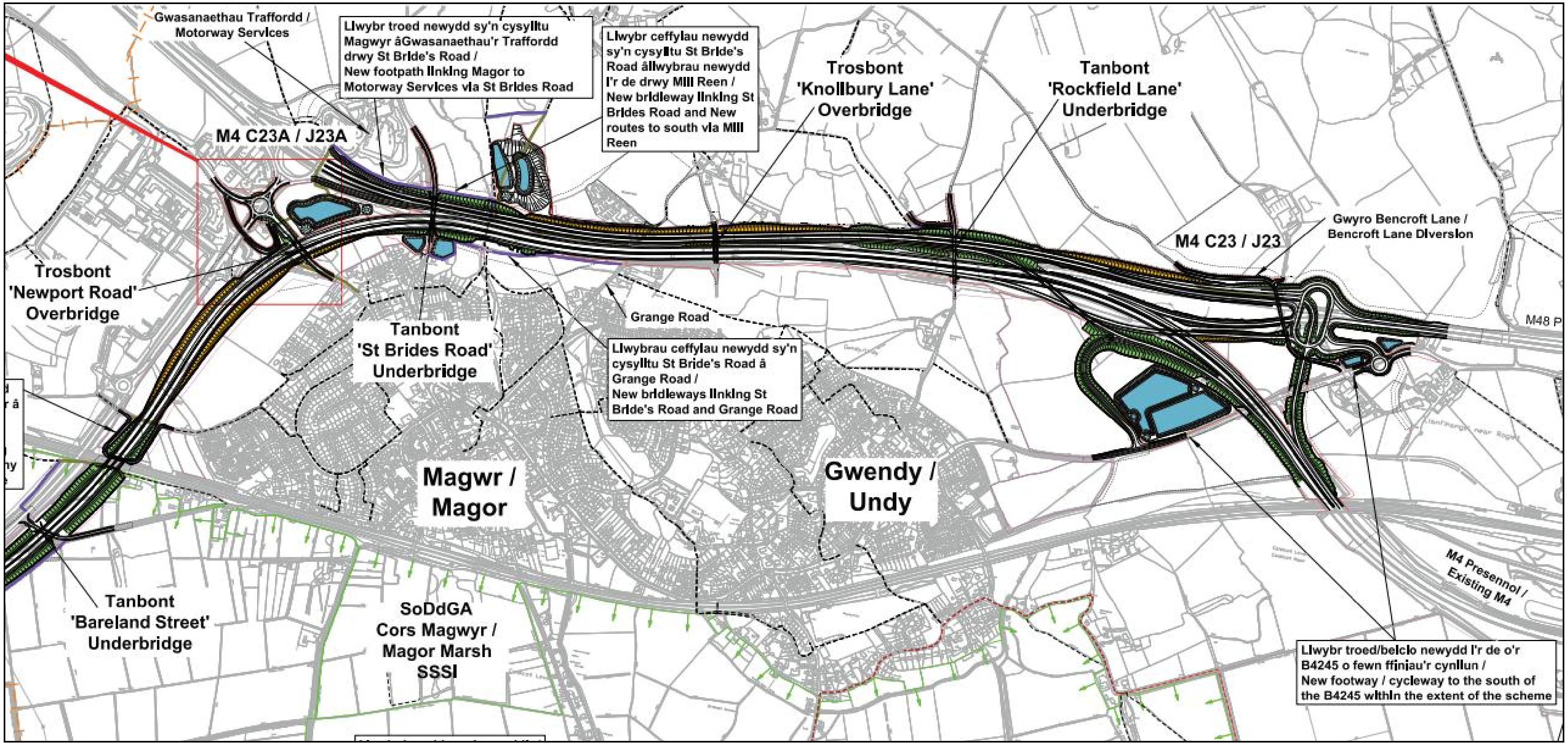

Figure A 7: Proposed Arrangement of M4 CaN and M48 around Magor

Appendix B

DUST ASSESSMENT CRITERIA AND RESULTS

This assessment is based on the IAQM Guidance on the Assessment of Dust from Demolition and Construction – February 2014.

Table B1 Dust emission magnitude determination criteria and assessment for demolition activities without mitigation

Demolition Criteria	**IAQM Dust Emission Magnitude**			**Site-specific Assessment**
	Small	**Medium**	**Large**	**Rockfield**
Installation Volume	<20,000m^3	20,000m^3-50,000m^3	>50,000m^3	>50,000m^3
Material Dust Potential	Metal/timber cladding, demolition activity above <10m ground, during wetter months.	Potentially dusty demolition material, activities at 10-20m above ground.	Potentially dusty demolition material. Onsite crushing e.g. concrete and screening demolition activities >20m above ground level.	No known demolition – farm housing located on site
Comments				Only minor demolition required
Overall Dust Emission Magnitude Rating				Small

Table B2 Dust emission magnitude determination criteria and assessment for earthworks activities without mitigation

Earthworks Criteria	IAQM Dust Emission Magnitude			Site-specific Assessment
	Small	**Medium**	**Large**	**Rockfield**
Site Area	<2,500m^2	2,500 – 10,000m^2	>10,000m^2	Large
Soil/Material Type	Sand	Silt	Clay (dry)	Large
Earthmoving equipment	<5 veh at a time	5 – 10 veh at a time	>10 veh at a time	Large
Bunds / Stockpiles	<4m high	4 – 8m high	>8m high	Medium
Material Moved	<20,000 tonnes	20,000 -100,000 tonnes	>100,000 tonnes	Large
Timing of Works	During wetter months	**Various conditions**	During drier months	Medium
Comments				Site area greater than 150,000m^2, soil material Clay/silt
Overall Dust Emission Magnitude Rating				Large

Table B3 Dust emission magnitude determination criteria and assessment for construction activities without mitigation

Construction Criteria	IAQM Dust Emission Magnitude			Site-specific Assessment
	Small	**Medium**	**Large**	**Rockfield**
Installation Volume	<25,000m^3	25,000m^3-100,000m^3	>100,000m^3	Large
Dust Potential of Construction Activities	Use of materials with low potential for dust release (e.g. metal cladding or timber)	e.g. use of dusty material such as concrete/ballast; piling	e.g. on-site concrete batching, sandblasting	Large
Comments				Large impact due to large volume build.
Overall Dust Emission Magnitude Rating				Large

Table B4 Dust emission magnitude determination criteria and assessment for trackout activities without mitigation

Trackout Criteria	IAQM Dust Emission Magnitude			Site-specific Assessment
	Small	Medium	Large	Rockfield
Number of HDV (>3.5t) per day	<10	10 – 50	>50	Medium
Extent of unconsolidated surfaces (i.e. unpaved road length)	<50m	50 – 100m	>100m	Large
Surface material dust potential	Low	Moderately dusty i.e. some clay content	Potentially dusty i.e. high clay content	Large
Comments				Large impact due to potentially large unconsolidated surfaces.
Overall Dust Emission Class Rating				Large

Table B5 Outcome of the assessment of potential dust emission magnitude from construction related activities

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction	Large
Trackout	Large

Table B6 Criteria for defining the sensitivity of receptors to construction dust related impacts

Sensitivity of the Area	Human Receptor – Dust Soiling Effects	Human Receptor – Human Health Effects of PM_{10}	Ecological Receptor
High	• users can reasonably expect a enjoyment of a high level of amenity; or	• locations where members of the public are exposed over a time period relevant to the	• locations with an international or national designation and the designated features

Sensitivity of the Area	Human Receptor – Dust Soiling Effects	Human Receptor – Human Health Effects of PM_{10}	Ecological Receptor
	• the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected a to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • indicative examples include parks and places of work.	• locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. • indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• the enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads. a People's expectations will vary depending on the existing	• locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• locations with a local designation where the features may be affected by dust deposition. • indicative example is a local Nature Reserve with dust sensitive features.

Table B7 Criteria for the determination of the sensitivity of the area to dust soiling effects on people and property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table B8 Criteria for the determination of the sensitivity of the area to human health impacts

Receptor Sensitivity	PM_{10} background concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	10-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table B9 Criteria for the determination of the sensitivity of the area to ecological impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table B10 Outcome of the assessment of the sensitivity of the area to construction dust impacts

Potential Impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	High	High	Medium
Human Health	Low	Low	Low	Low
Ecological	Low	Low	Low	Low

a For selected properties only

Table B11 Criteria for the determination of the risk of dust impacts in the absence of mitigation

Receptor Sensitivity	Dust Emission Magnitude		
	Large	**Medium**	**Small**
	Demolition		
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
	Earthworks		
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
	Construction		
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
	Trackout		
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Table B12 Outcome of the assessment of the risk of dust impacts

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	High Risk	High Risk	Medium Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk
Ecological	Negligible	Negligible	Negligible	Negligible