Kairus Ltd

Air Quality Assessment

Tidcombe Hall
Tidcombe Lane
Tiverton

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1 Introduction

1.1 Introduction

Kairus Ltd was commissioned by Land Value Alliances (LVA) to carry out an air quality assessment (AQA) for a proposed redevelopment of land at Tidecombe Hall, Tiverton (the 'Site') to include the conversion of Tidecombe Hall and outbuildings and the erection of dwellings to provide up to 100 dwellings.

The Site is the subject of a previous outline planning application (Reference 20/01174/MOUT) for up to 179 dwellings. A revised application is now being submitted for a reduced number of dwellings. This report provides an updated AQA in support of the revised masterplan. The air quality impact assessment (AQIA) undertaken as part of the previous assessment, which includes detailed modeling of operational traffic impacts based on up to 179 residential units, has not been updated and is presented within this report as it is considered to represent a worst-case prediction of potential impacts from operational traffic.

Due to exceedances of the national air quality objectives for nitrogen dioxide (NO_2) Mid Devon District Council (MDDC) has declared a number of Air Quality Management Areas (AQMAs) within the district. None of these are located in Tiverton and currently air quality within the town is meeting the relevant air quality objective limits.

The recently updated MDDC Supplementary Planning Document on Air Quality and Development (SPD) [1]sets out an approach to assessing air quality impacts from proposed development. The SPD sets out criteria to determine when air quality assessment is required to accompany a planning application and the level of assessment that is likely to be required.

As the Site will provide more than 10 dwellings it is considered as having a 'large potential impact' based on the criteria set out within the SPD, therefore, a Construction Impact Assessment, an Air Quality Impact Assessment and Emissions Mitigation Assessment is required.

This report addresses the impact of the proposed development on local air quality in the vicinity of the Site. Potential sources of emissions are identified and assessed in the context of existing air quality and emission sources and the nature and location of receptors.

A glossary of common air quality terminology is provided in Appendix A.

1.2 Scope of Assessment

The proposed development will provide up to 100 residential units within the Site, resulting in additional vehicle movements on the adjacent road network, therefore an assessment of the impact of traffic generated pollution emissions by the proposals has been undertaken (Air Quality Impact Assessmennt). The assessment has concentrated on nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of less than 10 µm and 2.5µm (PM_{10}/$PM_{2.5}$)), the pollutants most associated with traffic emissions and which can be harmful and cause discomfort to humans.

The assessment has taken into consideration the proposed Traffic Regulation Order (TRO) which would see the closure of Tidcombe Canal Bridge to vehicles, thus reducing vehicle trips along Tidecombe Lane to the north of the Site. The proposed development would not be delivered until the TRO is in place. The TRO would result in all development traffic travelling south along Tidcombe Lane and along Canal Hill to reach the A396.

1 Mid Devon District Council (2022) Supplementary Planning Guidance on Air Quality and Development, Adopted April 2023

An assessment of air quality impacts associated with the construction of the proposed development has also been undertaken.

An Emissions Mitigation Assessment has been carried out in accordance with the approach set out within the SPD, including a damage cost calculation providing an estimate of the societal costs associated with operational traffic emissions.

The scope of the assessment has been discussed and agreed with Janet Wallace, Contract Environmental Protection Officer, MDDC, via email correspondence dated 12th May 2023.

2 Site Description

2.1 The Existing Site

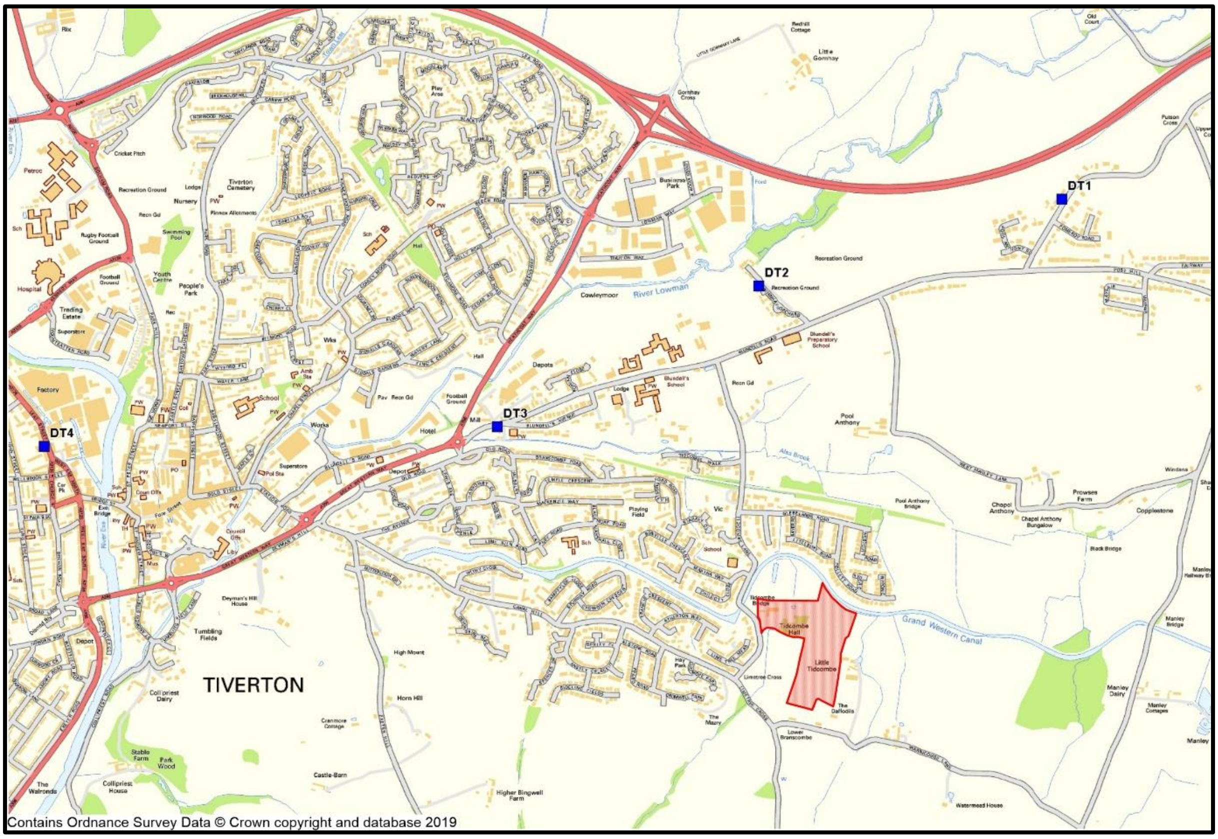
Tiverton is a town in Mid Devon, approximately 14 km north of Exeter. The Site is approximately 12.1 hectares in area and is located to the east of the town on the southern side of The Great Western Canal. The Site includes Tidecombe Hall and associated grounds plus 5 adjoining field parcels surrounding Little Tidecombe Farm.

The Grand Western Canal runs along the northern boundary of the Site, while Tidecombe Lane lies to the west, providing road access into the Site.

To the south are a number of residential properties associated with Warnicombe Lane with agricultural fields beyond. To the east is further agricultural land and Litle Tidcombe Farm. To the west there are areas of agricultural land separating parts of the site from Tidecombe Lane and the Grand Western Canal.

The location of the Site is shown below in Figure 2.1.

Figure 2.1: Location of Application Site[2]



2.2 The Proposed Development

The application is an '*outline application, with all matters reserved bar the main point of access and its associated works, for the conversion of Tidcombe Hall and outbuildings and the erection of dwellings to provide up to 100 dwellings in total, provision of community growing areas, public open space, associated infrastructure and ancillary works*'.

2 Clifton Emery Design, Land at Tidcombe Hall, Tiverton, Design and Access Statement, July 2020

An indicative masterplan for the Site is provided in Figure 2.2.

Figure 2.2: Indicative Masterplan[2]

3 Legislation, Policy and Guidance

3.1 National Legislation and Policy

3.1.1 Air Quality Regulations

The Air Quality Standards Regulations 2010[3] and Air Quality EU Exit Regulations 2019[4] set out a series of limit values for the protection of human health and critical levels for the protection of vegetation. Concentration limits apply both nationally, where they are the responsibility of national government and locally, where achieving them is the responsibility of the relevant local authority. The UK is currently exceeding the objective limits for nitrogen dioxide (NO_2) and particulate matter (PM_{10}) within London and a number of other air quality zones within the UK.

The air quality limits are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

For some pollutants, there is both a long-term (annual mean) limit and a short-term limit. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants (e.g. temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road).

Of the pollutants included in the regulations, NO_2, PM_{10} and $PM_{2.5}$ are of particular relevance to this assessment as these are the primary pollutants associated with road traffic. The current limit values for these three pollutants in relation to human health are set out in Table 3.1.

In relation to $PM_{2.5}$, new legal targets are set out in the recently published Environmental Improvement Plan (EIP) 2023[5] and Statutory Instrument 'The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[6]. Although legally binding, it is central government's responsibility for meeting these future targets. Local Authorities currently have no statutory obligation to achieve these targets. For the purposes of this assessment the limit value for $PM_{2.5}$ as set out in the 2010 regulations (as provided in Table 3.1) is considered to be appropriate to apply for this assessment. However, the new targets set out in the EIP are also provided in Table 3.1 and given consideration within the report.

Table 3.1: Relevant Air Quality Limit Values

Pollutant	Concentrations	Measured As	Date to be Achieved By
Nitrogen Dioxide (NO2)	200 µg/m³ not to be exceeded more than 18 times per year	1 hour mean	31 December 2005
	40 µg/m³	Annual mean	31 December 2005

3 Air Quality Regulations 2010-Statutrory Instrument 2010 No.1001

4 Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 – Statutory Instrument 2019 No. 74

5 HM Government Environmental Improvement Plan 2023, First Revision of the 25 Year Environment Plan

6 The Environmental Targets (Fine particulate Matter) (England) Regulations 2023 – Statutory Instrument 2023 No.96

Table 3.1: Relevant Air Quality Limit Values			
Pollutant	**Concentrations**	**Measured As**	**Date to be Achieved By**
Particulate Matter (PM10)	50 µg/m³ not to be exceeded more than 35 times per year	24 hour mean	31 December 2004
	40 µg/m³	Annual mean	31 December 2004
Particulate Matter (PM2.5)	20 µg/m³	Annual mean	1 January 2020
	10 µg/m³ (Long-term EIP Target)	Annual mean	31 December 2040
	12 µg/m³ (Interim EIP Target)	Annual mean	31 January 2028

The NAQOs apply to external air where there is relevant exposure to the public over the associated averaging periods within each objective. Guidance is provided within LAQM.TG(22) on where the objectives apply, as detailed in Table 3.2. The objectives do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e. centre of roadways).

Table 3.2: Locations Where Air Quality Objectives Apply		
Averaging Period	**Objectives should apply at:**	**Objectives should generally not apply at:**
Annual Mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care home etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term.
24 Hour Mean	All locations where the annual mean objective would apply together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1 Hour Mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside Sites (e.g. pavements of busy shopping streets).	Kerbside sites where the public would not be expected to have regular access.

Table 3.2: Locations Where Air Quality Objectives Apply		
Averaging Period	**Objectives should apply at:**	**Objectives should generally not apply at:**
	Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend 1-hour or more. Any outdoor locations where the public might reasonably be expected to spend 1-hour or longer.	

3.1.2 The UK Air Quality Strategy

The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) published in August 2023[7]. The document sets out the strategic framework for improving air quality and responsibilities of local authorities to address air quality exceedances in their areas. This includes requirements for declaring air quality management areas (AQMA) and publishing Air Quality Action Plans (AQAPs) setting out measures to reduce emissions and comply with the limit values.

The strategy also sets out expectations on local authorities to implement preventative action to ensure future breaches of the limit values do not occur.

3.1.3 Local Air Quality Management – The Environment Act 1995

Local authorities are seen to play a particularly important role. Section 82 of the Environment Act 1995 requires every local authority to conduct a review of the air quality from time to time within the authority's area. The DEFFA technical guidance, LAQM.TG(22), continues with the streamlined approach to the Local Air Quality Management (LAQM) regime, whereby every authority has to undertake and submit a single Annual Status Report/Annual Progress Report within its area, to identify whether the objectives have been or will be achieved at relevant locations by the applicable date. If the objectives are not being met, the authority must declare an Air Quality Management Area (section 83 of the Act) and prepare an action plan (section 84) which identifies measures that will be introduced in pursuit of the objectives.

3.1.4 National Air Quality Plan for Nitrogen Dioxide (NO_2) in the UK

The National Air Quality Plan[8] was written as a joint venture between the Defra and the Department for Transport (DfT) and aims to tackle roadside concentrations of NO_2 in the UK. It includes a number of measures such as those aimed at investing in Ultra Low Emission Vehicles (ULEVs) charging infrastructure, public transport and grants to help local authorities in improving air quality.

The plan requires all local authorities (LAs) in England with areas expected not to meet the Limit Values by 2020 (known as 'air quality hotspots') to develop plans to bring concentrations within these values in "the shortest time possible". These plans are to be reviewed by the government and suggestions included in the plan include actions such as utilising retrofitting technologies, changing road layout and encouraging public transport and ULEV use. Where these approaches are not considered sufficient, the LA may need to consider implementation of a Clean Air Zone (CAZ) which

7 DEFRA (2023) The Air Quality Strategy: Framework for Local Authority Delivery, August 2023

8 Defra and DfT. (2017). UK plan for tackling roadside nitrogen dioxide concentrations. London: HMSO

places restrictions on vehicle access to an area and may include charging certain (or all) vehicles or restrictions on the type of vehicle allowed to access an area.

3.1.5 Road to Zero Strategy

The 'Road to Zero' strategy9 sets out the government's plans to encourage zero emissions vehicles. These include the aim that by 2040 all new cars and vans will have zero tailpipe emissions and by 2050 almost every car will have zero emissions. Measures within the Strategy are aimed at encouraging the uptake of the cleanest vehicles and supporting electric charging infrastructure.

3.1.6 Clean Air Strategy

The Clean Air Strategy sets out policies to lower national emissions of pollutants in order to reduce background pollution and human exposure. It aims to create a strong framework to tackle air pollution and to reduce the number of people living in locations with PM2.5 concentrations exceeding 10 µg/m3 by 50% by 2025.

3.1.7 Control of Dust and Particulates Associated with Construction

Section 79 of the Environmental Protection Act (1990)[10] states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Statutory nuisance is defined as:

- *'any dust or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance', and*
- *'any accumulation or deposit which is prejudicial to health or a nuisance'.*

Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

In the context of the proposed development, the main potential for nuisance of this nature would arise during the construction phase - potential sources being the clearance, earthworks, construction and landscaping processes.

There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist - 'nuisance' is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred. However, research has been undertaken by a number of parties to determine community responses to such impacts and correlate these to dust deposition rates. However, impacts remain subjective and statutory limits have yet to be derived.

9 HM Government. (2018). Road to Zero Strategy. London: HMSO

10 Secretary of State, The Environment Act 1990 HMSO

3.2 Planning Policy

3.2.1 National Planning Policy

The latest edition of the National Planning Policy Framework (NNPF)[11] was published in September 2023, and sets out the Government's planning policies for England and how these are expected to be applied. The main changes to the policy, primarily impact on planning making and on planning decisions on housing proposals. The presumption in favour of sustainable development still remains at the heart of the NNPF which requires Local Plans to be consistent with the principles and policies set out in the NPPF with the objective of contributing to the achievement of sustainable development. In addition, members of the United Nations, including the United Kingdom, '*have agreed to pursue the 17 Global Goals for Sustainable Development in the period to 2030. These address social progress, economic well-being and environmental protection.'*

The three overarching objectives for achieving sustainable development remain the same, including the environmental objective, however, the wording of this objective has been altered slightly. It includes a requirement *'to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.'*

Section 15: Conserving and Enhancing the Natural Environment, remains and the NPPF (paragraph 174) requires that *'planning policies and decisions should contribute to and enhance the natural local environment by … preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality.'*

In dealing specifically with air quality the NPPF (paragraph 186) states that *'planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality* Management *Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.'*

Paragraph 188 states that *'the focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively'.*

11 Department for Levelling up, Housing and Communities (2023) National Planning Policy Framework, September 2023

3.2.2 Local Planning Policy

Mid Devon Local Plan Review 2013-2033

The Mid Devon Local Plan Review12 was adopted at a Full Council meeting held on 29th July 2020. The Local Plan will guide development over a 20-year period with an aim for development to be located in the most sustainable locations.

Policy DM3 deals specifically with Traffic and Air Quality and requires development proposals that are expected to give rise to significant increases in vehicle movements to be accompanied by a Transport Assessment, Travel Plan, Traffic Pollution Assessment and Low Emission Assessment, stating that 'the traffic pollution assessment must consider the impact of traffic-generated nitrogen oxides on environmental assets including protected sites listed in Policy DM28 and propose mitigation measures where appropriate'.

In terms of the Low Emission Strategy this should include the following:

'a) Assessment of the impact on existing Air Quality Management Areas, or an impact likely to result in the declaration of an additional Air Quality Management Area, in cases where a demonstratable negative impact on ambient concentrations of air pollutants is considered likely;

b) modelling of local residual road transport emissions from the development without mitigation measures; and

c) on site mitigation measures to reduce negative impacts on local air quality'.

Air quality is further addressed under Policy DM4 Pollution which states:

'Applications for development that risks negatively impacting on the quality of the environment through noise, light, air, water, land and other forms of pollution must be accompanied by a pollution impact assessment and mitigation scheme where necessary. Development will be permitted where the direct, indirect and cumulative effects of pollution will not have an unacceptable negative impact on health, the natural environment and general amenity'.

Mid Devon Supplementary Planning Document on Air Quality and Development

The MDDC Supplementary Planning Document (SPD) on Air Quality and Development[13] was updated in April 2023. It provides information to developers about when an air quality assessment will be required and guidance on the process of undertaking one.

3.3 Air Quality Guidance

3.3.1 DEFRA Technical Guidance, LAQM.TG(22)

LAQM.TG(22) sets out detailed guidance on how air quality should be assessed and monitored by local authorities. The document provides useful guidance on how air quality from specific sources should be screened and the approaches that should be used to undertake detailed assessment where potentially significant emissions are identified, including details on model verification and consideration of monitoring data for use in assessments.

12 Mid Devon District Council (2020) Mid Devon Local Plan 2013 – 2033, Adopted July 2020

13 Mid Devon District Council (2022) Supplementary Planning Document on Air Quality and Development. June 2022

3.3.2 IAQM Land-Use Planning and Development Control: Planning for Air Quality

The EPUK and IAQM have published joint guidance on the assessment of air quality impacts for planning purposes. This includes information on when an air quality assessment is required, what should be included in an assessment and criteria for assessing the significance of any impacts.

3.3.3 IAQM Guidance on the Assessment of Dust from Demolition and Construction

The IAQM recently updated the guidance on assessing impacts from construction and demolition activities[14]. The methodology for identifying the risk magnitude of potential dust sources associated with demolition, construction, earthworks and trackout remains as detailed in the previous version, but the numbers used to define the risk categories have been updated. The risk magnitude of potential dust sources is then used to identify the level of mitigation necessary in order for the impacts to be not significant.

14 IAQM (2023) Guidance on the assessment of dust from demolition and construction. August 2023

4 Methodology

4.1 Scope of Assessment

The MDDC SPD sets out an approach to assessing air quality effects from proposed development. The guidance sets out a simplified approach to assessing the potential impacts on local air in relation to planning applications provides a three-staged, five step assessment process as follows set out in Table 4.1.

Table 4.1: Air Quality Impact Classification Process	
Stage	**Step**
Stage 1. Determine if the development proposal should be classified as Small or Large Potential Impact dependent on an identified set of thresholds.	**Step A:** Pre-application Discussion
	Step B: Development Classification
Stage 2. Assess and quantify the impact on local air quality and whether any mitigation is required.	**Step C:** Construction and Demolition Screening Assessment
	Step D: Air Quality Impact Assessment
Stage 3. Determine if the proposal can be made acceptable by applying mitigation measures	**Step E:** Emissions Mitigation Assessment

At Stage 1, the proposals have been assessed as having a 'Large Potential Impact' due to the Site providing more than 10 residential units, therefore the following assessments are required for inclusion within this report based on the SPD:

- Construction Impact Assessment;
- Air Quality Impact Assessment; and
- Emissions Mitigation Assessment.

The full approach to undertake these assessments is provided below.

4.2 Construction Impact Assessment

4.2.1 Construction Traffic

During construction of the proposed development, lorries will require access to the Site to deliver and remove materials; earthmoving plant and other mobile machinery may also work on site including generators and cranes. These machines produce exhaust emissions; of particular concern are emissions of NO_2 and PM_{10}.

Based on the development proposals it is anticipated that there would be no more than 15-20 additional Heavy-Duty Vehicles (HDV) generated on the adjacent road network on any given day.

The IAQM air quality planning guidance sets out criteria to assist in establishing when an air quality assessment will be required. These criteria indicate that significant impacts on air quality are unlikely to occur where a development results in less than 25 HDV movements per day in locations within or adjacent to an AQMA and less than 100 HDV outside of an AQMA. It is therefore anticipated that construction traffic generated by the proposed development would result in a negligible impact on local NO_2 and PM_{10} concentrations and has not been considered any further in this assessment.

4.2.2 Construction/Fugitive Dust Emissions

Construction phase activities associated with the Proposed Development may result in the generation of fugitive dust emissions (i.e. dust emissions generated by site-specific activities that disperse beyond the construction site boundaries).

If transported beyond the site boundary, dust can have an adverse impact on local air quality. The IAQM has published a guidance document for the assessment of demolition and construction phase impact[15].The guidance considers the potential for dust nuisance and impacts to human health and ecosystems to occur due to activities carried out during the following stages of construction:

- Demolition (removal of existing structures);
- Earthworks (soil-stripping, ground-leveling, excavation and landscaping);
- Construction (activities involved in the provision of a new structure); and
- Trackout (the transport of dust and dirt from the construction site onto the public road network where it may be deposited and then re-suspended by vehicles using the network).

A qualitative assessment of air quality impacts due to the release of fugitive dust and particulates (PM_{10}) during the construction phase was undertaken in accordance with the methodology detailed in the IAQM guidance.

The assessment 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, thus enabling a level of risk to be assigned. Risks are described in terms of there being a low, medium or high risk of 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.

The IAQM assessment is undertaken where there are:

- human receptors within 250m of the site boundary or within 50m of the route(s) used by construction vehicles on the public highway;
- human receptors up to 250m from the site entrance(s);
- ecological receptors within 50m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway; and
- ecological receptors up to 500m from the site entrance(s).

It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors.

A summary of the IAQM assessment methodology is provided in Appendix B.

4.2.3 Assessment of Significance

The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity following the application of appropriate mitigation measures. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effects will normally be negligible.

15 IAQM (June 2023) Guidance on the assessment of dust from demolition and construction Version 1.1

4.3 Air Quality Impact Assessment

4.3.1 Introduction

Potential impacts on air quality due to local traffic emissions have been predicted using the ADMS dispersion model (version 5.0.0.1, released March 2020, updated September 2020). This is a commercially available dispersion model and has been widely validated for this type of assessment and used extensively in the Air Quality Review and Assessment process.

The model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. Meteorological data from the Exeter Meteorological Station for 2019 has been used for the assessment.

Quantitative assessment of the impacts on local air quality from road traffic emissions associated with the operation of the development have been completed against the current statutory standards and objectives set out in Table 3.1 for NO_2, PM_{10} and $PM_{2.5}$.

As discussed in Section 1.1, the air quality modelling assessment presented in this report was carried out for the original application (Reference 20/01174/MOUT) and is based on a previous masterplan for the Site providing up to 179 residential dwellings. As the revised masterplan provides up to 100 residential units, the previous modelling represents a worst-case prediction of potential air quality impacts and has not been updated as part of this revised AQA.

4.3.2 Emissions Data

The model has been used to predict road specific concentrations of oxides of nitrogen (NO_x) and particulate matter (PM_{10} and $PM_{2.5}$) at selected receptors.

The assessment has predicted air quality during 2019 for model verification. The emission factors released by Defra in August 2020, provided in the emissions factor toolkit EFT2020_v10.0[16] have been used to predict traffic related emissions of PM and NO_x.

Emission factors and background data used in the prediction of future air quality concentrations predict a gradual decline in pollution levels over time due to improved emissions from new vehicles and the gradual renewal of the vehicle fleet. In recent years the Defra emission factors published within the Emission Factor Toolkits (EFT) have been found to predict lower NO_x concentrations in future years compared to concentrations measures at roadside locations across the UK. However, research carried out by Air Quality Consultants Ltd (AQC) has now shown that emissions of NO_x from vehicles within the recently released EFT are now matching concentrations recorded at roadside locations between 2013 to 2019. The report[17] concludes that *'the EFT is now unlikely to over-state the rate at which NOx emissions decline into the future at an 'average' site in the UK. Indeed, the balance of evidence suggests that, on average, NOx concentrations are likely to decline more quickly in the future than predicted by the EFT'.* This has removed the need for the use of any sensitivity tests for future year scenarios.

In light of the above the relevant future year EFT emissions data could be used to predict concentrations in the 2031 future year scenario, however, as a cautious approach the assessment has assumed no change in emission factors between 2019 and 2031.

16 https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

17 https://www.aqconsultants.co.uk/news/march-2020/defra%E2%80%99s-emission-factor-toolkit-now-matching-measu

4.3.3 Background Concentrations

The ADMS model estimates concentrations arising as a result of vehicle emissions. It is necessary to add an estimate of local background concentrations to obtain the total concentration for comparison against the air quality objectives.

Estimated concentrations for NO_2, PM_{10} and $PM_{2.5}$ have been taken from the Defra 2018 based background maps, published in August 2020. Concentrations have been extracted from the 2019 maps for the grid square which represent the Site and adjacent road network. Data for 2019 has been used for the 2031 scenario as a cautious approach, assuming no decline in background levels between the base year and future year scenario.

Details of the background data used within the modelling assessment are provided in Table 5.2.

4.3.4 Traffic Data

Traffic data for use in the assessment has been provided by Awcock Ward Partnership (AWP). The base traffic flows have been taken from the 2031 TEUE SATURN model, with TEMPro Growth Factors applied to obtain 2019 base flows.

Anticipated development trips have been applied to the 3031 base flows to provide the Do Something Scenario.

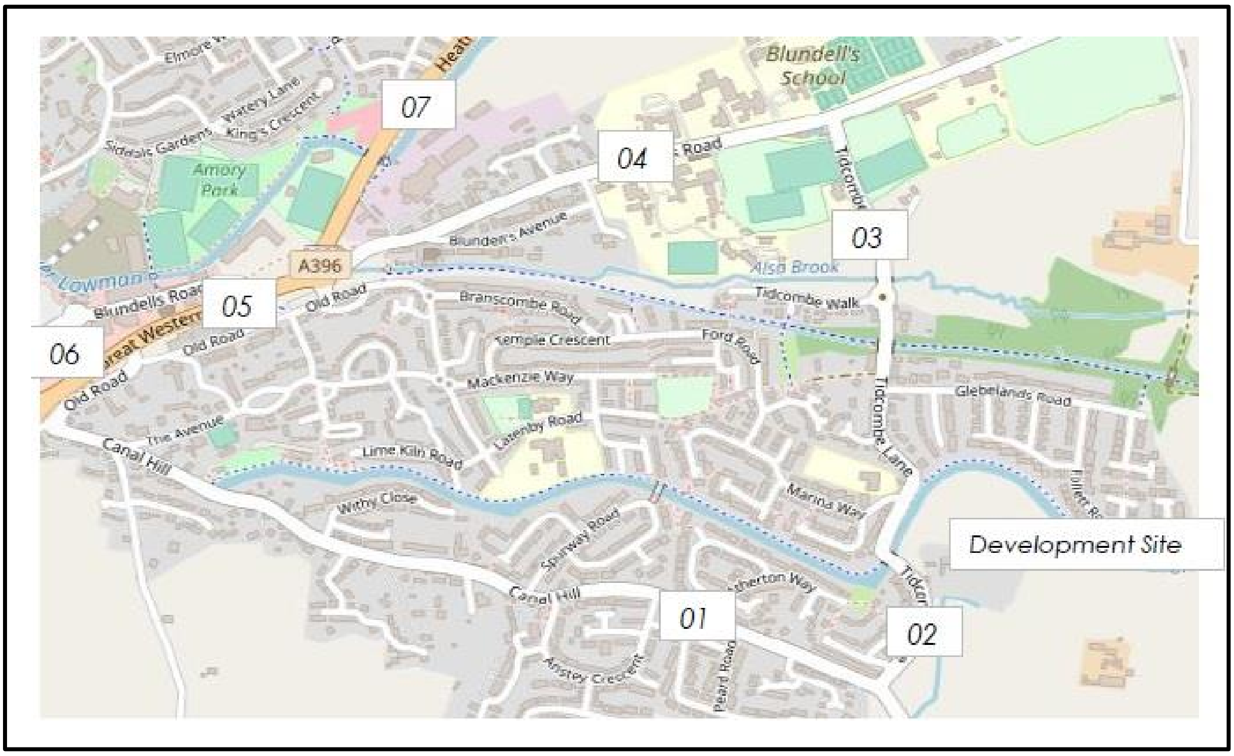
The proposed TRO, which will close Tidcombe Canal Bridge to vehicles, has also been applied to the Do-Something scenario on the assumption that the development will not be completed and occupied until the TRO is in place.

The traffic data used within the assessment are provided below in Table 4.1. The location of each link is shown in Figure 4.1.

Table 4.1: AADT traffic Flows used in ADMS Modelling Assessment

Road Link	Speed (kph)	2019 Base		2031 Base		2031 Do Something	
		AADT	%HGV	AADT	%HGV	AADT	%HGV
1 – Canal Hill	35 (20 at junction)	2418	2.0	2852	2.0	3637	1.6
2 – Tidcombe Lane (south of site access)	35 (20 at junction)	1764	2.0	2080	2.0	833	5.0
3 – Tidcombe Lane (north of site access)	35 (20 at junction)	2438	2.0	2875	2.0	794	7.2
4 – Blundells Road	48 (25 at junction)	6978	2.0	8229	2.0	8290	2.0
5 – A396 east of Old Road)	48 (25 at junction)	12975	2.1	15301	2.1	15808	2.0
6 – A396 (west of Old Road)	48 (25 at junction)	16433	2.1	19378	2.1	19656	2.1
7 – A396 Heathcote Way	48 (25 at junction)	17419	2.1	20541	2.1	20988	2.1

Figure 4.1: Location of Road Links used in Modelling



4.3.5 Model Outputs and Results Processing

The ADMS Model has predicted traffic related annual mean emissions of NO_x and PM at a number of receptors along the road links set out in Table 4.1. Relevant background concentrations have subsequently been added to the model outputs to provide the total concentrations of each pollutant.

The predicted concentrations of NO_x have been converted to NO_2 using the LAQM calculator (Version 8.1, released August 2020) available on the Defra air quality website[18].

Analysis of long-term monitoring data[19] suggests that if the annual mean NO_2 concentration is less than 60 µg/m^3 then the one-hour mean NO_2 objective is unlikely to be exceeded where road transport is the main source of pollution. Therefore, in this assessment the annual mean concentration has been used to screen whether the one-hour mean objective is likely to be achieved as recommended within LAQM.TG(16). Similar to NO_2, an annual mean PM_{10} concentrations below 32 µg/m^3 is used to screen whether the 24-hour PM_{10} mean objective is likely to be achieved, the approach also recommended within LAQM.TG(16).

4.3.6 Verification of Model Results

It is recommended that the model results are compared with measured data to determine whether the model results need adjusting to more accurately reflect local air quality. This process is known as verification.

LAQM.TG(16) recommends that model predictions should be within 25% (preferably 10%) of monitored concentrations for the model to be predicting with any degree of accuracy. Also, the

18 http://uk-air.defra.gov.uk

19 D Laxen and B Marner: Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites (July 2003).

guidance recommends that any adjustment factors applied to model results should be calculated based on verification using monitoring sites in a similar location i.e. roadside, intermediate or background sites.

To verify the model results, the ADMS model has been used to predict NO_x concentrations at the monitoring site located on Blundell's Road (DT3, as detailed in the MDDC 2020 Air Quality Annual Status Report[20]. See Appendix C for further details on the verification method.

There is no suitable monitoring of PM data to allow verification of the PM model results. However, LAQM.TG (16) suggests applying the NO_x adjustment factor to modelled road-PM where no appropriate verification against PM data can be carried out. Therefore, the adjustment applied to predicted NO_x concentrations has also been applied to the modelled PM_{10} concentrations.

4.3.7 Selection of Receptors

As set out in Table 3.2, LAQM.TG(16) describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations *'where members of the public are regularly present'* should be considered. At such locations, members of the public would be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

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

For the completion of this assessment, air quality has been predicted at sensitive receptors (residential properties and educational facilities) located adjacent to the road links set out in Table 4.1. Each receptor has been selected to represent worst-case exposure to local traffic emissions.

Two receptors have also been selected to represent the proposed development site to allow an exposure assessment to be undertaken.

The details of each receptor are presented below in Table 4.2 and their locations shown in Figure 4.2.

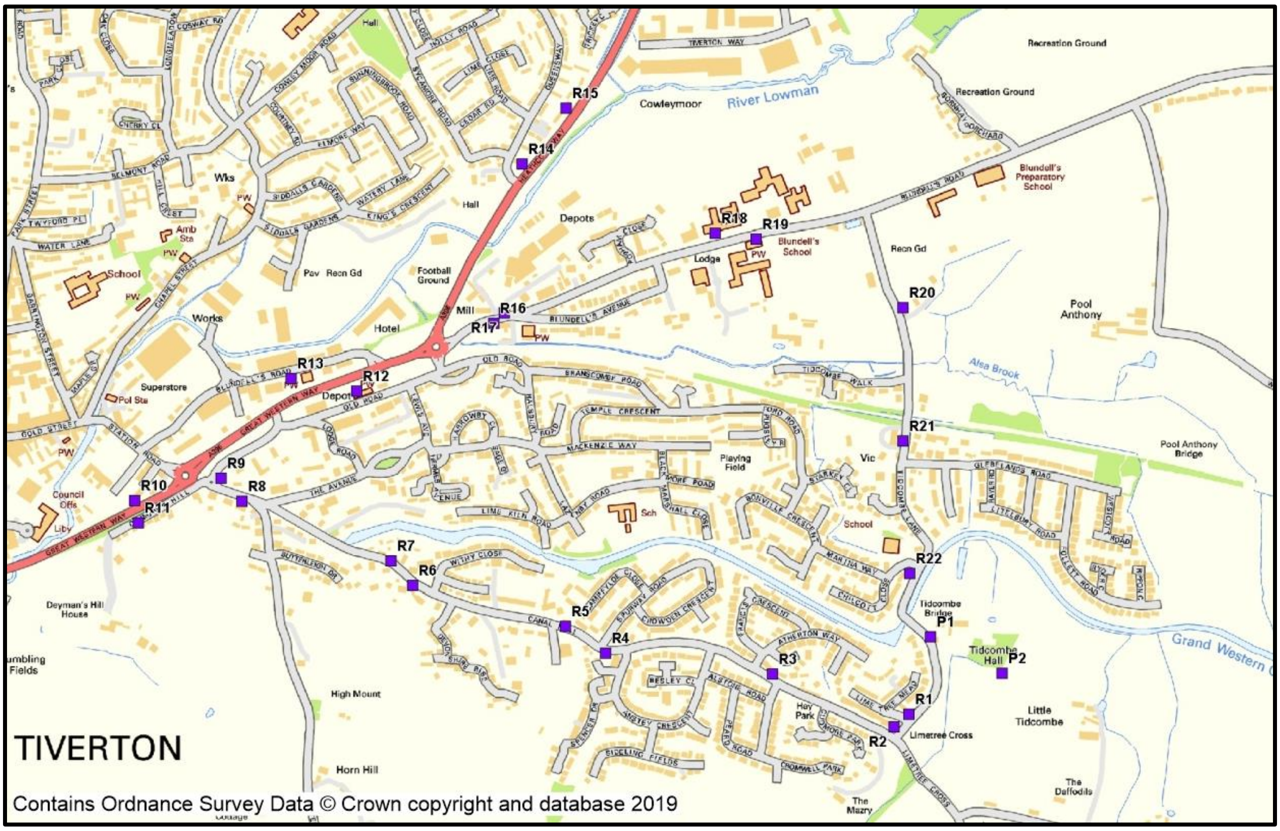
Table 4.2: Location of Receptors used in ADMS Modelling Assessment

Receptor Number	Receptor Location	OS Grid Reference	Receptor Height (m)
R1	21 Lime Tree Mead	297355, 112029	1.5
R2	19 Lime Tree Mead	297326, 112004	1.5
R3	9 Wesley Close	297092, 112106	1.5
R4	70 Canal Hill	296770, 112146	1.5
R5	1 Bingwell Cottages	296691, 112199	1.5

20 Bureau Veritas (2020) Mid Devon District Council Annual Status Report 2020, August 2020

Table 4.2: Location of Receptors used in ADMS Modelling Assessment			
Receptor Number	**Receptor Location**	**OS Grid Reference**	**Receptor Height (m)**
R6	46 Canal Hill	296396, 112277	1.5
R7	Claremont	296355, 112325	1.5
R8	8 Canal Hill	296066, 112440	1.5
R9	9 Canal Hill	296027, 112485	1.5
R10	Coopers Court	295860, 112441	1.5
R11	Deymans Hill	295867, 112399	1.5
R12	St James Catholic Church	296288, 112653	1.5
R13	Cherith Christian Fellowship Church	296162, 112678	1.5
R14	129 Queens Way	296608, 113093	1.5
R15	13 Heathcote Way	296693, 113201	1.5
R16	1 Blundell's Road	296553, 112785	1.5
R17	2 Blundell's Road	296573, 112805	1.5
R18	Blundell's School	296923, 112941	1.5
R19	Blundell's School	297060, 112947	1.5
R20	Tidcombe Lane	297344, 112815	1.5
R21	41 Tidcombe Lane	297344, 112557	1.5
R22	Marina Way	297356, 112301	1.5
P1	Proposed Development	297397, 112178	1.5
P2	Proposed Development	297535, 112107	1.5

Figure 4.2: Sensitive Human Receptors used in Modelling



4.3.8 Significance Criteria

The guidance issued by EPUK & IAQM relates to Air Quality considerations within the planning process and sets criterion which identify the need for an Air Quality Assessment, the type of Air Quality assessment required, and the significance of any predicted impact.

The guidance suggests expressing the magnitude of incremental change in concentrations as a proportion of an Air Quality Assessment Level (AQAL) such as the air quality objectives set out in Table 3.1.

The significance of impact is then identified based on the incremental change in the context of the new total concentrations and its relationship with the assessment criteria, noting whether the impact is adverse or beneficial based on a positive or negative change in concentrations. The criteria suggested for assigning significance is set out in Table 4.3 below.

To assess the overall significance of the predicted impact the assessment draws on the approach used for undertaking environmental impact assessments where a moderate and major impact is deemed to be significant while a minor or negligible impact would not be classed as significant.

75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% of AQAL	Moderate	Substantial	Substantial	Substantial

AQAL – Air Quality Assessment Level which in this assessment refers to the Air Quality Objectives set out in Table 3.1

The percentage change in concentration should be rounded to a whole number

The table should only be used with annual mean concentrations

The descriptors are for individual receptors only: overall significance should be based on professional judgment

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

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

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

4.4 Emissions Mitigation Assessment

An emissions mitigation assessment has been carried out in accordance with the MDDC SPD to determine the appropriate level of mitigation required to help avoid, minimise and where required, off-set impacts on local air quality.

A calculation of NO_2 and $PM_{2.5}$ emissions from the operational site have been calculated from the operational daily trip generation in conjunction with the latest emissions factors set out within the EFTv11. The data have subsequently been used within the 2022 damage cost appraisal toolkit published by Defra in January 2023[21] incorporating the updated 2023 damage costs, to calculate the anticipated damage costs associated with the proposals.

The calculated damage cost provides an indication of the level of mitigation that should be implemented to reduce emissions during operation of the proposed development. Appropriate mitigation will be determined based on the calculated damage cost and measures set out in the SPD.

21 https://www.gov.uk/government/publications/assess-the-impact-of-air-quality

5 Baseline Assessment

5.1 Mid Devon Review and Assessment of Air Quality

MDDC has completed a number of detailed assessments of air quality which has identified exceedances of the annual mean NO_2 objective at a number of locations. MDDC currently has two AQMAs, one covering the town of Crediton and the other the town of Cullompton.

Air quality within Tiverton has not been found to be exceeding the relevant air quality objectives and no AQMA has been declared within the town, although the Local Plan states that Tiverton is '*at risk of being declared an AQMA*'.

5.2 Air Quality Monitoring

5.2.1 Nitrogen Dioxides

NO_2 is monitored within Tiverton using diffusion tubes at four locations. No monitoring of NO_2 concentrations is carried out in the immediate vicinity of the Site. Three of the sites are located within the northern part of the town and the other within the town centre. The location of the sites is shown in Figure 2.1.

Details of the four sites are presented in Table 5.1.

Diffusion tubes are a passive form of monitoring, which, due to their relative in-expense, allow for a much greater spatial coverage than with automatic monitoring sites. Diffusion tubes are acknowledged as a less accurate method of monitoring ambient air pollutants than automatic monitors, with diffusion tubes over or under estimating concentrations by as much as 30 %.

To allow the results to be reliably compared with the AQ Objectives, the data should be bias corrected using data collected from tubes co-located with continuous monitoring sites. The data provided below has been bias adjusted by MDDC following recommended guidance.

Data recorded at all four monitoring sites shows annual mean NO_2 concentrations well below (<30 $\mu g/m^3$) the annual mean objective of 40 $\mu g/m^3$ since 2018.

The data indicates a downward trend in concentrations within the town.

It is not possible to monitor short-term NO_2 concentrations using diffusion tubes, however, as discussed previously, research has concluded that exceedances of the 1-hour mean objective are generally unlikely to occur where annual mean concentrations are below 60 $\mu g/m^3$. Based on the monitoring data presented in Table 5.1, it is unlikely that the short-term objective is being exceeded.

Table 5.1: Diffusion Tube annual average nitrogen dioxide concentrations (μgm^{-3})

Site	Classification	Year				
		2018	2019	2020[1]	2021[1]	2022
DT1 – Uplowman Road	R	-	9.9	6.9	8.2	7.5
DT2 – Gornhay Orchard	R	-	8.7	6.3	7.9	7.7
DT3 – Horsdon Terrace	R	19.4	17.2	12.5	14.3	14.3
DT4 – Leat Street	R	30.8	27.0	19.2	23.4	21.3
R – Roadside						

Table 5.1: Diffusion Tube annual average nitrogen dioxide concentrations (μgm^{-3})						
Site	Classification	Year				
		2018	2019	2020[1]	2021[1]	2022
[1] data has been presented for 2020 and 2021 for completeness, however due to the Covid 19 Pandemic and the resulting suppression in traffic movements pollution levels during both years were significantly suppressed. The data for both years has not been used to inform the baseline assessment.						

5.2.2 Particulate Matter

MDDC monitor PM_{10} and $PM_{2.5}$ concentrations at four locations across the district, two within the Cullompton AQMA and two within the Crediton AQMA.

PM_{10} concentrations recorded within the district are set out in Table 5.2 and $PM_{2.5}$ concentrations are presented in Table 5.3.

The data in Table 5.2 shows that the annual mean PM_{10} concentrations are less than 75% of the air quality limit of 40 µg/m³ (well below the objective limit). The sites have recorded exceedances of the 24-hour objective limit, however at no time has the number of exceedances exceeded 35 in any given year, therefore the objective has not been breached at any of the monitoring locations.

Table 5.2: PM_{10} concentrations recorded in Mid Devon				
Site ID	Averaging period	Year		
		2020[1]	2021[1]	2022
DEV2450357 Crediton	Annual Mean	18.7	11.7	7.3
	1-hour	6	3	0
DEV2450358 Crediton	Annual Mean	13.3	8.5	14.6
	1-hour	5	0	7
DEV2450359 Cullompton	Annual Mean	22.4	8.3	7.4
	1-hour	21	0	0
DEV2450360 Cullompton	Annual Mean	17.6	13.0	8.8
	1-hour	2	2	1
Figures in BOLD represent an exceedance of the annual mean objective of 40 µg/m³ [1] data has been presented for 2020 and 2021 for completeness, however due to the Covid 19 Pandemic and the resulting suppression in traffic movements pollution levels during both years were significantly suppressed. The data for both years has not been used to inform the baseline assessment.				

Estimated $PM_{2.5}$ concentrations (Table 5.3) are well below the annual mean limit value of 20 µg/m³. Furthermore, concentrations at all four locations are meeting the interim and long-term EIP target levels.

Table 5.3: $PM_{2.5}$ concentrations recorded in Mid Devon				
Site ID	Averaging period	Year		
		2020[1]	2021[1]	2022
DEV2450357 Crediton	Annual mean	5.1	4.4	3.6
DEV2450358 Crediton	Annual Mean	5.6	5.3	9.2
DEV2450359 Cullompton	Annual Mean	9.8	6.8	4.6
DEV2450360Cullompton	Annual Mean	6.5	6.4	4.4
Figures in BOLD represent an exceedance of the annual mean limit of 20 µg/m^3 Figures underlined exceed the EIP targets [1] data has been presented for 2020 and 2021 for completeness, however due to the Covid 19 Pandemic and the resulting suppression in traffic movements pollution levels during both years were significantly suppressed. The data for both years has not been used to inform the baseline assessment.				

5.3 DEFRA Background Maps

Additional information on estimated background pollutant concentrations has been obtained from the DEFRA background maps provided on UK-AIR, the Air Quality Information Resource (http://uk-air.defra.gov.uk). Estimated air pollution concentrations for oxides of nitrogen (NO_x), NO_2, PM_{10} and $PM_{2.5}$ have been extracted from the 2018 based background pollution maps for the UK, which were published in August 2020[22]. The maps are available in 1 km x 1 km grid squares and provide an estimate of concentrations between 2018 and 2030. Concentrations have been taken from the 2019 maps from the grid squares which represent the Site and road network considered within the assessment.

The NO_x and PM background maps are provided not only as total concentrations but are also broken down into sector contributions (i.e. primary A roads and brake tyre). However, as this assessment is considering the impact of the proposed development on existing air quality, background concentrations from all sources should be considered. Therefore, data presented in Table 5.4 provides total background concentrations for all three pollutants.

The data indicates that background concentrations of NO_2, PM_{10} and $PM_{2.5}$ in the vicinity of the Site are comfortably below the annual mean objectives.

Table 5.4: Annual Mean Background Air Pollution Concentrations				
OS Grid Square	NO_x	NO_2	PM_{10}	$PM_{2.5}$
295500, 112500	13.5	10.2	10.9	7.1
296500, 112500	9.5	7.5	10.5	6.8
297500, 112500	7.3	5.8	9.9	6.3
296500, 113500	12.0	9.2	11.6	7.6

22 https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

5.4 Air Quality at the Development Site

The Site is located on the south-eastern edge of the town and is considered to represent a background location in terms of air quality. Monitoring sites DT1 and DT2 are also located on the outskirts of the town and therefore are in similar background locations. Based on data recorded at both these locations, NO_2 concentrations across the Site will be well below the annual mean and 1-hour objective limits.

Based on the outcome of the air quality review and assessment process PM_{10} and $PM_{2.5}$ concentrations are also expected to be meeting the relevant air quality objectives across the Site.

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6 Construction Impacts

6.1 Site and Surroundings

A summary of the proposed development is provided in Section 2 of this report.

The Site covers an area of approximately 7 hectares (70,000 m^2) and there are residential properties located within 250 m of the Site. An assessment of construction related impacts in relation to human receptors has therefore been undertaken.

Dust emissions from construction activities are unlikely to result in significant impacts on ecologically sensitive receptors beyond 50 m from the site boundary. A review of data held on the DEFRA MAGIC website[23] shows that the Grand Western Canal Country Park Local Nature Reserve (LNR) runs along the northern boundary of the Site. There may be species within the LNR that are sensitive to dust and therefore impacts on ecological receptors have been included within the assessment.

As discussed in Section 5, the PM_{10} concentrations, taken from the Defra background maps, in the vicinity of the Site are expected to be below the relevant objective limits (Table 5.4). The data indicates background concentrations in the region of 9-10 $\mu g/m^3$ at the Site. Based on professional judgment, it is anticipated that PM_{10} concentrations at the Site and at adjacent properties are unlikely to be much higher than background, therefore PM_{10} concentrations are expected to be below 24$\mu g/m^3$.

The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited would depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

A windrose from the Exeter Meteorological Station is provided in Figure 6.1, which shows that prevailing winds are from the south southwest direction. Areas most consistently affected by dust are influenced by prevailing winds that are generally located downwind of an emission source. Therefore, the highest risk of impacts would occur at receptors to the north northeast, which includes properties on the opposite side of the Grand Western Canal along Follet Road and Little Tidcombe Farm, to the east of the Site, all of which would be particularly sensitive to dust effects.

23 http://magic.defra.gov.uk/

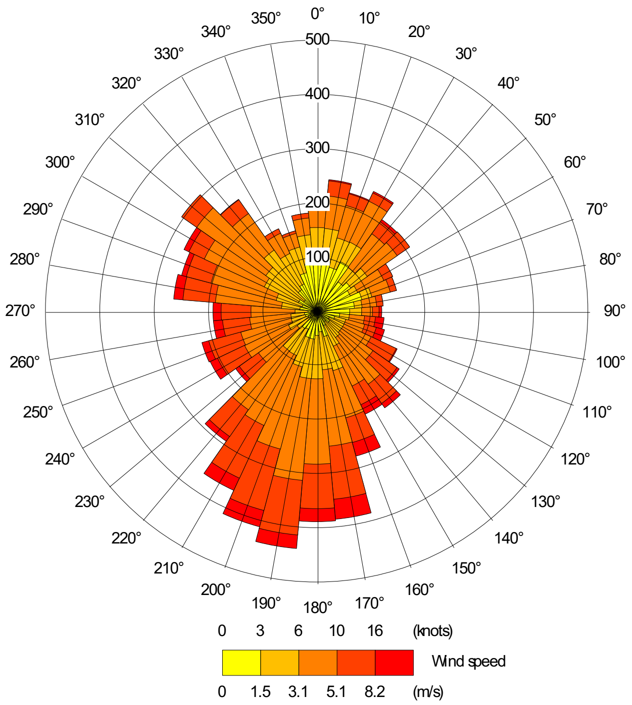

Figure 6.1: Windrose from Exeter Meteorological Station (2022)

6.2 Risk Assessment of Dust Impacts

6.2.1 Defining the Dust Emission Magnitude

With reference to the criteria detailed in Appendix B, the dust emission magnitude for each of the category's demolition, earthworks, construction and trackout have been determined. These have been summarised in Table 6.1.

Table 6.1: Dust Emission Magnitudes		
Activity	**Criteria**	**Dust Emission Magnitude**
Demolition	Small amount of demolition associated with restoration of Tidcombe Hall	**Small**
Earthworks	Building site area approximately 70,000 m^2, 4-5 HDV on site.	**Medium**
Construction	Building volume between 45,000 - 55,000m^3, main construction material brick and concrete	**Medium**
Trackout	Between 15-20 HDV (>3.5t) movements per day	**Small**

6.2.2 Sensitivity of Surrounding Area

Using the criteria set out in Tables B2 to B4 in Appendix B, the sensitivity of the surrounding area to impacts from dust emissions has been determined and are set out in Table 6.2.

Dust Soiling

There are residential properties in close proximity to the Site, however the majority of these are over 20 m from the Site boundary and therefore over 20 m from construction activities. The sensitivity of the surrounding area in relation to dust soiling effects is therefore considered to be medium.

There will be between 15-20 HDV (>3.5t) movements per day during the construction phase which will travel to and from the Site along Tidcombe Road, (south) and Canal Hill. As a general guide, significant impacts from trackout may occur up to 500 m from large sites, 250 m from medium sites and 50 m from small sites, as measured from the site exit. There are residential receptors located along both roads within 20 m of the roadside. The sensitivity of the area to dust soiling effects from trackout is therefore considered to be high.

PM_{10} Effects

As previously discussed, annual mean PM_{10} concentrations in the vicinity of the Site are expected to be below 24 µg/m^3. Based on the proximity of sensitive receptors to the site boundary and the local concentrations of PM_{10} the sensitivity of the surrounding area is considered to be low with regards human health impacts.

Table 6.2: Sensitivity of Receptors		
Potential Impact		**Sensitivity at Site**
Dust Soiling (demolition)	Receptor Sensitivity	High
	Number of Receptors	None within 20 m, 3 – 4 within 50 m
	Sensitivity of the area	**Low**
Dust Soiling (earthworks and construction)	Receptor Sensitivity	High
	Number of Receptors	1-2 residential properties within 20 m, >20 within 20-50 m.
	Sensitivity of the area	**Medium**
Dust Soiling (trackout)	Receptor Sensitivity	High
	Number of Receptors	>20 residential properties within 20 m of roadside
	Sensitivity of the area	**High**
Human Health (demolition)	Receptor Sensitivity	High
	Annual Mean PM_{10} Concentration	< 24 µg/m^3
	Number of Receptors	None within 20 m, 3 – 4 within 50 m
	Sensitivity of the area	**Low**
Human Health (earthworks and construction)	Receptor Sensitivity	High
	Annual Mean PM_{10} Concentration	< 24 µg/m^3
	Number of Receptors	1-2 residential properties within 20 m, >20 within 20-50 m.
	Sensitivity of the area	**Low**

Table 6.2: Sensitivity of Receptors		
Potential Impact		**Sensitivity at Site**
Human Health (trackout)	Receptor Sensitivity	High
	Annual Mean PM_{10} Concentration	< 24 μg/m^3
	Number of Receptors	>20 residential properties within 20 m of roadside
	Sensitivity of the area	**Low**

Ecological Effects

The adjacent LNR is located directly adjacent to the Site, within 20 m of the Site boundary. However, LNRs are considered to be low sensitivity receptors.

As the LNR is over 50 m from any demolition works sensitivity to dust during this phase would be negligible, however during earthworks and construction sensitivity would be low. Sensitivity to trackout effects is also considered to be negligible given the distance of the LNR from the site access points.

6.3 Defining the Risk of Impacts

The dust emission magnitude as set out in Table 6.1 is combined with the sensitivity of the area (Table 6.2) to determine the risk of both dust soiling and human health impacts, assuming no mitigation measures applied at site. The risk of impacts associated with each activity is provided in Table 6.3 below and has been used to identify site-specific mitigation measures, which are discussed in Section 9.1.1 and set out in Appendix D.

Table 6.3: Summary of Effects Without Mitigation			
Source	**Dust Soiling**	**PM_{10} Effect**	**Ecological**
Demolition	Negligible	Negligible	Negligible
Earthworks	Medium	Low	Low
Construction	Medium	Low	Low
Trackout	Low	Low	Negligible

7 Operational Impacts

7.1 Air Quality Impact Assessment

7.1.1 Existing Receptors

Nitrogen Dioxide

Annual mean NO_2 concentrations predicted at the selected existing receptor locations are presented below in Table 7.1.

The modelling assessment is predicting annual mean NO_2 concentrations well below the annual mean objective of 40 µg/m^3 (AQAL) at all the selected receptors.

Traffic generated by the operational development is predicted to increase annual mean NO_2 concentrations by up to 1.4 µg/m^3, the highest impact predicted at receptor R5, on Canal Hill. This equates to an increase of up to 3 % of the AQAL. Based on the criteria set out in Table 4.3, the predicted increase in NO_2 is deemed to be of negligible significance given that concentrations remain at less than 75% of the AQAL (<30 µg/m^3).

The model is also predicting a decline in NO_2 concentrations at receptors along Tidcombe Lane (Receptors R1. R2, RR20 to R22) due to the TRO closing Tidcombe Canal Bridge to vehicles. The reduction in vehicle trips as a result of this closure would result in a decline in NO_2 concentrations of up to 3.3 µg/m^3, which equates to 8% of the AQAL and is deemed to be a slight beneficial impact.

With predicted annual mean concentrations being less than 60 µg/m^3, it is expected that the hourly objective of 200 µg/m^3 will also be met at all locations and impacts in terms of short-term NO_2 would be negligible.

Table 7.1: Predicted Annual Mean NO_2 Concentrations at Existing Receptors (µg/m^3)

Receptor	2019 Base	2031 Base	2031 Do Something	Change due to Proposed Development as a % of AQAL	Significance of Impact
R1	8.1	8.4	7.4	-3	Negligible
R2	8.1	8.4	8.2	-1	Negligible
R3	8.8	9.3	10.1	2	Negligible
R4	10.8	11.3	12.2	2	Negligible
R5	12.6	13.4	14.7	3	Negligible
R6	11.4	11.9	12.9	2	Negligible
R7	12.3	13.1	14.3	3	Negligible
R8	12.8	13.7	14.6	2	Negligible
R9	15.6	17.0	17.9	2	Negligible
R10	21.0	22.9	23.1	0	Negligible
R11	18.7	20.2	20.3	0	Negligible

Table 7.1: Predicted Annual Mean NO_2 Concentrations at Existing Receptors ($\mu g/m^3$)					
Receptor	**2019 Base**	**2031 Base**	**2031 Do Something**	**Change due to Proposed Development as a % of AQAL**	**Significance of Impact**
R12	13.4	14.5	14.7	1	Negligible
R13	11.7	12.4	12.6	0	Negligible
R14	18.1	19.7	19.9	0	Negligible
R15	17.3	18.7	18.8	0	Negligible
R16	18.8	20.6	20.8	0	Negligible
R17	15.7	17.1	17.2	0	Negligible
R18	9.8	10.3	10.3	0	Negligible
R19	13.7	15.1	15.1	0	Negligible
R20	8.4	8.8	7.1	-4	Negligible
R21	10.4	11.1	7.8	-8	Slight Beneficial
R22	8.2	8.6	7.0	-4	Negligible

PM_{10} Concentrations

Predicted annual mean PM_{10} concentrations at the selected existing receptor locations are presented below in Table 7.2.

Table 7.2: Predicted Annual Mean PM_{10} Concentrations at Existing Receptors ($\mu g/m^3$)					
Receptor	**2019 Base**	**2031 Base**	**2031 Do Something**	**Change due to Proposed Development as a % of AQAL**	**Significance of Impact**
R1	10.2	10.3	10.1	0	Negligible
R2	10.3	10.3	10.3	0	Negligible
R3	1034	10.5	10.6	0	Negligible
R4	11.1	11.2	11.3	0	Negligible
R5	11.4	11.5	11.8	1	Negligible
R6	11.2	11.3	11.4	0	Negligible
R7	11.3	11.5	11.7	1	Negligible
R8	11.4	11.5	11.7	0	Negligible
R9	11.8	12.0	12.2	0	Negligible
R10	12.8	13.2	13.2	0	Negligible

Table 7.2: Predicted Annual Mean PM_{10} Concentrations at Existing Receptors (µg/m^3)					
Receptor	2019 Base	2031 Base	2031 Do Something	Change due to Proposed Development as a % of AQAL	Significance of Impact
R11	12.4	12.47	12.7	0	Negligible
R12	11.6	11.8	11.9	0	Negligible
R13	11.3	11.4	11.5	0	Negligible
R14	13.4	13.7	13.7	0	Negligible
R15	13.2	13.5	13.5	0	Negligible
R16	12.6	13.0	13.0	0	Negligible
R17	12.1	12.3	12.4	0	Negligible
R18	10.9	11.0	11.0	0	Negligible
R19	11.4	11.7	11.7	0	Negligible
R20	10.3	10.4	10.1	-1	Negligible
R21	10.7	10.8	10.2	-1	Negligible
R22	10.3	10.3	10.1	-1	Negligible

The ADMS model is predicting annual mean PM_{10} concentrations at less than 75% of the AQAL of 40 µg/m^3 at all receptor locations.

Traffic generated by the operational development is predicted to increase annual mean PM_{10} concentrations by no more than 0.2 µg/m^3, which is less than 1% of the AQAL and therefore classed as a negligible impact based on criteria set out in Table 4.3.

At receptors along Tidcombe Lane, annual mean PM_{10} concentrations are predicted to decline by up to 0.6 µg/m^3, 1% of the AQAL and again classed as a negligible impact.

As discussed in section 4.2.5, where annual mean PM_{10} concentrations fall below 32 µg/m^3, exceedance of the 24-hour objective is considered unlikely. As annual mean concentrations are below this threshold at all the selected receptors, concentrations are predicted to be meeting the 24-hour objective limit of 50 µg/m^3.

7.1.2 $PM_{2.5}$ Concentrations

Predicted annual mean $PM_{2.5}$ concentrations at the selected existing receptor locations are presented below in Table 7.3.

The ADMS model is predicting annual mean $PM_{2.5}$ concentrations at less than 75% of the AQAL of 25 µg/m^3 at all receptors.

The operational development is predicted to increase/decrease annual mean PM_{10} concentrations by no more than 0.1 µg/m^3, which is less than 1% of the AQAL and therefore classed as a negligible impact.

Table 7.3: Predicted Annual Mean $PM_{2.5}$ Concentrations at Existing Receptors ($\mu g/m^3$)					
Receptor	2019 Base	2031 Base	2031 Do Something	Change due to Proposed Development as a % of AQAL	Significance of Impact
R1	6.5	6.5	6.4	0	Negligible
R2	6.5	6.5	6.5	0	Negligible
R3	6.9	7.0	7.0	0	Negligible
R4	7.1	7.2	7.3	0	Negligible
R5	7.3	7.4	7.5	1	Negligible
R6	7.2	7.3	7.4	0	Negligible
R7	7.3	7.4	7.5	1	Negligible
R8	7.3	7.4	7.5	0	Negligible
R9	7.6	7.7	7.8	0	Negligible
R10	8.2	8.4	8.4	0	Negligible
R11	8.6	8.8	8.8	0	Negligible
R12	7.4	7.6	7.6	0	Negligible
R13	7.3	7.3	7.4	0	Negligible
R14	8.6	8.8	8.8	0	Negligible
R15	8.5	8.7	8.7	0	Negligible
R16	8.0	8.2	8.3	0	Negligible
R17	7.7	7.9	7.9	0	Negligible
R18	7.1	8.1	7.1	0	Negligible
R19	7.2	7.3	7.4	0	Negligible
R20	6.6	6.6	6.4	-1	Negligible
R21	6.8	6.8	6.5	-1	Negligible
R22	6.5	6.6	6.4	-1	Negligible

7.1.3 Proposed Receptors (Exposure Assessment)

Annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations predicted during the 2031 Do-something scenario at receptors P1 and P2, which represent the proposed development areas, are set out in Table 7.4.

Concentrations of all three pollutants are predicted to be well below the relevant annual mean and short-term objective limits at both receptors. The impact of the development in terms of new exposure would therefore be negligible.

Table 7.4: Predicted Annual Mean NO_2 and PM_{10} Concentrations at Development Site in the 2031 Do-Something Scenario (µg/m^3)			
Receptor	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
P1	7.7	10.2	6.5
P2	6.1	10.0	6.3

7.2

8 Emissions Mitigation Assessment

The modelling assessment has found that impacts associated with operational traffic will not be significant due to the small size of the development and the small increase in vehicles associated with the proposals. However, it is acknowledged that the development will generate vehicle movements across the network which will contribute to traffic related emissions. The SPD therefore requires a damage cost calculation to be undertaken for all developments considered to have a 'large potential impact' to inform a mitigation strategy to reduce emissions and contribute to improving air quality within the borough.

8.1 Damage Cost Calculation

Based on a development of 100 residential units, data provided by AWP indicates a daily trip generation of 466 vehicles, of which 1% would be HGVs. The assessment has therefore used the following input data within the EFT2021_V11 to calculate the emissions for the site:

- Emission Assessment year - 2024
- Trip rate - 466 AADT;
- 1% HGV;
- 56kph speed;
- trip length - 10 km (NTS UK average taken from National Travel Survey).

The emissions of both NO_x and $PM_{2.5}$ have been used within the Defra Damage Cost Appraisal Toolkit to calculate the damage cost for the operational development. The outputs from the EFT and Damage Cost Appraisal Toolkit are set out in Table 8.1 and a copy of the EFT and Damage Cost spreadsheets are provided in Appendix E.

Table 8.1: Calculate Damage Costs for Operational Development

Pollutant	Assessment year	Emissions (tonnes per year)	Damage Cost over 10 Years	Total Damage Cost
NO_x	2024	0.314	£25,878	£43,638
$PM_{2.5}$	2024	0.0306	£17,760	

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9 Mitigation Measures

9.1 Mitigation Measures

9.1.1 Construction Phase

The control of dust emissions from construction site activities relies upon management provisions and mitigation techniques to reduce emissions of dust and limit dispersion. Where dust emission controls have been used effectively, large-scale operations have been successfully undertaken without impacts to nearby properties.

The proposed development has been identified as a medium-risk site for dust soiling effects during earthworks, construction and track and a negligible risk site during demolition as set out in Table 6.3.

The developer should therefore implement appropriate dust and pollution control measures as set out within the IAQM guidance. A summary of these measures is set out in Appendix D. The proposed measures should be set out within a CMP and approved by MDDC prior to commencement of any work on site.

Following implementation of the measures recommended for inclusion within the CMP the impact of emissions during construction of the proposed development would be negligible.

9.1.2 Operational Phase

The assessment has predicted a negligible impact on NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of traffic generated by the proposed development. The exposure assessment has also shown that the development would not introduce new receptors into a location of poor air quality, therefore no mitigation in relation to exposure is required. However, it is recognised that cumulatively the development would contribute to local emissions through additional vehicle movements on the network.

The site would need to implement mitigation measures in accordance with the requirements of the SPD taking into account the calculated damage cost.

It is anticipated that as a minimum the development would incorporate the following:

- Provision for electric vehicle (EV) infrastructure to allow EV charging units to be fitted for use by occupants. The final number will be determined as part of the reserve matters application.
- All energy provision will be either form electric sources such as Air Source Heat Pumps (ASHP) or low NO_x gas boilers (rated <40 mg NO_x/kW) in conjunction with renewable energy.

Additional mitigation measures will be determined as part of any reserve matters application taking into account the damage costs, with the aim of implementing measures that will reduce these costs significantly through a reduction in trip generation and measures to encourage the use of alternative modes of transport. The final package of measures will be agreed with MDDC as part of the approval process.

10 Conclusion

It is inevitable that with any development construction activities would cause some disturbance to those nearby and the assessment has predicted a minor to moderate adverse impact prior to the implementation of any on-site mitigation. However, following the implementation of appropriate mitigation measures, which would be set out within a CMP, impacts associated with the construction of the development are likely to be insignificant.

The ADMS dispersion model has been used to predict the impact of the operational development on local NO_2, PM_{10} and $PM_{2.5}$ concentrations (Air Quality Impact Assessment). The assessment has predicted an overall negligible impact on NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of traffic generated by the development on receptors within Tiverton. Furthermore, the exposure assessment has concluded that the development would not introduce new receptors into a location or poor air quality and impacts associated with new exposure would also be negligible.

It is recognised that cumulatively the development would contribute to local emissions through additional vehicle movements on the network. In accordance with the SPD the site would need to implement mitigation measures to reduce emissions in accordance with the requirements of the MDDC guidance, taking into account the calculated damage cost.

It is anticipated that as a minimum the development would incorporate the following:

- Provision for electric vehicle (EV) infrastructure to allow EV charging units to be fitted for use by occupants. The final number will be determined as part of the reserve matters application.
- All energy provision will be either form electric sources such as Air Source Heat Pumps (ASHP) or low NO_x gas boilers (rated <40 mg NO_x/kW) in conjunction with renewable energy.

Additional mitigation measures will be determined as part of any reserve matters application taking into account the damage costs, with the aim of implementing measures that will reduce these costs significantly through a reduction in trip generation and measures to encourage the use of alternative modes of transport. The final package of measures will be agreed with MDDC as part of the approval process.

The proposed development would meet current national and local planning policy and based on the above, air quality does not pose a constraint to development of the site for residential purposes.

Appendix A – Air Quality Terminology

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

Appendix B – IAQM Construction Dust Assessment Procedure

In order to assess the potential impacts, the activities on construction sites are divided into four categories. These are:

- demolition (removal of existing structures);
- earthworks (soil-stripping, ground-leveling, excavation and landscaping);
- construction (activities involved in the provision of a new structure); and
- trackout (the transport of dust and dirt from the construction site onto the public road network where it may be deposited and then re-suspended by vehicles using the network).

For each activity, the risk of dust annoyance, health and ecological impact is determined using three risk categories: low, medium and high risk. The risk category may be different for each of the four activities. The risk magnitude identified for each of the construction activities is then compared to the number of sensitive receptors in the near vicinity of the site in order to determine the risks posed by the construction activities to these receptors.

Step 1: Screen the Need for an Assessment

The first step is to screen the requirement for a more detailed assessment. An assessment is required where there is:

- a 'human receptor' within 250m of the boundary of the site or 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s); and/or
- an 'ecological receptor' within 50m of the boundary of the site; or 50m of the route(s) used by the construction vehicles on the public highway, up to 200m from the site entrance(s).

Step 2A: Define the Potential Dust Emission Magnitude

This is based on the scale of the anticipated works and the proximity of nearby receptors. The risk is classified as small, medium or large for each of the four categories.

Demolition: The potential dust emission classes for demolition are:

- Large: Total building volume >75,000m^3, potentially dusty construction material (e.g. Concrete), on site crushing and screening, demolition activities >12m above ground level;
- Medium: total building volume12,000m^3 –75,000m^3, potentially dusty construction material, demolition activities 6-12m above ground level; and
- Small: total building volume <12,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6m above ground, demolition during wetter months.

Earthworks: This involves excavating material, haulage, tipping and stockpiling. The potential dust emission classes for earthworks are:

- Large: Total site area >110,000m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6m in height,;
- Medium: Total site area 18,000m^2 –110,000m^2, moderately dusty soil (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 3m-6min height; and
- Small: Total site area <18,000 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, earthworks during wetter months.

Construction: The important issues here when determining the potential dust emission magnitude include the size of the building(s)/infrastructure, method of construction, construction materials, and duration of build. The categories are:

- Large: Total building volume >75,000m^3, on site concrete batching, sandblasting;
- Medium: Total building volume12,000m^3 –75,000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and
- Small: Total building volume <12,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout: The risk of impacts occurring during trackout is predominantly dependent on the number of vehicles accessing the Site on a daily basis. However, vehicle size and speed, the duration of activities and local geology are also factors which are used to determine the emission class of the Site as a result of trackout. The categories are:

- Large: >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100m;
- Medium: 20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content, unpaved road length 50-100m; and
- Small: <20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length >50m.

Step 2B: Defining the Sensitivity of the Area

The sensitivity of the area is defined for dust soiling, human health (PM_{10}) and ecological receptors. The sensitivity of the area takes into account the following factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of receptors;
- in the case of PM_{10}, the local background concentration; and
- site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Table B1 is used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

Based on the sensitivities assigned to the different receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification can be defined for each. Tables B2 to B4 indicate the criteria used to determine the sensitivity of the area to dust soiling, human health and ecological impacts.

High	Users can reasonably expect enjoyment of a high level of amenity The appearance, aesthetics or value of their property would be diminished by soiling' The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. E.g. dwellings, museums and other important collections, medium and long term car parks and car showrooms.	10 – 100 dwellings within 20 m of site. Local PM_{10} concentrations close to the objective (e.g. annual mean 36 -40 μg/m^3). E.g. residential properties, hospitals, schools and residential care homes.	Locations with an international or national designation and the designated features may be affected by dust soiling. Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red List for Great Britain. E.g. A Special Area of Conservation (SAC).
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. The appearance, aesthetics or value of their property could be diminished by soiling 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. E.g. parks and places of work.	Less than 10 receptors within 20 m. Local PM_{10} concentrations below the objective (e.g. annual mean 30-36 μg/m^3). E.g. office and shop workers but will generally not include workers occupationally exposed to PM_{10} as protection is covered by the Health and Safety at Work legislation.	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. Locations with a national designation where the features may be affected by dust deposition E.g. A Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	The enjoyment of amenity would not reasonably be expected. Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. 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. E.g. playing fields, farmland unless commercially sensitive horticultural, footpaths, short lived car [parks and roads.	Locations where human exposure is transient. No receptors within 20 m. Local PM_{10} concentrations well below the objectives (less than 75%). E.g. public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition. E.g. Local Nature Reserve with dust sensitive features.

Table B2: Sensitivity of the Area to Dust Soiling on People and Property					
Receptor Sensitivity	**Number of Receptors**	**Distance from the Source (m)**			
		<20	**<50**	**<100**	**<350**
High	>100	High	High	Low	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

High	>32 µg/m3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table B4: 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

Define the Risk of Impacts

The final step is to combine the dust emission magnitude determined in step 2A with the sensitivity of the area determined in step 2B to determine the risk of impacts with no mitigation applied. Tables B5 to B7 indicate the method used to assign the level of risk for each construction activity. The identified level of risk is then used to determine measures for inclusion within a site-specific Construction Management Plan (CMP) aimed at reducing dust emissions and hence reducing the impact of the construction phase on nearby receptors. The mitigation measures are drawn from detailed mitigation set out within the IAQM guidance document.

Table B5: Risk of Dust Impacts from Demolition			
Sensitivity of Area	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table B7: Risk of Dust Impacts from Trackout			
Sensitivity of Area	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible

Appendix C– Verification and Adjustment of Modelled Concentrations

Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions.

Verification of concentrations predicted by the ADMS model has followed the methodology presented in LAQM.TG(16).

Verification of the model results has been carried out against the monitoring site DT3, located on Blundell's Road.

The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road-NO_x (Figure B1). The 'measured' road NO_x has been calculated from the measured NO_2 concentrations by using the DEFRA NO_x from NO_2 calculator available on the UK-AIR website.

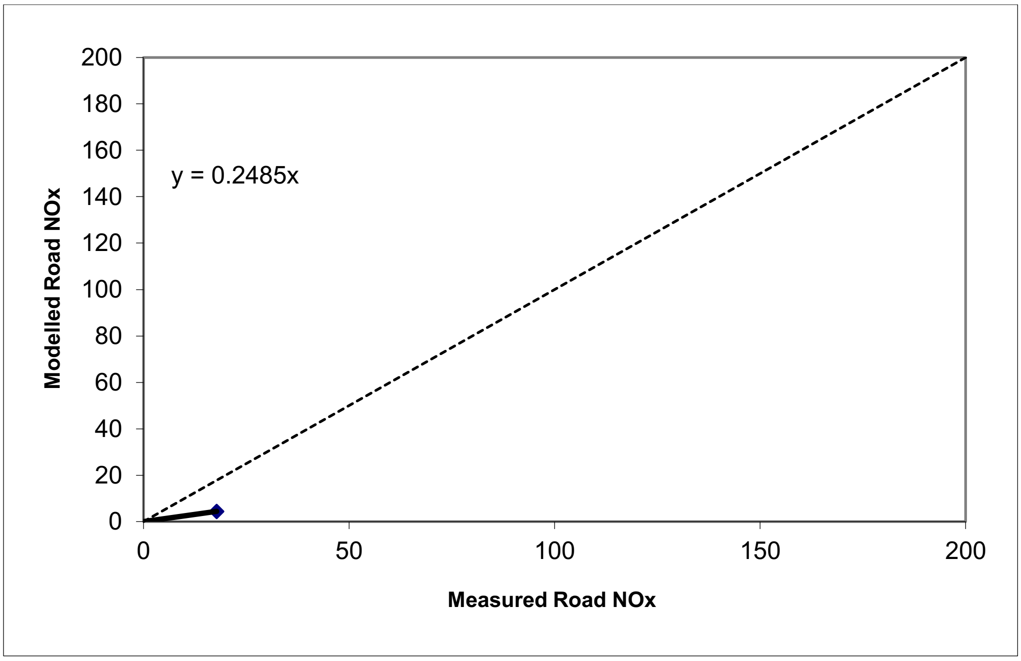

Figure B1: Comparison of Modelled Road NO_x with Measured Road NO_x

Figure B1 shows that the ADMS model is under-predicted the road-NO_x concentrations at the monitoring sites. An adjustment factor has therefore been determined as the ratio between the measured road-NO_x contribution and the modelled road-NO_x contribution, forced through zero (1/0.2485 =4.02). This factor has been applied to the modelled road-NO_x concentration for each location to provide an adjusted modelled road-NO_x concentration.

The annual mean road-NO_2 concentration was determined using the DEFRA NO_x:NO_2 spread sheet calculation tool and added to the background NO_2 concentration to produce a total adjusted NO_2 concentration.

Figure B2 shows the adjusted modelled total NO_2 vs monitored NO_2. There is good agreement, between the two data sets, therefore no secondary adjustment is required.

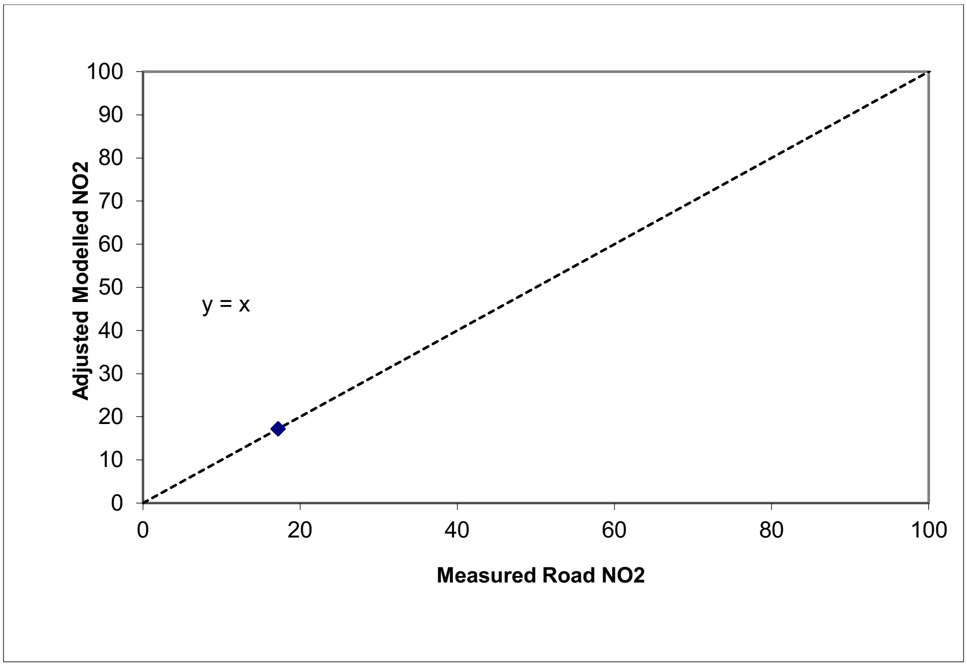

Figure B2: Comparison of Modelled NO_2 with Measured NO_x

The adjustment factor of 4.02 has been applied to the modelled NO_x-road concentrations predicted at the selected receptor locations. The predicted NO_2-road concentrations, calculated using the NO_x-NO_2 converter tool, have subsequently been added to background NO_2 to provide the final predicted annual mean NO_2 concentrations at each receptor.

These factors have also been used to adjust the predicted PM_{10} and $PM_{2.5}$ concentrations.

Appendix D Construction Mitigation Measures

It is recommended that the 'highly recommended' measures set out below are incorporated into a CMP and approved by MDDC prior to commencement of any work on site:

- develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;
- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off- site and the action taken to resolve the situation in the log book;
- carry out regular site inspections to monitor compliance with the CMP, record inspection results and make inspection log available to MC when asked;
- increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions;
- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles;
- fully enclose site or specific operations where there is a high potential for dust production and the activities are being undertaken for an extensive period;
- avoid site runoff of water or mud;
- keep site fencing, barriers and scaffolding clean using wet methods;
- remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used on site, cover as detailed below;
- cover, seed or fence stockpiles to prevent wind whipping;
- ensure all vehicles switch off engines when stationary - no idling vehicles;
- avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable;
- produce a construction logistic plan to manage the sustainable delivery of goods and materials;
- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes and conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;

- ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- avoid bonfires and burning of waste materials;
- soft strip inside buildings before demolition (retaining walls and windows in the rest of the building, where possible, to provide screening against dust);
- ensure effective water suppression is used during demolition operations;
- avoid explosive blasting, us appropriate manual or mechanical alternatives;
- bag and remove biological debris and damp down as much material before demolition;
- re-vegetate earthworks and exposed areas/soil stockpiles to stabile surface as soon as practicable;
- use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable;
- only remove the cover in small areas during works and not all at once;
- avoid scabbling, if possible;
- ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- use water-assisted dust sweepers on the access and local roads, to remove, as necessary, any material tracked out of the site;
- avoid dry sweeping of large areas;
- ensure vehicles entering and leaving the site are covered to prevent the escape of materials during transport;
- inspect on-site haul routes for integrity and instigate necessary repairs to the surfaces as soon as reasonably practicable;
- record all inspections of haul routes and any subsequent action in a site log book;
- install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- impose and signpost a maximum speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas;
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud);
- ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit.
- access gates to be located at least 10 m from receptors where possible.

The following 'desirable' measures should also be considered for inclusion within the CMP:

- undertake daily on-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the site boundary, with cleaning to be provided if necessary impose and signpost a maximum speed limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);

- implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car sharing);
- ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
- for smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Appendix D- Damage Cost Calculation Spreadsheet

Figure D1: EVTv11 Input Screen

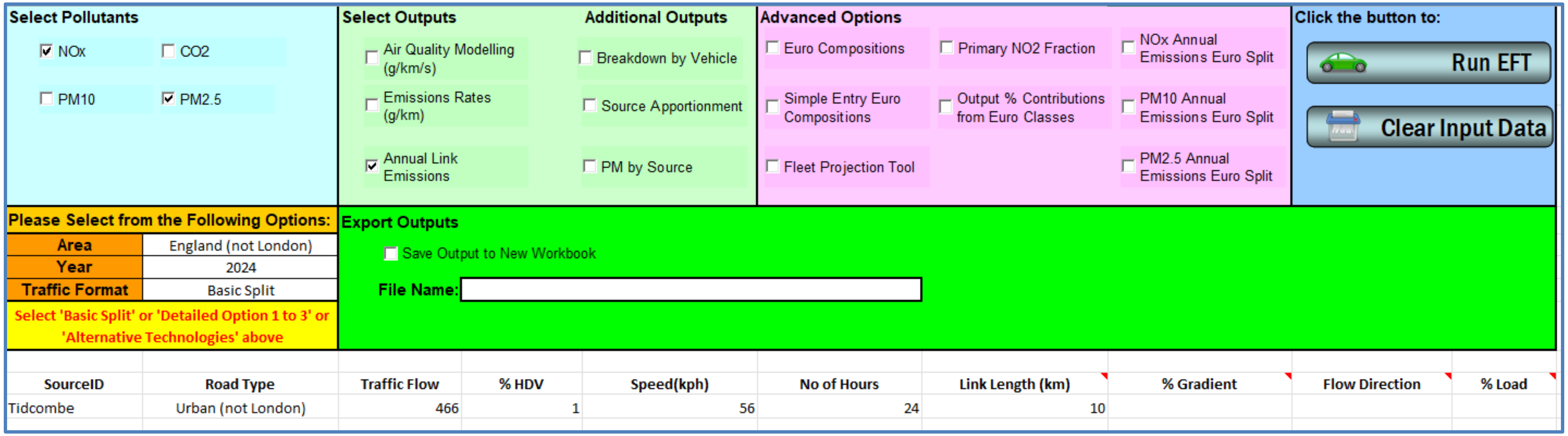

Figure D2: EVTv11 Output Screen

Source Name	Pollutant Name	All Vehicles (Annual Emissions (kg/yr except CO2 tonnes/yr))	All LDVs (Annual Emissions (kg/yr except CO2 tonnes/yr))	All HDVs (Annual Emissions (kg/yr except CO2 tonnes/yr))
Tidcombe	NOx	313.87316	306.08847	7.78469
Tidcombe	PM2.5	30.55552	29.42220	1.13332

Figure D3: Defra Damage Cost Tool – Control Panel

Control Panel

Start Year	2024	Please type the year at which the policy will start from, the start year is also the discount year
End Year	2033	Please type the year at which the appraisal will end
Appraisal Period	10	Autofills the number of years for which the policy is reviewed for
Price Base Year	2020	Please type the price base year for your appraisal
Number of pollutants	2	Please type the number of pollutants to be assessed

Note: if you are assessing PM10 impacts, please convert these to PM2.5 using conversion factors found in the Assumptions sheet

Key assumptions:	Health discount rate	1.50% from appraisal year 0 to 30
		1.29% from appraisal year 31 to 75
		1.07% from appraisal year 76 to 125

Figure D4: Defra Damage Cost Tool – User Interface

Damage Cost User Interface

Pollutant	NOx	Road Transport Urban Medium	<<CHANGED TO INCLUDI	Pollutant	PM2.5	Road Transport Urban Medium

Note: If you are assessing PM10 impacts, please convert these to PM2.5 using conversion factors found in the Assumptions sheet

NOx Road Transport Urban Medium

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Reduction in emissions (tonnes)	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314
Central Damage Costs (£)	8804	8804	8804	8804	8804	8804	8804	8804	8804	8804
Central Benefit (£)	2765	2765	2765	2765	2765	2765	2765	2765	2765	2765
Discounted Central Benefit (£)	2765	2724	2683	2644	2605	2566	2528	2491	2454	2418
Central Present Value	£25,878									
Low Sensitivity Damage Costs (£)	1618	1618	1618	1618	1618	1618	1618	1618	1618	1618
Low Sensitivity Benefit (£)	508	508	508	508	508	508	508	508	508	508
Discounted Low Sensitivity Benefit (£)	508	501	493	486	479	472	465	458	451	444
Low Sensitivity Present Value	£4,757									
High Sensitivity Damage Costs (£)	33098	33098	33098	33098	33098	33098	33098	33098	33098	33098
High Sensitivity Benefit (£)	10393	10393	10393	10393	10393	10393	10393	10393	10393	10393
Discounted High Sensitivity Benefit (£)	10393	10239	10088	9939	9792	9647	9505	9364	9226	9089
High Sensitivity Present Value	£97,281									

PM2.5 Road Transport Urban Medium

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Reduction in emissions (tonnes)	0	0	0	0	0	0	0	0	0	0
Central Damage Costs (£)	62006	62006	62006	62006	62006	62006	62006	62006	62006	62006
Central Benefit (£)	1897	1897	1897	1897	1897	1897	1897	1897	1897	1897
Discounted Central Benefit (£)	1897	1869	1842	1815	1788	1761	1735	1710	1684	1659
Central Present Value	£17,760									
Low Sensitivity Damage Costs (£)	24586	24586	24586	24586	24586	24586	24586	24586	24586	24586
Low Sensitivity Benefit (£)	752	752	752	752	752	752	752	752	752	752
Discounted Low Sensitivity Benefit (£)	752	741	730	719	709	698	688	678	668	658
Low Sensitivity Present Value	£7,042									
High Sensitivity Damage Costs (£)	177517	177517	177517	177517	177517	177517	177517	177517	177517	177517
High Sensitivity Benefit (£)	5432	5432	5432	5432	5432	5432	5432	5432	5432	5432
Discounted High Sensitivity Benefit (£)	5432	5352	5273	5195	5118	5042	4968	4894	4822	4751
High Sensitivity Present Value	£50,846									

Figure D5: Defra Damage Cost Tool - Output

Outputs

Pollutant	Low Sensitivity Present Value	Central Present Value	High Sensitivity Present Value
NOx Road Transport Urban Medium	£4,757	£25,878	£97,281
PM2.5 Road Transport Urban Medium	£7,042	£17,760	£50,846