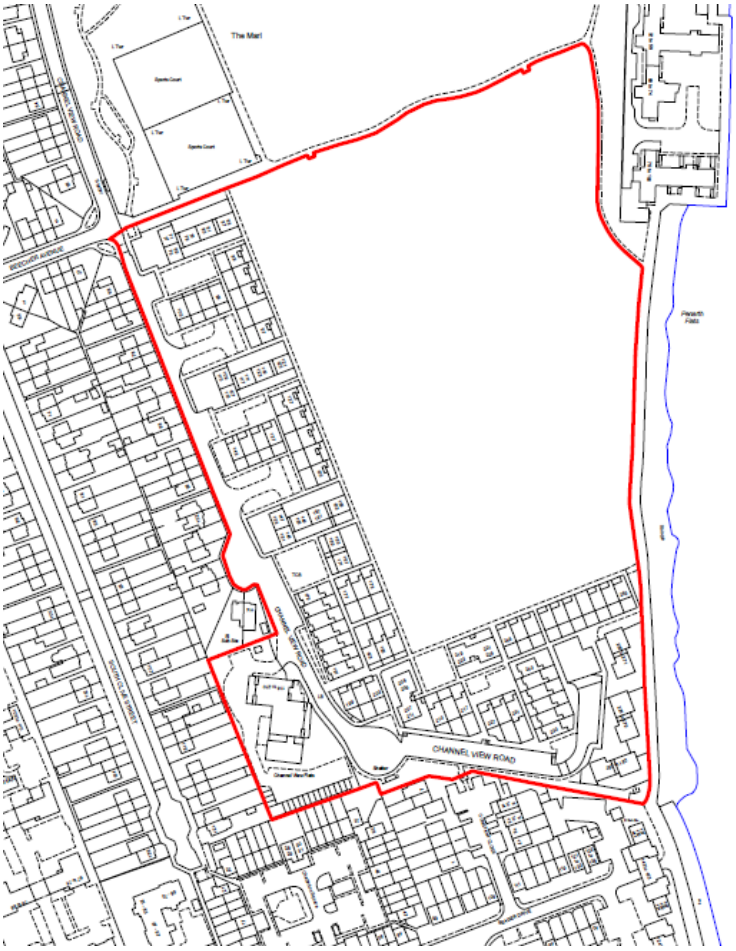
Amity Planning Consultants
The Marl, Channel View Road, Cardiff, CF11 7HB



Air Quality Assessment

A115866-1

28th April 2021

PRESENTED TO

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EXECUTIVE SUMMARY

This report presents the findings of an air quality assessment undertaken to support a planning application for the demolition of 188 residential units of between 2-4 storeys high and the demolition of the 14-storey block of flats to accommodate the construction of 370 new residential dwellings. The dwellings would provide a mix of 2 storey properties and blocks of flats of up to 7 storeys high and an older person's scheme of up to 15 stories high at the site of the Marl, Channel view Road, Cardiff, CF11 7HB.

Construction Phase

During the construction phase, the potential impacts from construction on air quality will be managed through site-specific mitigation measures detailed within this assessment. With these mitigation measures in place, the effects from the construction phase are not predicted to be significant.

Operational Phase

Detailed dispersion modelling of traffic pollutants has been undertaken for the proposed development. The impacts during the operational phase take into account exhaust emissions from additional road traffic generated due to the proposed development.

The long-term (annual) assessment of the effects associated with the proposed development with respect to Nitrogen Dioxide (NO_2) is determined to be 'negligible'. With respect to PM_{10} and $PM_{2.5}$ exposure, the effect is determined to be 'negligible' at all identified existing sensitive receptor locations.

All proposed receptor locations are expected to be exposed to air quality below the Air Quality Objectives for NO_2, PM_{10} and $PM_{2.5}$. No further mitigation is required to protect future occupants.

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling Software
AQAL	the Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Standards
CHP	Combined Heat and Power
CL	Critical Level
CO	Carbon Monoxide
DEFRA	Department for Environment Food & Rural Affairs
EAL	Environmental Assessment Limits
EC	European Commission
EFT	The Emissions Factors Toolkit
EPUK	Environmental Protection UK
EU	European Union
EPAQS	The Expert Panel on Air Quality Standards
IAQM	The Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NGR	The United Kingdom National Grid Reference
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
PC	Process Contribution
MHCLG	the Ministry for Housing, Communities and Local Government
NPPF	The National Planning Policy Framework
OS	the UK Ordnance Survey
PEC	Predicted Environment Concentration
PPG	Planning Policy Guidance
PPS	Planning Policy Statements
SAC	Special Areas of Conservation
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
VOC	Volatile organic compounds
WHO	World Health Organization
UK	The United Kingdom

1.0 INTRODUCTION

Tetra Tech have been commissioned by Amity Planning Consultants to prepare an Air Quality Assessment for the demolition of 188 residential units of between 2-4 storeys high and the demolition of the 14-storey block of flats to accommodate the construction of 370 new residential dwellings. The dwellings would provide a mix of 2 storey properties and blocks of flats of up to 7 storeys high and an older person's scheme of up to 15 stories high at the site of The Marl, Channel view Road, Cardiff, CF11 7HB.

1.1 SITE LOCATION

The approximate United Kingdom National Grid Reference (NGR) is 318061, 174440. The Proposed Development Site is bounded to the north by Heol Ferry Road, to the east the site is bounded by Jim Driscoll Way, to the south it is bounded by Channel view Road and residential properties and to the west lies South Clive Street and residential properties.

Reference should be made to Figure 1-1 for an image of the application site and surrounding area.

Figure 1-1. Satellite Image of Site and Surrounding Area

Google Imagery (2021)

1.2 CONTEXT

The primary source of the air quality associated with the proposed scheme is from vehicle movements, arriving and departing the proposed development. The traffic data generated by the development (provided by Tetra Tech Ltd) has been assessed at the surrounding sensitive receptors and proposed sensitive receptors.

The following assessment stages have been undertaken as part of this assessment:

- Baseline evaluation;
- Assessment of potential air quality impacts during the construction phase;
- Assessment of potential air quality impacts during the operational phase; and,
- Identification of mitigation measures (as required).

The results of the assessment are detailed in the following sections of this report.

The construction phase assessment considers the potential effects of dust and particulate emissions from site activities and materials movement using a qualitative risk assessment method based on the Institute of Air Quality Management's (IAQM) 'Guidance on the Assessment of Dust from Demolition and Construction' document, published in 2014.

The assessment of the potential air quality impacts that are associated with the operational phase has focused on the predicted impact of changes in ambient nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of less than 10 µm (PM_{10}) and less than 2.5 µm ($PM_{2.5}$) as a result of the development at key local receptor locations. The changes have been referenced to EU air quality limits and UK air quality objectives and the magnitude and impact description of the changes have been referenced to non-statutory guidance issued by the IAQM and Environmental Protection UK (EPUK).

1.3 REPORT STRUCTURE

Following this introductory section, the remainder of this report is structured as follows:

- Section 2: Policy and legislative context
- Section 3: Assessment methodology
- Section 4: Baseline conditions
- Section 5: Assessment of Air Quality Impacts – Construction Phase
- Section 6: Assessment of Air Quality Impacts – Operational Phase
- Section 7: Mitigation
- Section 8: Conclusions

All technical Appendices are included at the end of this report for information.

2.0 POLICY AND LEGISLATIVE CONTEXT

2.1 DOCUMENTS CONSULTED

The following documents were consulted during the undertaking of this assessment:

Legislation and Best Practice Guidance

- National Planning Policy Framework, Ministry for Housing, Communities and Local Government, Revised February 2019;
- Planning Practice Guidance: Air Quality, Ministry for Housing, Communities and Local Government, November 2019;
- The Air Quality Standards Regulations (Amendments), 2016;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra, 2007;
- The Environment Act, 1995;
- Local Air Quality Management Technical Guidance LAQM.TG16, Defra, 2018;
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, LA 105 Air quality, Highways England, November 2019;
- Land-Use Planning & Development Control: Planning for Air Quality, EPUK & IAQM, 2017;
- Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014;
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.0), IAQM, June 2020; and,
- Ecological Assessment of Air Quality Impacts, CIEEM, January 2021.

Websites Consulted

- Google maps (maps.google.co.uk);
- The UK National Air Quality Archive (www.airquality.co.uk);
- Department for Transport Matrix (www.dft.go.uk/matrix);
- emapsite.com;
- Multi-Agency Geographic Information for the Countryside (http://magic.defra.gov.uk/);
- Planning Practice Guidance (http://planningguidance.planningportal.gov.uk/); and,
- The East Riding of Yorkshire Council (https://www.eastriding.gov.uk/).

Site Specific Reference Documents

- 2019 Air Quality Status Report for Cardiff Council; and
- Cardiff Local Development Plan (2006-2026), Adopted January 2016.

2.2 AIR QUALITY LEGISLATIVE FRAMEWORK

European Legislation

European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include:

- **Directive 1999/30/EC** – the First Air Quality "Daughter" Directive – sets ambient air limit values for NO_2 and oxides of nitrogen, sulphur dioxide, lead and PM_{10};
- **Directive 2000/69/EC** – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene and carbon monoxide; and,
- **Directive 2002/3/EC** – the Third Air Quality "Daughter" Directive – seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- **Directive 2004/107/EC** – sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

The European Commission (EC) Directive Limits, outlined above, have been transposed in the UK through the Air Quality Standards Regulations. In the UK responsibility for meeting ambient air quality limit values is devolved to the national administrations in Scotland, Wales and Northern Ireland.

The European Union (Withdrawal) Act 2018 (EUWA) provides a new framework for the continuity of 'retained EU law' in the UK. EU Directives no longer have to be implemented by the UK except to any extent agreed or decided by the UK unilaterally.

EUWA retains the domestic effect of EU Directives to the extent already implemented in UK law, by preserving the relevant domestic implementing legislation enacted in UK law before ‘Implementation Period’ completion day. Though the EU Directives are not retained, following the UK’s departure from the EU, the EUWA converts the current framework of Air Quality targets, however the role that the EU instructions were party to are lost.

UK Legislation

The Air Quality Standards Regulations (Amendments 2016) seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives and also transpose the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. SI 2010 No. 1001, Part 7 Regulation 31 extends powers, under Section 85(5) of the Environment Act (1995), for the Secretary of State to give directions to Local Authorities (LAs) for the implementation of these Directives.

The UK Air Quality Strategy is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland and provides a framework for improving air quality and protecting human health from the effects of pollution.

For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (England) Regulations (2000) SI 928, and subsequent amendments.

The AQOs for pollutants included within the Air Quality Strategy and assessed as part of the scope of this report are presented in Table 2-1 and Table 2-2 along with European Commission (EC) Directive Limits and World Health Organisation (WHO) Guidelines. The ecological levels are based on WHO and CLRTAP (Convention on Long-range Transboundary Air Pollution) guidance.

Table 2-1. Air Quality Standards, Objectives, Limits and Target Values

Pollutant	Applies	Objective	Concentration Measured as[10]	Date to be achieved and maintained thereafter	European Obligations	Date to be achieved and maintained thereafter	New or existing
PM_{10}	UK	50µg/m^3 by end of 2004 (max 35 exceedances a year)	24-hour Mean	1st January 2005	50µg/m^3 by end of 2004 (max 35 exceedances a year)	1st January 2005	Retain Existing
	UK	40µg/m^3 by end of 2004	Annual Mean	1st January 2005	40µg/m^3	1st January 2005	
$PM_{2.5}$	UK	25µg/m^3	Annual Mean	31st December 2010	25µg/m^3	1st January 2010	Retain Existing
NO_2	UK	200µg/m^3 not to be exceeded more than 18 times a year	1-Hour Mean	31st December 2005	200µg/m^3 not to be exceeded more than 18 times a year	1st January 2010	Retain Existing
	UK	40µg/m^3	Annual Mean	31st December 2005	40µg/m^3	1st January 2010	

Table 2-2. Ecological Air Quality Standards, Objectives, Limit and Target Values

Pollutant	Applies	Objective	Concentration Measured as
NO_X	UK	30µg/m^3	Annual Mean

Within the context of this assessment, the annual mean objectives are those against which facades of residential receptors will be assessed and the short-term objectives apply to all other receptor locations, where people may

be exposed over a short duration, both residential and non-residential such as using gardens, balconies, walking along streets, using playgrounds, footpaths or external areas of employment uses.

Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves assessing present and likely future air quality against the AQOs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA).

2.3 PLANNING AND POLICY GUIDANCE

2.3.1.1 National Policy

The National Planning Policy Framework (NPPF), revised February 2019, principally brings together and summarises the suite of Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) which previously guided planning policy making. The NPPF (para. 181) 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 or 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 or 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'.*

The Planning Practice Guidance (PPG) web-based resource was updated by the Ministry for Housing, Communities and Local Government (MHCLG) on 1st November 2019 to support the National Planning Policy Framework and make it more accessible. A review of PPG: Air Quality identified the following guidance (Paragraph: 001 Reference ID: 32-001-20191101):

> *"The 2008 Ambient Air Quality Directive sets legally binding limits for concentrations in outdoor air of major air pollutants that affect public health such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2).*
>
> *The UK also has national emission reduction commitments for overall UK emissions of 5 damaging air pollutants:*
>
> - *fine particulate matter ($PM_{2.5}$);*
> - *ammonia (NH_3);*
> - *nitrogen oxides (NO_x);*

- *sulphur dioxide (SO_2); and*
- *non-methane volatile organic compounds (NMVOCs).*

As well as having direct effects on public health, habitats and biodiversity, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems. Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

2.3.1.2 Local Policy

Cardiff Council's (CC) Local Development Plan – adopted September 2016, has been reviewed which outlines the Council's broad planning strategy. Following this review of policies, the following was identified as being relevant to the proposed development from an air quality perspective:

"KP18: Natural Resources:

In the interests of the long-term sustainable development of Cardiff, development proposals must take full account of the need to minimise impacts on the city's natural resources and minimise pollution, in particular the following elements:

i. Protecting the best and most versatile agricultural land;

ii. Protecting the quality and quantity of water resources, including underground surface and coastal waters;

iii. Minimising air pollution from industrial, domestic and road transportation sources and managing air quality; and

iv. Remediating land contamination through the redevelopment of contaminated sites."

3.0 ASSESSMENT METHODOLOGY

The potential environmental effects of the operational phase of the proposed development have been identified as proposed vehicle movements. The significance of potential environmental effects is assessed according to the latest guidance produced by EPUK and IAQM in January 2017 '*Land-Use Planning & Development Control: Planning for Air Quality*' and June 2019 '*A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites*'.

The methodology used to determine the potential air quality effects of the construction phase of the proposed development has been derived from the IAQM '*Guidance on the Assessment of the Impacts of Dust from Demolition and Construction'* document and is summarised in Section 5.

3.1 DETERMINING IMPACT DESCRIPTION OF THE AIR QUALITY EFFECTS

The impact description of the effects during the operational phase of the development is based on the latest guidance produced by EPUK and IAQM in January 2017. The guidance provides a basis for a consistent approach that could be used by all parties associated with the planning process to professionally judge the overall impact description of the air quality effects based on severity of air quality impacts.

The following rationale is used in determining the severity of the air quality effects at individual receptors:

1. The change in concentration of air pollutants, air quality effects, are quantified and evaluated in the context of AQOs. The effects are provided as a percentage of the Air Quality Objective (AQO), which may be an AQO, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)';
2. The absolute concentrations are also considered in terms of the AQO and are divided into categories for long term concentration. The categories are based on the sensitivity of the individual receptor in terms of harm potential. The degree of harm potential to change increases as absolute concentrations are close to or above the AQO;
3. Severity of the effect is described as qualitative descriptors; negligible, slight, moderate or substantial, by taking into account in combination the harm potential and air quality effect. This means that a small increase at a receptor which is already close to or above the AQO will have higher severity compared to a relatively large change at a receptor which is significantly below the AQO;
4. The effects can be adverse when pollutant concentrations increase or beneficial when concentrations decrease as a result of development;
5. The judgement of overall impact description of the effects is then based on severity of effects on all the individual receptors considered; and,
6. Where a development is not resulting in any change in emissions itself, the impact description of effect is based on the effect of surrounding sources on new residents or users of the development, i.e., will they be exposed to levels above the AQO.

Table 3-1. Impact Descriptors for Individual Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to AQO			
	1	2-5	6-10	>10
≤75% of AQO	Negligible	Negligible	Slight	Moderate
76-94% of AQO	Negligible	Slight	Moderate	Moderate
95-102% of AQO	Slight	Moderate	Moderate	Substantial
103-109 of AQO	Moderate	Moderate	Substantial	Substantial
≥110 of AQO	Moderate	Substantial	Substantial	Substantial

In accordance with explanation note 2 of Table 6.3 of the EPUK & IAQM guidance, the Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.

4.0 BASELINE CONDITIONS

4.1 AIR QUALITY REVIEW

This section provides a review of the existing air quality in the vicinity of the application site in order to provide a benchmark against which to assess potential air quality impacts of the proposed development. Baseline air quality in the vicinity of the application site has been defined from several sources, as described in the following sections.

Local Air Quality Management (LAQM)

As required under section 82 of the Environment Act 1995, Cherwell District Council (CDC) has undertaken an ongoing exercise to review and assess air quality within its area of jurisdiction. The assessments have indicated that concentrations of NO_2 are above the relevant AQOs, and there are currently has four Air Quality Management Areas;

- Ely Bridge AQMA 1: A number of residential premises along the A48 Cowbridge Road West, Western Avenue and A4119 through Llandaff Village Cardiff Road.
- St Mary Street AQMA: An area encompassing St Mary Street, Cardiff and properties on either side of the road.
- Stephenson Court AQMA: From NE and NW boundaries of Stephenson Court, NW boundary of Burgess Court, NW and SW boundaries of Four Elms Court, SW corner of Four Elms Court south across Newport road to the junction with Orbit street, West across Newport Road to the SE corner of Stephenson Court.
- Newport Road AQMA: A number of residential properties along the A4161 Newport Road, Cardiff.
- The Philog AQMA: A number of residential premises along the A470 Manor Way, The Philog, Birchgrove Road and Caerphilly Road.
- Llandaff AQMA: Centre on Cardiff Road through Llandaff village.
- Cardiff City Centre AQMA: Former St Mary Street AQMA with the addition of Westgate Street in Cardiff City Centre.

The application site is not situated within any of the CC AQMA's. but is located approximately 1.5 km away from Cardiff City Centre AQMA. Proposed traffic data provided by Cambria consulting Ltd indicated that there will be less than 100AADT, associated with the development, entering any of the above mentioned AQMA's. As stated within the IAQM Land Use planning for Development and Control: Planning for Air Quality guidance, where the additional vehicle movements are below the criteria set in Table 6.2 of the guidance, then impacts within the AQMA's are considered to be negligible. As there are less than 100AADT entering the AQMA's then the impacts within them are considered insignificant.

Air Quality Monitoring

Monitoring of air quality within CC is undertaken through continuous and non-continuous monitoring methods. These have been reviewed in order to provide an indication of existing air quality conditions in the area surrounding the proposed development site.

Continuous Monitoring

CC undertook automatic monitoring of NO_2 at 2 monitoring stations during 2018. The closest monitoring station; Cardiff Centre AURN, is located approximately 2.1 km north-east of the application site.

Table 4-1. Monitored Annual Mean NO_2 Concentrations at Diffusion Tubes

Site ID	Location	Site Type	Distance from Kerb (m)	Inlet Height (m)	Monitored 2018 Annual Mean NO_2 Concentration ($\mu g/m^3$)
Cardiff Centre AURN	Cardiff City Centre	Urban Background	200	-	20
Cardiff Newport Road AURN	Newport Road	Roadside/ Urban Traffic	4.5	-	29

*Located within AQMA

As indicated in Table 4.1, all automatic monitoring stations monitored a concentration below the AQO for NO_2 (40 $\mu g/m^3$ annual mean) during 2018. Cardiff Centre AURN automatic monitoring station has not been used within the model verification due to the distance from the proposed site.

It should be noted that as part of the model verification, a review of diffusion tubes locations and monitoring heights was undertaken. As part of this process, the locations and monitoring heights were adjusted following desk-based review using Google Maps.

Non - Continuous Monitoring

CC undertook passive diffusion tube monitoring of NO_2 at 85 tubes during 2018. Reference should be made to Figure 1 for the locations of the diffusion tubes within the extents of the air quality study area.

The most recently available diffusion tube monitoring data is from 2018 and is outlined below in Table 4.2.

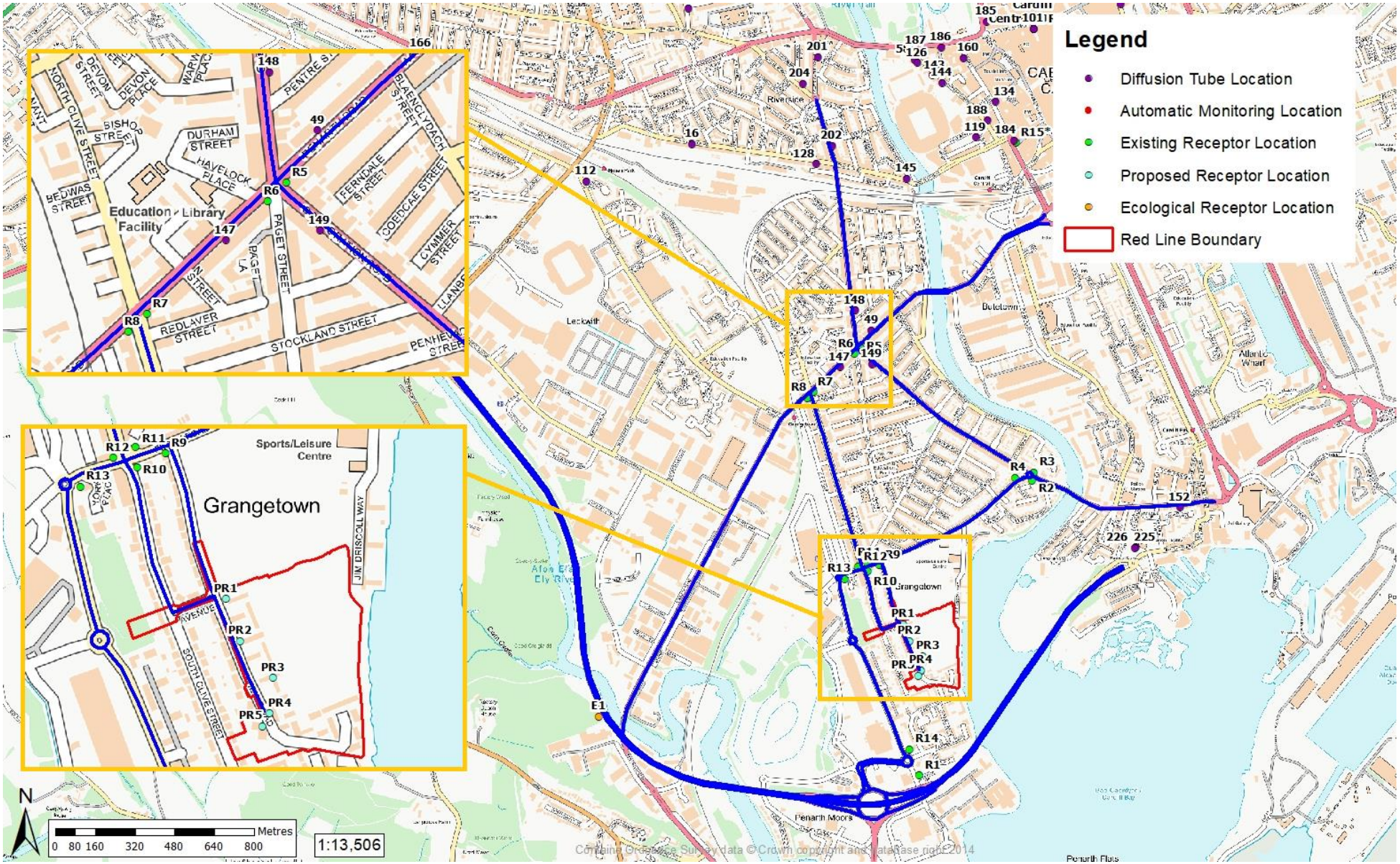
Table 4.2. Monitored Annual Mean NO_2 Concentrations

Site ID	Location	Site Type	Distance from Kerb (m)	Inlet Height (m)	2018 Annual Mean NO_2 Concentration ($\mu g/m^3$)
49	Penarth Road	Roadside	7.0	1.5	27.3
147	211 Penarth Road	Roadside	7.0	1.5	29.3
148	161 Clare Road	Roadside	5.0	1.5	26.6
149	10 Corporation Road	Roadside	4.6	1.0	31.3
152	22 Clare Street	Roadside	6.0	2.0	27.8
202	James Street	Roadside	3.5	1.5	30.2

*Located within AQMA

As indicated in Table 4.2, all diffusion tubes monitored annual average NO_2 concentrations below the annual average AQO (40$\mu g/m^3$) in 2018. All diffusion tubes included within Table 4.2 have been used as part of the model verification.

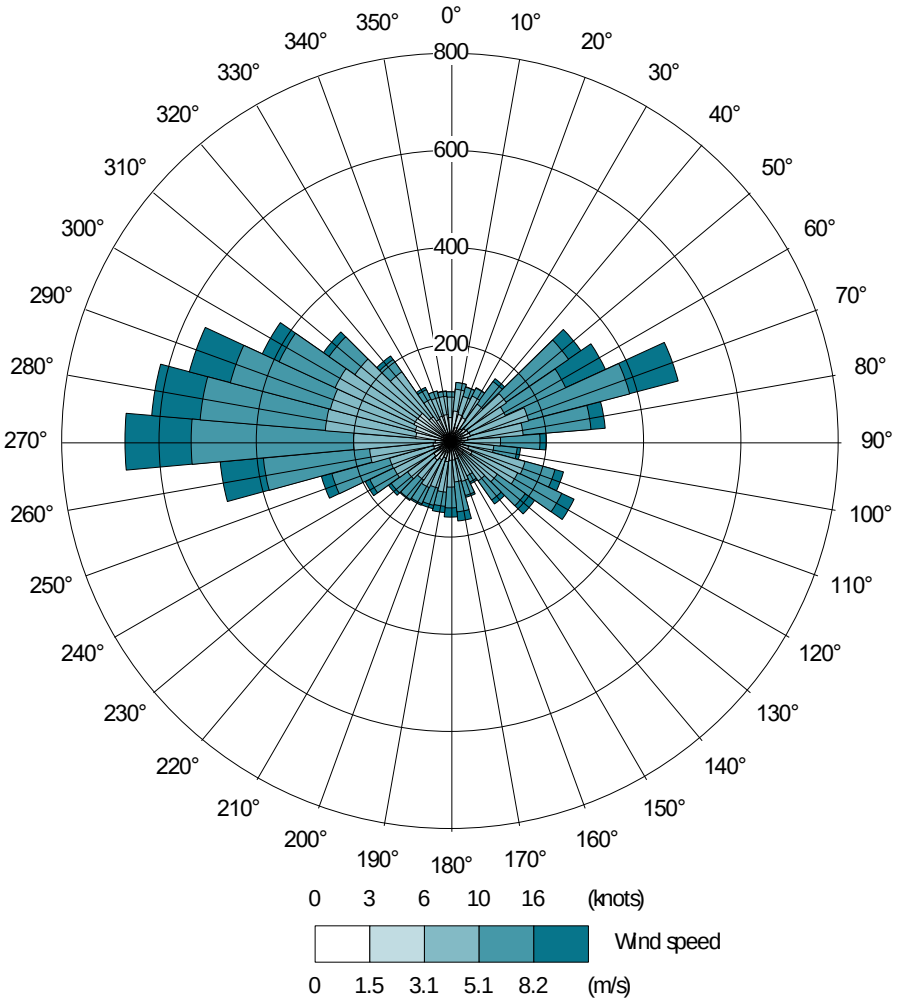
Figure 4-1. Local Authority Monitoring Locations



4.2 METEOROLOGY

Meteorological conditions have significant influence over air pollutant concentrations and dispersion. Pollutant levels can vary significantly from hour to hour as well as day to day, thus any air quality predictions need to be based on detailed meteorological data. The ADMS model calculates the dispersion of pollutants on an hourly basis using a year of local meteorological data. The 2018 meteorological data used in the assessment is derived from Cardiff Airport Meteorological Station. This is the nearest meteorological station, which is considered representative of the development site, with all the complete parameters necessary for the ADMS model. Reference should be made to Figure 2 for an illustration of the prevalent wind conditions at the Cardiff Airport Meteorological Station site.

Figure 4-2. Cardiff Airport 2018 Wind Rose



4.3 EMISSION SOURCES

A desktop assessment has identified that traffic movements are likely to be the most significant local source of pollutants affecting the site and its surroundings. The principal traffic derived pollutants likely to impact local receptors are NO_2, PM_{10} and $PM_{2.5}$.

The assessment has therefore modelled all roads within the immediate vicinity of the proposed development site which are considered likely to experience significant changes in traffic flow as a result of the proposed development. Reference should be made to Figure 1 for a graphical representation of the traffic data utilised within the ADMS Roads 5.0 model.

It should be noted that the pollutant contribution of minor roads and rail sources that are not included within the dispersion model is considered to be accounted for via the use of background air quality levels.

4.4 SENSITIVE RECEPTORS

Receptors that are considered as part of the air quality assessment are primarily those existing receptors that are situated along routes predicted to experience significant changes in traffic flow as a result of the proposed development.

The existing receptor locations are summarised in Table 4.2 and the spatial locations of all of the receptors are illustrated in Figure 4-3.

Table 4-2 -Modelled Sensitive Receptor Locations

Sensitive Receptor		Receptor Height (m)
R1	28 O'Leary Drive	1.5
R2	9 Horle Close	1.5
R3	233 Corporation Road	1.5
R4	1 Avondale Way	1.5
R5	187 Penarth Road	1.5
R6	189a Penarth Road	1.5
R7	2 Clive Street	1.5
R8	10 Ferry Road	1.5
R9	2 Ferry Road	1.5
R10	1A Ferry Road	1.5
R11	Flat 10 Marl Court	1.5
R12	18 York Place	1.5
R13	14 Morel Court	1.5
R14	51 St Marys Street	1.5

4.5 ECOLOGICAL RECEPTORS

Air quality impacts associated with the proposed re-development have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. The IAQM guidance on 'Air Quality Impacts on Designated Nature Conservation Sites' (2019) outlines the types of designated nature sites within 2 km of the proposed development which require air quality assessment. These are inclusive of:

- Sites of Special Scientific Interest (SSSIs);

- Special Areas of Conservation (SACs);
- Special Protection Areas (SPAs);
- Ramsar Sites;
- Areas of Special Scientific Interest (ASSIs);
- National Nature Reserves (NNRs);
- Local Nature Reserves (LNRs);
- Local Wildlife Sites (LWSs); and,
- Areas of Ancient Woodland (AW).

The Conservation of Habitats and Species Regulations (2017) additionally requires competent authorities to review planning applications and consents that have the potential to impact on European designated sites (e.g. Special Protection Areas).

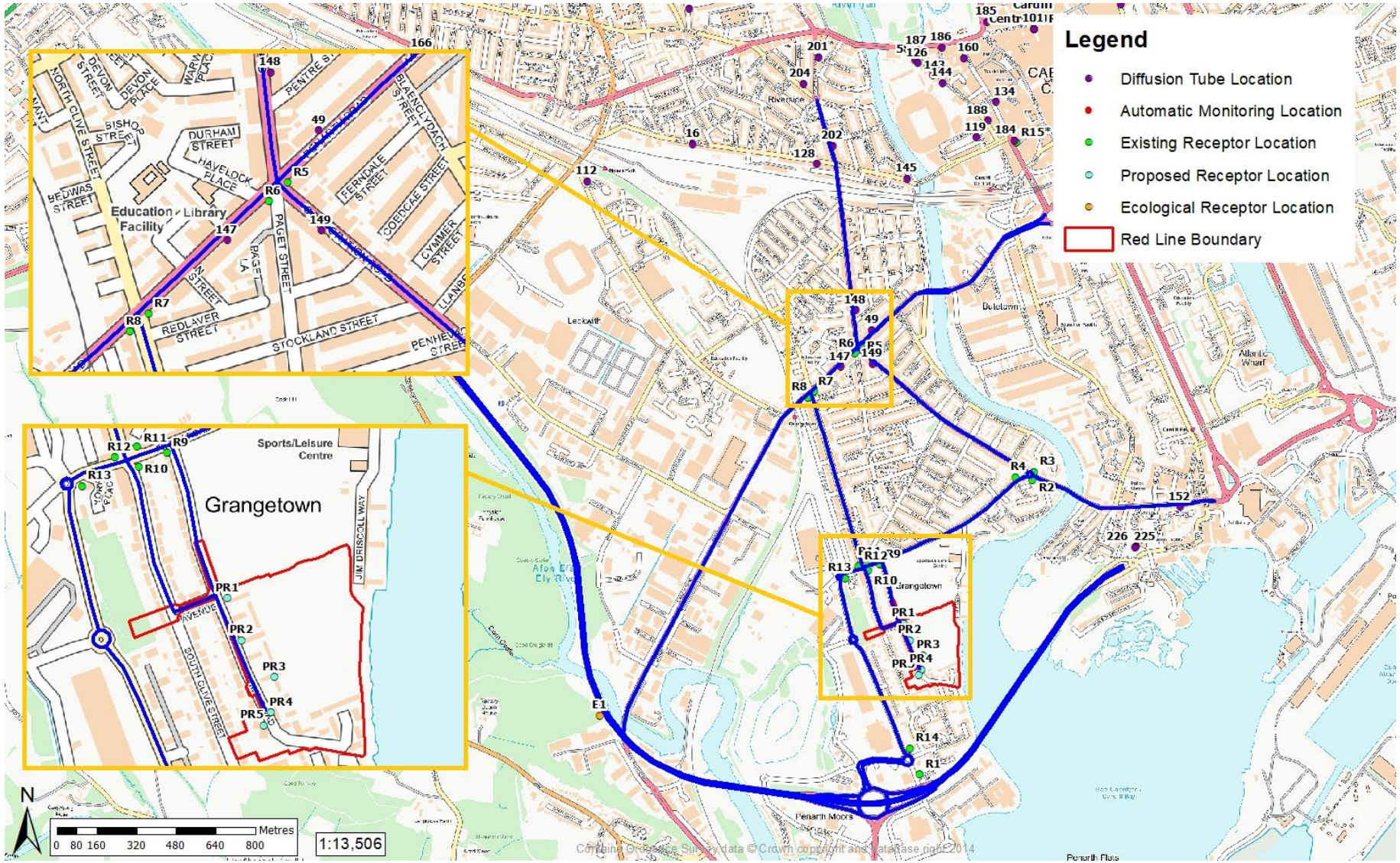
A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the extents of the dispersion modelling assessment. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service, which draws together information on key environmental schemes and designations. Following a search within a 2 km radius of the site boundary, the following ecological receptors were identified.

Table 4-3. Ecological Sensitive Receptor Locations

Site ID	Site	Designation	UK NGR (m)		Distance from Site (km)	Distance from Nearest Affected Road (m)
			X	Y		
E1	Cwm Cydfin, Leckwith	SSSI	316646	173798	1.4	17
E2	Severn Estuary	SPA/Ramsar/SAC/SSSI	319532	173092	1.7	1,390
E3	Cardiff Bay Wetlands and Hamadryad Park	LNR/SINC	318765	174067	0.7	180
E4	River Taff	SINC	318289	174368	0.2	1
E5	Cogan Spur	SINC	317560	172862	1.2	540
E6	SINC No. 188 Factory Wood	SINC	315583	175281	1.3	60
E7	Leckwith Pond and Marsh	SINC	316630	174238	1.2	35
E8	SINC No. 189 Reservoir Wood	SINC	316259	173349	1.7	510
E9	Canton Common Ditch	SINC	316094	175498	2.0	310
E10	River Ely	SINC	317129	173585	0.8	1
E11	Grangemore Park	SINC	317504	173922	0.4	400

It should be noted that the IAQM Guidance only requires the assessment of ecological receptors which are located within 200m of the road network. Assessment of receptors at Sites of Importance for Nature Conservations (SINC's) are not required by IAQM guidance but have been included within this assessment for completeness. Therefore, further assessment of all ecological receptors listed within Table 4.3 will be included within this report.

Figure 4-3. Sensitive Receptor Locations



5.0 ASSESSMENT OF AIR QUALITY IMPACTS - CONSTRUCTION PHASE

5.1 POLLUTANT SOURCES

The main emissions during construction are likely to be dust and particulate matter generated during earth moving (particularly during dry months) or from construction materials. The main potential effects of dust and particulate matter are:

- Visual - dust plume, reduced visibility, coating and soiling of surfaces leading to annoyance, loss of amenity, the need to clean surfaces;
- Physical and/or chemical contamination and corrosion of artefacts;
- Coating of vegetation and soil contamination; and,
- Health effects due to inhalation e.g. asthma or irritation of the eyes.

A number of other factors such as the amount of precipitation and other meteorological conditions will also greatly influence the amount of particulate matter generated.

Construction activities can give rise to short-term elevated dust/PM_{10} concentrations in neighbouring areas. This may arise from vehicle movements, soiling of the public highway, demolition or windblown stockpiles.

5.2 PARTICLUATE MATTER (PM_{10})

The UK Air Quality Standards seek to control the health implications of respirable PM_{10}. However, the majority of particles released from construction will be greater than this in size.

Construction works on site have the potential to elevate localised PM_{10} concentrations in the area. On this basis, mitigation measures should still be taken to minimise these emissions as part of good site practice.

5.3 DUST

Particles greater than 10µm are likely to settle out relatively quickly and may cause annoyance due to their soiling capability. Although there are no formal standards or criteria for nuisance caused by deposited particles, the IAQM 'Guidance on Monitoring in the Vicinity of Demolition and Construction Sites' (October 2018) and the Environment Agency Technical Guidance Note (TGN) M17 states that dust is usually compared with a 'complaints likely' guideline of 200mg/m^2/day. Therefore, a deposition rate of 200mg/m^2/day is often presented as a threshold for serious nuisance though this is usually only applied to long term exposure as people are generally more tolerant of dust for a short or defined period. Significant nuisance is likely when the dust coverage of surfaces is visible in contrast with adjacent clean areas, especially when it happens regularly. Severe dust nuisance occurs when the dust is perceptible without a clean reference surface.

Construction activities have the potential to suspend dust, which could result in annoyance of residents surrounding the site. Measures will be taken to minimise the emissions of dust as part of good site practice.

Recommended mitigation measures proportionate to the risk associated with the development and based on best practice guidance are discussed in the following sections.

5.4 METHODOLOGY

The construction phase assessment utilises the IAQM Guidance on the Assessment of Dust from Demolition and Construction document published in February 2014.

Four construction processes are considered; these are demolition, earthworks, construction and trackout. For each of these phases, the impact description of the potential dust impacts is derived following the determination of a dust emission magnitude and the distance of activities to the nearest sensitive receptor, therefore assessing worst case impacts. A full explanation of the methodology is contained in Appendix A.

5.5 ASSESSMENT RESULTS

Based on the methodology detailed in Appendix A, the scale of the anticipated works has determined the potential dust emission magnitude for each process, as presented in the Table 5-1 below.

Table 5-1. Dust Emission Magnitude

Construction Process	Site Criteria	Dust Emission Magnitude
Demolition	Total building volume >50,000 m^3	Large
Earthworks	Total site area >10,000 m^2	Large
Construction	Total building volume 100,000 - 25,000 m^3	Medium
Trackout	Assumed 10-50 HDV outward movements, unpaved road length 50-100 m	Medium

The sensitivity of the surrounding area to each construction process has been determined following stage 2B of the IAQM guidance. The assessment has determined the area sensitivities as shown in the Table 5-2.

The sensitivity of the ecological receptors is considered not applicable within the construction phase assessment due to the distance from the application site which is greater than 500m. This is in accordance with Table 4 of the IAQM Guidance.

Table 5-2. Sensitivity of the Area

Source	Area Sensitivity					
	Dust Soiling	Site Sensitivity Criteria	Health Effects of PM_{10}	Site Sensitivity Criteria	Ecological	Site Sensitivity Criteria
Demolition	Medium					1-10 Highly Sensitive Receptors within 50 m
Earthworks	Medium	1-10 Highly Sensitive Receptors within 50 m	Low	Annual Mean of <24 ug/m^3 for PM_{10} 10-10 Highly Sensitive Receptors within 50m	N/A	>50 m from site boundary
Construction	Medium	1-10 Highly Sensitive Receptors within 50 m	Low		N/A	
Trackout	Medium	1-10 Highly Sensitive Receptors within 50 m of roads within 500m of site exit	Low	Annual Mean of <24 ug/m^3 for PM_{10} 10-10 Highly Sensitive Receptors within 50m of roads within 500m of site	Low	<50 m from roads within 500 m from site boundary

The dust emission magnitude determined in Table 5-1 has been combined with the sensitivity of the area determined in Table 5-2, to determine the risk of impacts prior to the implementation of appropriate mitigation measures. The potential impact significance of dust emissions associated with the development, without mitigation, is presented in Table 5-3 below.

Table 5-3. Impact Risk Summary

Source	Summary Risk of Impacts Prior to Mitigation		
	Dust Soiling	Health Effects of PM_{10}	Ecological
Demolition	High		
Earthworks	Medium	Low	N/A
Construction	Medium	Low	N/A
Trackout	Low	Low	N/A

Appropriate mitigation measures are detailed and presented in Section 7. Following the adoption of these measures, the subsequent impact significance of the construction phase is not predicted to be significant.

6.0 ASSESSMENT OF AIR QUALITY IMPACTS - OPERATIONAL PHASE

In the context of the proposed development, road traffic is identified as the dominant emission source that is likely to cause potential risk of exposure of air pollutants at receptors.

The operational phase assessment therefore consists of the quantified predictions of the change in NO_2, PM_{10} and $PM_{2.5}$ for the operational phase of the development due to changes in traffic movement. Predictions of air quality at the site have been undertaken for the operational phase of the development using ADMS Roads.

In accordance with the provided traffic data, the operational phase assessment has been undertaken with an assumed operational opening year of 2022. The assessment scenarios are therefore:

- 2018 Baseline = Existing Baseline Conditions (2018);
- 2026 "Do Minimum" = Baseline Conditions + Cumulative Development Flows; and,
- 2026 "Do Something" = Baseline Conditions + Cumulative Development + Proposed Development.

6.1 EXISTING AND PREDICTED TRAFFIC FLOWS

Baseline 2018 data and projected 2026 'do minimum' and 'do something' traffic data has been obtained for the operational phase assessment in the form of Annual Average Daily Traffic figures (AADT).

2018 Baseline, 2026 'do minimum' and 'do something' traffic data have been provided by Cambria Consulting Ltd. For road links that were not provided by the transport consultant, 2018 baseline traffic data has been downloaded from the Department for Transport (DfT) database. Where no traffic flow data was available from the Transport Consultant or DfT database, a representative traffic flow has been used.

Emission factors for the 2018 baseline and 2026 projected 'do minimum' and 'do something' scenarios have been calculated using the Emission Factor Toolkit (EFT) Version 10.1 (August 2020).

It is assumed the average vehicle speeds on the local road network in an opening year of 2026 will be broadly the same as the ones in 2018. A 50 m 20 km/hr slow down phase is included on each link at every junction and roundabout within the assessment. All of the roads within the dispersion model are illustrated in **Error! Reference source not found.**. Detailed traffic figures are provided in the Table 6.1.

Table 6-1. Traffic Data

Link	Speed (km/h)	2018 Baseline		2026 Do Minimum		2026 Do Something	
		AADT	HGV %	AADT	%HGV	AADT	%HGV
Cardiff Bay Link Road (A4232)	112	62,805	3.4	69985	3.4	70047	3.4
Penarth Road (A4160)	48	11,217	2.0	12466	2.0	12466	2.0
Corporation Road	32	6,895	2.0	7683	2.0	7745	2.0
James Street (A4119)	32	10,066	2.0	11187	2.0	11249	2.0
Clare Road (A4119)	32	6,895	2.0	7683	2.0	7683	2.0
Ferry Road/Avondale Road (East of site Entrance)	32	7,563	2.0	8404	2.0	8526	2.0

Channel View Road (Site Access)	32	602	1.0	880	1.0	1240	1.0
Ferry Road (West of Site Access)	32	7,563	2.0	8404	2.0	8587	2.0
Ferry Road (South)	48	7,563	2.0	8404	2.0	8587	2.0
Ferry Road (Link Road)	48	7,563	2.0	8404	2.0	8587	2.0
Beecher Avenue	20	602	2.0	880	2.0	1063	2.0
South Clive Street	32	602	2.0	880	2.0	1063	2.0
Clive Street	32	5,799	1.0	6444	1.0	6627	1.0
Penarth Road (between Clive Street and Corporation Street)	48	11,217	1.0	12466	1.0	12466	1.0
Penarth Road (West of Clive Street)	48	14,861	2.0	16515	2.0	16653	2.0

6.2 BACKGROUND CONCENTRATIONS

The use of background concentrations within the modelling process ensures that pollutant sources other than traffic are represented appropriately. Background sources of pollutants include industrial, domestic and rail emissions within the vicinity of the study site. Several sources have been used to obtain representative background levels as discussed below.

The background concentrations used within the assessment have been determined with reference to the IAQM Guidance and Technical Guidance (TG) (16).

The IAQM Guidance states:

> "*A matter of judgement should take into account the background and future background air quality and whether it is likely to approach or exceed the value of the AQO.*"

Additionally, TG (16) states:

> "*Typically, only the process contributions from local sources are represented within an output by the dispersion model. In these circumstances, it is necessary to add an appropriate background concentration(s) to the modelled source contributions to derive the total pollutant concentrations.*"

Defra Published Background Concentrations for 2019

The background concentrations shown in Table 6-2 were referenced from the UK National Air Quality Information Archive database based on the National Grid Co-ordinates of 1 x 1 km grid squares nearest to the application site. In August 2020, Defra issued revised 2018 based background maps for nitrogen oxide (NO_X), NO_2, PM_{10} and $PM_{2.5}$.

Table 6-2. Published Background Air Quality Levels (µg/m^3)

Receptor Location	2018			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$
Local Authority Monitoring				
49	24.34	17.38	14.65	9.83
147	24.34	17.38	14.65	9.83
148	24.34	17.38	14.65	9.83
149	24.34	17.38	14.65	9.83
202	25.52	18.15	14.70	9.74
152	28.07	19.54	14.31	8.78
Existing Sensitive Receptors				
R1	22.88	16.55	13.71	8.57
R2	22.72	16.41	13.88	8.98
R3	22.72	16.41	13.88	8.98
R4	22.72	16.41	13.88	8.98
R5	24.34	17.38	14.65	9.83
R6	24.34	17.38	14.65	9.83
R7	24.34	17.38	14.65	9.83
R8	24.34	17.38	14.65	9.83
R9	21.61	15.68	14.17	9.00
R10	21.61	15.68	14.17	9.00
R11	21.61	15.68	14.17	9.00
R12	21.61	15.68	14.17	9.00
R13	21.61	15.68	14.17	9.00
R14	22.88	16.55	13.71	8.57
R15	33.91	22.95	15.62	9.79
Proposed Sensitive Receptors				
PR1 – PR5	22.88	16.55	13.71	8.57

All the Defra background concentrations detailed in Table 6-2 for 2019, show that the background levels are predicted to be below the relevant AQO within the study area.

A breakdown of the background source apportionment of NO_X concentrations at each monitoring location and receptor is shown in Table 6-3.

Table 6-3. Pollutant Source Apportionment of NO_X ($\mu g/m^3$)

Receptor Location	2018						
	Total NO_x	% of NO_X from Road Sources	% of NO_X from Industrial Sources	% of NO_X from Domestic Sources	% of NO_X from Aircraft Sources	% of NO_X from Rail Sources	% of NO_X from Other Sources
Local Authority Monitoring							
49	24.34	41.79	4.89	14.13	0.05	11.14	28.01
147	24.34	41.79	4.89	14.13	0.05	11.14	28.01
148	24.34	41.79	4.89	14.13	0.05	11.14	28.01
149	24.34	41.79	4.89	14.13	0.05	11.14	28.01
202	25.52	48.92	4.58	18.75	0.04	6.01	26.55
152	28.07	43.55	5.64	16.01	0.04	3.02	47.07
Modelled Receptors Locations							
R1	22.88	47.56	8.16	8.96	0.05	5.11	30.16
R2	22.72	43.97	5.68	12.03	0.04	4.23	34.04
R3	22.72	43.97	5.68	12.03	0.04	4.23	34.04
R4	22.72	43.97	5.68	12.03	0.04	4.23	34.04
R5	24.34	41.79	4.89	14.13	0.05	11.14	28.01
R6	24.34	41.79	4.89	14.13	0.05	11.14	28.01
R7	24.34	41.79	4.89	14.13	0.05	11.14	28.01
R8	24.34	41.79	4.89	14.13	0.05	11.14	28.01
R9	21.61	40.60	5.65	11.77	0.05	6.19	35.74
R10	21.61	40.60	5.65	11.77	0.05	6.19	35.74
R11	21.61	40.60	5.65	11.77	0.05	6.19	35.74
R12	21.61	40.60	5.65	11.77	0.05	6.19	35.74
R13	21.61	40.60	5.65	11.77	0.05	6.19	35.74
R14	22.88	47.56	8.16	8.96	0.05	5.11	30.16
R15	33.91	45.89	3.87	21.73	0.03	6.84	21.64

*Located in the AQMA

Table 6-3 shows that the major background source of NO_X at the monitoring, sensitive receptor locations where sources have been identified are mainly comprised of road sources.

A review of the Defra background site has determined that they are in line with the Local Authority monitoring within CDC.

Table 6-4 shows the background concentrations utilised within the assessment.

Where some backgrounds give unrepresentative results, a nearby background concentration has been used to create a robust model.

Table 6-4. Utilised Background Concentrations (µg/m^3)

Receptor Location	2018		Source
	NO_x	NO_2	
Local Authority Monitoring			
49	24.34	17.38	Defra Background Maps
147	24.34	17.38	
148	24.34	17.38	
149	24.34	17.38	
202	25.52	18.15	
152	28.07	19.54	
Existing Sensitive Receptors			
R1	22.88	16.55	Defra Background Maps
R2	22.72	16.41	
R3	22.72	16.41	
R4	22.72	16.41	
R5	24.34	17.38	
R6	24.34	17.38	
R7	24.34	17.38	
R8	24.34	17.38	
R9	21.61	15.68	
R10	21.61	15.68	
R11	21.61	15.68	
R12	21.61	15.68	
R13	21.61	15.68	
R14	22.88	16.55	
R15	33.91	22.95	
Proposed Sensitive Receptors			
PR1 – PR5	22.88	16.55	Defra Background Maps
Ecological Sensitive Receptors			
E1	20.03	-	APIS
E2	28.78	-	
E3	26.86	-	
E4	26.86	-	
E5	21.29	-	
E6	23.78	-	
E7	24.65	-	
E8	20.03	-	
E9	23.40	-	
E10	26.34	-	
E11	26.34	-	

*Located in the AQMA

6.3 MODEL VERIFICATION

Model verification involves the comparison of modelled data to monitored data in order to gain the best possible representation of current pollutant concentrations for the assessment years. The verification process is in

general accordance with that contained in Section 7 of the TG16 guidance note and uses the most recently available diffusion tube monitoring data to best represent this.

The verification process consists of using the monitoring data and the published background air quality data in the UK National Air Quality Information Archive to calculate the road traffic contribution of NO_X at the monitoring locations. Outputs from the ADMS Roads model are provided as predicted road traffic contribution NO_X emissions. These are converted into predicted roadside contribution NO_2 exposure at the relevant receptor locations based on the updated approach to deriving NO_2 from NO_X for road traffic sources published in Local Air Quality Management TG16. The calculation was derived using the NO_X to NO_2 worksheet in the online LAQM tools website hosted by Defra. Table 6-5 summarises the final model/monitored data correlation following the application of the model correction factor.

Table 6-5. Comparison of Roadside Modelling & Monitoring Results for NO_2

Link	NO_2 µg/m^3		
	Monitored NO_2	Modelled NO_2	Difference (%)
49	27.30	27.95	2.40
147	29.30	30.16	2.93
148	26.60	25.60	-3.75
149	31.30	29.22	-6.66
202	27.80	26.46	-4.84
152	27.30	27.95	2.40
49	27.30	27.95	2.40

*Located in the AQMA

The final model produced data at the monitoring locations to within 10% of the monitoring results, as recommended by TG16.

The final verification model correlation coefficient (representing the model uncertainty) is 1.00. This was achieved by applying a model correction factor of 3.34 to roadside predicted NO_X concentrations before converting to NO_2. This figure demonstrates that the model predictions were in line with the road traffic emissions at the monitoring locations.

6.4 SUMMARY OF MODEL INPUTS

Table 6-6. Summary of ADMS Roads Model Inputs

Parameter	Description	Input Value
Chemistry	A facility within ADMS-Roads to calculate the chemical reactions in the atmosphere between Nitric Oxide (NO), NO_2, Ozone (O_3) and Volatile organic compounds (VOCs).	No atmospheric chemistry parameters included
Meteorology	Representative meteorological data from a local source	**Cardiff Airport 2018 Meteorological Station, hourly sequential data**
Surface Roughness	A setting to define the surface roughness of the model area based upon its location.	**1.5m** representing a typical surface roughness for **Large Urban Areas** was used for the Site and met. Measurement site.
Latitude	Allows the location of the model area to be set	United Kingdom = **51.9**
Monin-Obukhov Length	This allows a measure of the stability of the atmosphere within the model area to be specified depending upon its character.	Small Towns = **10m** was used for the Site. Mixed Urban/Industrial = **30m** was used for the met. Measurement site.
Elevation of Road	Allows the height of the road link above ground level to be specified.	All other road links were set at ground level = **0m**.
Road Width	Allows the width of the road link to be specified.	Road width used depended on data obtained from OS map data for the specific road link
Topography	This enables complex terrain data to be included within the model in order to account for turbulence and plume spread effects of topography	No topographical information used
Time Varied Emissions	This enables daily, weekly or monthly variations in emissions to be applied to road sources	No time varied emissions used
Road Type	Allows the effect of different types of roads to be assessed.	**Urban (Not London)** settings were used for the relevant links
Road Speeds	Enables individual road speeds to be added for each road link	Based on national speed limits
Canyon Height	Allows the model to take account turbulent flow patterns occurring inside a street with relatively tall buildings on both sides, known as a “street canyon”.	No canyons used within the model
Road Source Emissions	Road source emission rates are calculated from traffic flow data using the in-built EFT database of traffic emission factors.	The **EFT** Version **10.1 (2020)** dataset was used.
Year	Predicted EFT emissions rates depend on the year of emission.	**2018** data for verification and baseline Operational Phase Assessment. **2026** data for the Operational Phase Assessment,

6.5 ADMS MODELLING RESULTS

The ADMS Model has predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at relevant receptor locations adjacent to roads likely to be affected by the development, as summarised in the following tables. Only receptors close to roads where there is predicted to be a change in emissions have been assessed.

Assessment Scenarios

For the operational year of 2026, assessment of the effects of emissions from the proposed traffic associated with the scheme, has been undertaken using the Emissions Factor Toolkit (EFT) 2026 emissions rates which take into account of the rate of reduction in emission from road vehicles into the future with the following factors:

- 2018 Baseline = Existing Baseline conditions;
- 2026 “Do Minimum” = 2026 Baseline + Cumulative Developments; and,
- 2026 “Do Something” = 2026 Baseline + Cumulative Developments + Development Traffic Flows.

Additionally, a sensitivity, theoretical, test has been undertaken in Appendix B assuming no improvements in vehicle emissions between the baseline year of 2018 and the opening year of 2026.

Nitrogen Dioxide

Table 6-7 presents a summary of the predicted change in NO_2 concentrations at relevant receptor locations, due to changes in traffic flow associated with the operational phase, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table 6-7. Predicted Annual Average Concentrations of NO_2 at Receptor Locations

Receptor		NO_2 (µg/m^3)			
		2018 Baseline	2026 Do Minimum	2026 Do Something	Development Contribution
R1	28 O'Leary Drive	36.13	27.69	27.72	0.03
R2	9 Horle Close	31.63	24.91	24.95	0.04
R3	233 Corporation Road	32.92	25.64	25.68	0.04
R4	1 Avondale Way	25.06	21.19	21.23	0.04
R5	187 Penarth Road	38.12	29.15	29.18	0.03
R6	189a Penarth Road	32.04	25.74	25.75	0.01
R7	1 Clive Street	34.80	27.34	27.41	0.07
R8	2 Clive Street	36.63	28.28	28.38	0.10
R9	10 Ferry Road	27.40	22.28	22.49	0.21
R10	2 Ferry Road	26.51	21.80	21.98	0.18
R11	1A Ferry Road	25.76	21.33	21.45	0.12
R12	Flat 10 Marl Court	27.99	22.59	22.74	0.15
R13	18 York Place	28.28	22.71	22.83	0.12
R14	14 Morel Court	29.41	23.77	23.84	0.07
R15	51 St Marys Street	23.48	23.24	23.24	<0.01
PR1	Proposed Site	-	-	18.22	-
PR2	Proposed Site	-	-	18.25	-
PR3	Proposed Site	-	-	18.90	-
PR4	Proposed Site	-	-	19.17	-
PR5	Proposed Site	-	-	19.06	-
Annual Mean AQO		**40 µg/m^3**			

*Located in the AQMA

All modelled existing receptors are predicted to be below the AQO for NO_2 in both the 'do minimum' and 'Do Something' scenarios.

As indicated in Table 6-7, the maximum predicted increase in annual average exposure to NO_2 at any existing receptor, due to changes in traffic movements associated with the proposed development is 0.21 µg/m^3 at 10 Ferry Road (R9).

The predicted long-term NO_2 concentrations at all proposed and existing receptors are below 40 µg/m^3 in all scenarios. Therefore, it is unlikely there will be any exceedances for the short-term NO_2 AQO at all modelled receptors as outlined in LAQM TG16 technical guidance.

Figures 6-1 and 6-2, below illustrate the Total Long Term Annual Average Nitrogen Dioxide (NO_2) Concentration and contribution at the Proposed Development (µg/m^3).

Figure 6-1. Annual Average Long-Term Nitrogen Dioxide (NO_2) Contribution from Proposed Development ($\mu g/m^3$)

Figure 6-2. Total Long Term Annual Average Nitrogen Dioxide (NO_2) Concentration Across the Study Area ($\mu g/m^3$)

The impact description of changes in traffic flow associated with the operational phase with respect to annual mean NO_2 exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in Table 6-8.

Table 6-8. Impact Description of Effects at Key Receptors (NO_2)

Impact Description of NO_2 Effects at Key Receptors					
Receptor	**Change Due to Development (DS-DM) (µg/m³)**	**Change due to Development (% of AQO)**	**% Change in Concentration Relative to AQO**	**% Annual Mean Concentration in Assessment Year**	**Impact Description**
R1	0.03	0.08	0%	≤75% of AQO	Negligible
R2	0.04	0.10	0%	≤75% of AQO	Negligible
R3	0.04	0.10	0%	≤75% of AQO	Negligible
R4	0.04	0.10	0%	≤75% of AQO	Negligible
R5	0.03	0.08	0%	≤75% of AQO	Negligible
R6	0.01	0.03	0%	≤75% of AQO	Negligible
R7	0.07	0.18	0%	≤75% of AQO	Negligible
R8	0.10	0.25	0%	≤75% of AQO	Negligible
R9	0.21	0.53	1%	≤75% of AQO	Negligible
R10	0.18	0.45	0%	≤75% of AQO	Negligible
R11	0.12	0.30	0%	≤75% of AQO	Negligible
R12	0.15	0.38	0%	≤75% of AQO	Negligible
R13	0.12	0.30	0%	≤75% of AQO	Negligible
R14	0.07	0.18	0%	≤75% of AQO	Negligible
R15	<0.01	<0.01	0%	≤75% of AQO	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					
*Located in the AQMA					

The impact description of the effects of changes in traffic flow as a result of the operational phase, with respect to NO_2 exposure for existing receptors is determined to be 'negligible' at all modelled receptors. This is based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be 'high'.

Particulate Matter (PM_{10})

Table 6-9 presents a summary of the predicted change in annual mean PM_{10} concentrations at relevant receptor locations, due to changes in traffic flow associated with the operational phase, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table 6-9. Predicted Annual Average Concentrations of PM_{10} at Receptor Locations

Receptor		PM_{10} (µg/m³)			
		2018 Baseline	2026 Do Minimum	2026 Do Something	Development Contribution
R1	28 O'Leary Drive	16.74	16.73	16.74	0.01
R2	9 Horle Close	16.07	16.09	16.10	0.01
R3	233 Corporation Road	16.26	16.28	16.29	0.01
R4	1 Avondale Way	15.10	15.10	15.12	0.01
R5	187 Penarth Road	17.77	17.81	17.82	0.01
R6	189a Penarth Road	16.82	16.85	16.85	<0.01
R7	1 Clive Street	17.23	17.26	17.28	0.02
R8	2 Clive Street	17.48	17.51	17.54	0.03
R9	10 Ferry Road	15.83	15.86	15.92	0.06
R10	2 Ferry Road	15.70	15.74	15.79	0.05
R11	1A Ferry Road	15.61	15.63	15.66	0.04
R12	Flat 10 Marl Court	15.93	15.95	16.00	0.04
R13	18 York Place	15.96	15.98	16.02	0.04
R14	14 Morel Court	15.65	15.65	15.68	0.02
R15	51 St Marys Street	15.69	15.69	15.69	<0.01
Annual Mean AQO		**40 µg/m³**			
*Located in the AQMA					

All modelled existing receptors are predicted to be below the AQO for PM_{10} in both the 'Do Minimum' and 'Do Something' scenarios.

As indicated in Table 6-9, the maximum predicted increase in annual average exposure to PM_{10} at any existing receptor, due to changes in traffic movements associated with the operational phase is 0.06 µg/m³ at 10 Ferry Road (R9).

The impact description of changes in traffic flow associated with the operational phase with respect to annual mean PM_{10} exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in Table 6-10.

Table 6-10. Impact Description of Effects at Key Receptors (PM_{10})

Impact Description of PM_{10} Effects at Key Receptors					
Receptor	Change Due to Development (DS-DM) (µg/m³)	Change due to Development (% of AQO)	% Change in Concentration Relative to AQO	% Annual Mean Concentration in Assessment Year	Impact Description
R1	0.01	0.03	0%	≤75% of AQO	Negligible
R2	0.01	0.04	0%	≤75% of AQO	Negligible
R3	0.01	0.04	0%	≤75% of AQO	Negligible
R4	0.01	0.03	0%	≤75% of AQO	Negligible
R5	0.01	0.02	0%	≤75% of AQO	Negligible
R6	<0.01	0.01	0%	≤75% of AQO	Negligible
R7	0.02	0.05	0%	≤75% of AQO	Negligible
R8	0.03	0.08	0%	≤75% of AQO	Negligible
R9	0.06	0.15	0%	≤75% of AQO	Negligible
R10	0.05	0.13	0%	≤75% of AQO	Negligible
R11	0.04	0.09	0%	≤75% of AQO	Negligible

R12	0.04	0.11	0%	≤75% of AQO	Negligible
R13	0.04	0.10	0%	≤75% of AQO	Negligible
R14	0.02	0.05	0%	≤75% of AQO	Negligible
R15	<0.01	<0.01	0%	≤75% of AQO	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					
*Located in the AQMA					

The impact description of the effects of changes in traffic as a result of the operational phase, with respect to annual mean PM_{10} exposure for existing receptors is determined to be 'negligible' based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be 'high'.

Particulate Matter ($PM_{2.5}$)

Table 6-11 presents a summary of the predicted change in annual mean PM_{10} concentrations at relevant receptor locations, due to changes in traffic flow associated with the operational phase, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table 6-11. Predicted Annual Average Concentrations of $PM_{2.5}$ at Receptor Locations

Receptor		$PM_{2.5}$ (µg/m^3)			
		2018 Baseline	2026 Do Minimum	2026 Do Something	Development Contribution
R1	28 O'Leary Drive	10.40	10.26	10.26	0.01
R2	9 Horle Close	10.31	10.23	10.24	0.01
R3	233 Corporation Road	10.43	10.34	10.34	0.01
R4	1 Avondale Way	9.72	9.67	9.68	0.01
R5	187 Penarth Road	11.72	11.61	11.62	<0.01
R6	189a Penarth Road	11.14	11.07	11.07	<0.01
R7	1 Clive Street	11.39	11.30	11.31	0.01
R8	2 Clive Street	11.55	11.44	11.46	0.02
R9	10 Ferry Road	10.01	9.95	9.99	0.03
R10	2 Ferry Road	9.93	9.89	9.91	0.03
R11	1A Ferry Road	9.87	9.82	9.84	0.02
R12	Flat 10 Marl Court	10.07	10.00	10.03	0.02
R13	18 York Place	10.09	10.02	10.04	0.02
R14	14 Morel Court	9.74	9.66	9.67	0.01
R15	51 St Marys Street	9.84	9.83	9.83	<0.01
PR1	Proposed Site	-	-	9.37	-
PR2	Proposed Site	-	-	9.38	-
PR3	Proposed Site	-	-	8.92	-
PR4	Proposed Site	-	-	8.96	-
PR5	Proposed Site	-	-	8.94	-
Annual Mean AQO		**25 µg/m^3**			
*Located in the AQMA					

All modelled receptor locations are predicted to be below the AQO for $PM_{2.5}$ in both the 'do minimum' and 'do something' scenarios.

As indicated in Table 6.11, the maximum predicted increase in annual average exposure to $PM_{2.5}$ at any existing receptor, due to changes in traffic movements associated with the development is 0.03 µg/m^3 at 10 Ferry Road (R9) and 2 Ferry Road (R10).

The worst case $PM_{2.5}$ concentrations at any proposed receptor locations is 9.38 µg/m^3, this is below the AQO for $PM_{2.5}$ and no additional mitigation is required.

The impact description of changes in traffic flow associated with the development with respect to annual mean $PM_{2.5}$ exposure has been assessed with reference to the criteria in section 3. The outcomes of the assessment are summarised in Table 6.12.

Table 6-12. Impact Description of Effects at Key Receptors ($PM_{2.5}$)

Impact Description of $PM_{2.5}$ Effects at Key Receptors					
Receptor	**Change Due to Development (DS-DM) (µg/m³)**	**Change due to Development (% of AQO)**	**% Change in Concentration Relative to AQO**	**% Annual Mean Concentration in Assessment Year**	**Impact Description**
R1	0.01	0.02	0%	≤75% of AQO	Negligible
R2	0.01	0.03	0%	≤75% of AQO	Negligible
R3	0.01	0.03	0%	≤75% of AQO	Negligible
R4	0.01	0.03	0%	≤75% of AQO	Negligible
R5	0.00	0.01	0%	≤75% of AQO	Negligible
R6	<0.01	0.01	0%	≤75% of AQO	Negligible
R7	0.01	0.04	0%	≤75% of AQO	Negligible
R8	0.02	0.07	0%	≤75% of AQO	Negligible
R9	0.03	0.13	0%	≤75% of AQO	Negligible
R10	0.03	0.11	0%	≤75% of AQO	Negligible
R11	0.02	0.08	0%	≤75% of AQO	Negligible
R12	0.02	0.09	0%	≤75% of AQO	Negligible
R13	0.02	0.08	0%	≤75% of AQO	Negligible
R14	0.01	0.04	0%	≤75% of AQO	Negligible
R15	<0.01	<0.01	0%	≤75% of AQO	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					
*Located in the AQMA					

The impact description of the effects of changes in traffic as a result of the operational phase, with respect to annual mean $PM_{2.5}$ exposure for existing receptors is determined to be ‘negligible’ based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be ‘high’.

6.5.1 Ecological Sensitive Receptor Locations

Background concentrations at each of the ecologically sensitive sites were determined through a review of the NO_X pollutants published on the APIS website.

The below assessment has been undertaken in accordance with A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites (IAQM, 2019).

Nitrogen Oxide

Table 6-13 presents a summary of the predicted change in NO_X concentrations at relevant receptor locations,

due to changes in traffic flow associated with the development, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table 6-13. Predicted Annual Average Concentrations of NO_X at Ecological Receptor Locations

Ecological Receptor		Predicted Maximum Annual Mean Concentration (µg/m³)				
		Do Minimum 2021 NO_X	Do Something 2021 NO_X	Process Contribution (PC)	PC as %age of AQO	Background
E1	Cwm Cydfin, Leckwith	54.86	54.87	0.01	0.04	20.03
E2	Severn Estuary	28.79	28.79	<0.01	<0.01	28.78
E3	Cardiff Bay Wetlands and Hamadryad Park	32.39	32.40	0.01	0.02	26.86
E4	River Taff	30.25	30.26	0.02	0.06	26.86
E5	Cogan Spur	23.46	23.46	<0.01	0.01	21.29
E6	SINC No. 188 Factory Wood	24.53	24.53	<0.01	<0.01	23.78
E7	Leckwith Pond and Marsh	48.55	48.56	0.01	0.02	24.65
E8	SINC No. 189 Reservoir Wood	21.77	21.78	<0.01	0.01	20.03
E9	Canton Common Ditch	24.29	24.29	<0.01	<0.01	23.40
E10	River Ely	37.23	37.24	0.01	0.03	26.34
E11	Grangemore Park	33.78	33.80	0.02	0.07	26.34
Annual Mean AQO/Critical Level (CL)		**30 µg/m³**				

As indicated in Table 6.13, the maximum predicted increase in the annual average exposure to NO_X at any ecological receptor, due to changes in traffic movements associated with the development, is 0.02 µg/m³ at River Taff (R4) and Grangemore Park (E11).

Section 5.5.4.1 of A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites', IAQM 2019 states:

> *Where the assessment indicates that changes in annual mean NOx concentrations within a designated site cannot be dismissed as imperceptible (i.e. an increase of over 0.4 µg/m³) and the NOx critical level is exceeded, then changes in nutrient nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance.*

The maximum predicted increase in the annual average exposure to NO_X at the identified ecological receptor, due to changes in traffic movements associated with the development, is 0.02 µg/m³ at River Taff (E4) and Grangemore Park (E11), which is below the 0.40 µg/m³ development contribution stated within the guidance of 'A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites', IAQM 2019. As a result, no further assessment is required and the impact at all ecological receptors is considered to be negligible.

7.0 ASSESSMENT OF AIR QUALITY IMPACTS - OPERATIONAL PHASE

7.1 MITIGATION

7.1.1 Construction Phase

The dust risk categories have been determined in Section 5 for each of the four construction activities. The assessment has determined that the potential impact description of dust emissions associated with the construction phase of the proposed development is 'medium risk' at the worst affected receptors.

Using the methodology described in Appendix A, appropriate site-specific mitigation measures associated with the determined level of risk can be found in Section 8.2 of the 'IAQM Guidance on the Assessment of Dust from Demolition and Construction'.

The mitigation measures have been divided into general measures applicable to all sites and measures applicable specifically to demolition, earthworks, construction and trackout. They are categorised into 'highly recommended' and 'desirable' measures.

The mitigation measures for the proposed development are detailed in Table 7-1 and Table 7-2 below.

Table 7-1. Highly Recommended Mitigation Measures

Communications
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
Display the head or regional office contact information.
Dust Management
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real time PM_{10} continuous monitoring and/or visual inspections.
Record all dust and air quality complaints, identify cause(s), 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 offsite, and the action taken to resolve the situation in the logbook.
Hold regular liaison meetings with other high-risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
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 on site.
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.
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 they are being re-used on-site cover as described 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.
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).
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
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 the 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.
Demolition
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
Avoid explosive blasting, using appropriate manual or mechanical alternatives.
Bag and remove any biological debris or damp down such material before demolition.
Earthworks
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
Only remove the cover in small areas during work and not all at once.
Construction
Avoid scabbling (roughening of concrete surfaces) if possible.
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
Trackout
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
Record all inspections of haul routes and any subsequent action in a site logbook.
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
Access gates to be located at least 10m from receptors where possible.

Table 7-2. Desirable Mitigation Measures

Communications
No Action Required.
Dust Management
No Action Required.
Demolition
No Action Required.
Earthworks
No Action Required.
Construction
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout
No Action Required.

Following the implementation of the mitigation measures detailed in the tables above, the impact description of the construction phase is not considered to be significant.

8.0 CONCLUSIONS

Tetra Tech have undertaken an Air Quality Assessment for the proposed development at the site of the Marl, Channel view Road, Cardiff, CF11 7HB in accordance with the methodology and parameters described within this report.

Construction Phase

Prior to the implementation of appropriate mitigation measures, the potential impact description of dust emissions associated with the construction phase of the proposed development is determined to be 'high' at some worst affected receptors without mitigation. However, appropriate site-specific mitigation measures have been recommended based on Section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition, Earthworks, Construction and Trackout. It is anticipated that with these appropriate mitigation measures in place, the risk of adverse effects due to emissions from the construction phase will not be significant.

Operational Assessment

The 2026 assessment of the effect of emissions from traffic associated with the scheme, has determined that the maximum predicted increase in the annual average exposure to NO_2 at any existing receptor is likely to be 0.21 µg/m^3 at 10 Ferry Road (R9).

All modelled receptors predict NO_2 concentrations of below 60 µg/m^3 in all scenarios. Therefore, it is unlikely for any exceedances of the short-term NO_2 AQO to occur as outlined in LAQM TG16 technical guidance.

All proposed receptor locations are predicted to be subject to NO_2 concentrations below 40 µg/m^3. As a result, no additional mitigation is required.

For PM_{10}, the maximum predicted increase in the annual average exposure is likely to be 0.06 µg/m^3 at 10 Ferry Road (R9).

For $PM_{2.5}$, the maximum predicted increase in the annual average exposure is likely to be 0.03 µg/m^3 at 10 Ferry Road (R9) and 2 Ferry Road (R10).

In terms of NO_2, PM_{10} and $PM_{2.5}$ exposure, the impact description of effects of changes in traffic flow as a result of the proposed development is determined to be 'negligible' at all existing receptors.

Nitrogen Oxide

The maximum predicted increase in the annual average exposure to NO_X at the identified ecological receptor, due to changes in traffic movements associated with the development, is 0.02 µg/m^3 at River Taff (E4) and Grangemore Park (E11), which is below the 0.40 µg/m^3 development contribution stated within the guidance of 'A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites', IAQM 2019. As a result, no further assessment is required and the impact at Cwm Cydfin, Leckwith SSSI is considered to be negligible.

Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be 'high'. In conclusion, the development is not considered to be contrary to any of the national and local planning policies.

APPENDIX A - FIGURES

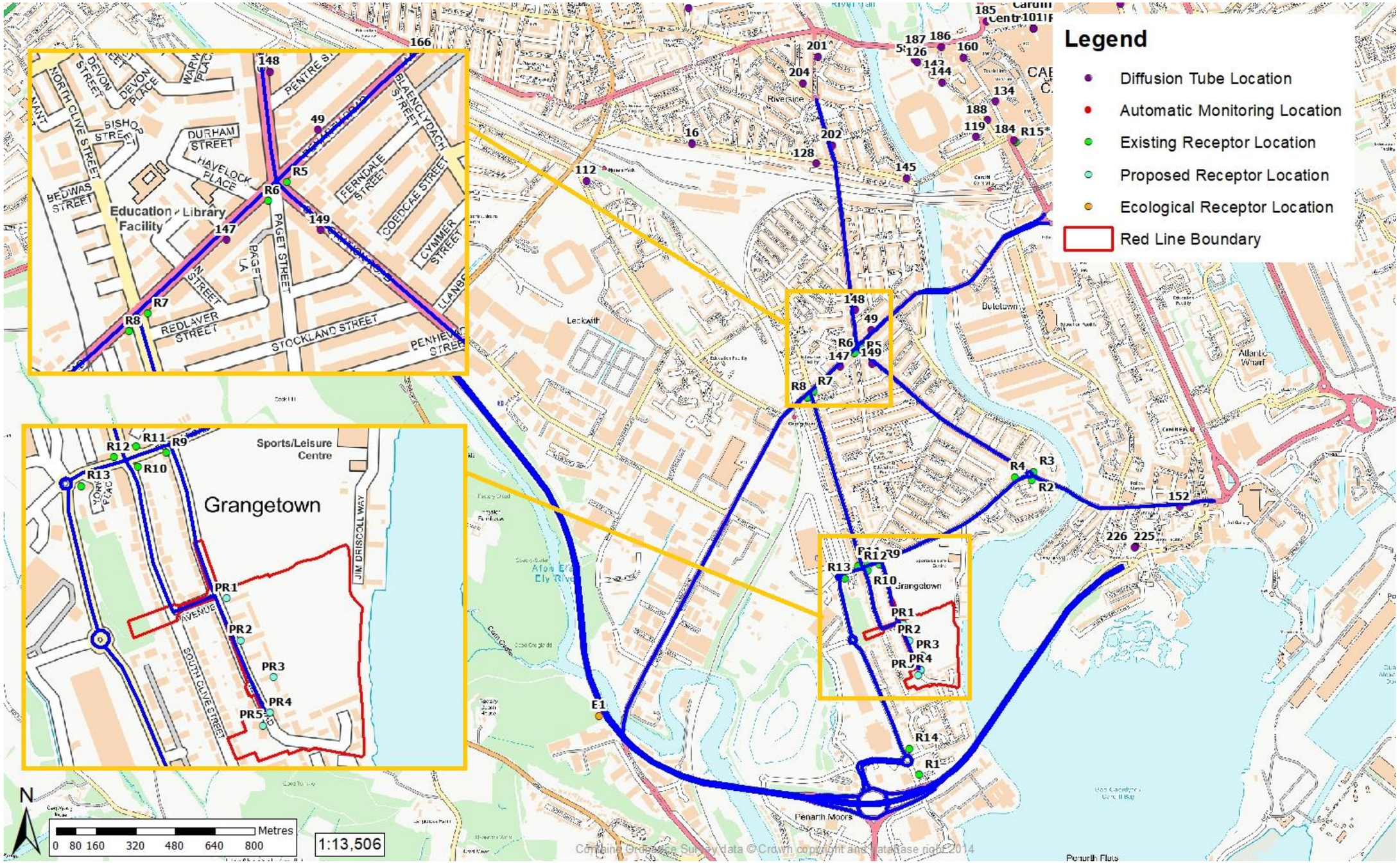


Figure A-1. Air Quality Assessment Area

APPENDIX B - CONSTRUCTION PHASE ASSESSMENT METHODOLOGY

The following information sets out the adopted approach to the construction phase impact assessment in accordance with the aforementioned IAQM guidance[1].

Step 1 – Screen the Requirement for a more Detailed Assessment

An assessment is required if there are sensitive receptors within 350m of the site boundary, within 50m of the route(s) used by construction vehicles on the surrounding road network, or within 500m from the site entrance. A detailed assessment is also required if there is an ecological receptor within 50m of the site boundary.

Step 2A – Define the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude for the demolition phase has been determined based on the below criteria:

- *Large*: Total building volume >50 000m^3, potentially dusty construction (e.g. concrete), on-site crushing and screening, demolition activities >20m above ground level;
- *Medium*: Total building volume 20 000m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20m above ground level; and,
- *Small*: Total building volume <20 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude for the planned earthworks has been determined based on the below criteria:

- *Large:* Total site area >10 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 >8m in height, total material moved >100 000 tonnes;
- *Medium*: Total site area 2 500m^2 – 10 000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m-8m in height, total material moved 20 000 tonnes – 100 000 tonnes; and
- *Small:* Total site area <2 500 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, total material moved <10 000 tonnes, earthworks during wetter months.

Construction

The dust emission magnitude for the construction phase has been determined based on the below criteria:

- *Large:* Total building volume >100 000m^3, on site concrete batching; sandblasting
- *Medium:* Total building volume 25 000m^3 – 100 000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and,
- *Small:* Total building volume <25 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

The dust emission magnitude for trackout has been determined based on the below criteria:

- *Large:* >50 HGV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- *Medium:* 10-50 HGV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and,
- *Small:* <10 HGV (>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

Sensitivities of People to Dust Soiling Effects

- *High:*
  - Users can reasonably expect an enjoyment of a high level of amenity;
  - The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably expect to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land; and,
  - Indicative examples include dwellings, museums and other culturally important collections, medium- and long-term car parks

[1] Institute of Air Quality Management 2014. *Guidance on the Assessment of dust from demolition and construction.*

and car showrooms.

- *Medium:*
  - Users can reasonably 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; and,
  - Indicative examples include parks and places of work.
- *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; and,
  - Indicative examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short term car parks and roads.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table B-1. Sensitivity of the Area to Dust Soiling Effects on People and Property

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

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of People to the Health Effects of PM_{10}

- *High:*
  - Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day);
  - Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.
- *Medium:*
  - Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day); and,
  - Indicative examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.
- *Low:*
  - Locations where human exposure is transient; and,
  - Indicative examples include public footpaths, playing fields, parks and shopping streets.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table B-2. Sensitivity of the Area to Human Health Impacts

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

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of Receptors to Ecological Effects

- *High:*
  - 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 Data List for Great Britain; and,
  - Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
- *Medium:*
  - 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; and,
  - Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
- *Low:*
  - Locations with a local designation where the features may be affected by dust deposition; and,
  - Indicative example is a local Nature Reserve with dust sensitive features.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table B-3. Sensitivity of the Area to Ecological Impacts

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

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Step 2C - Defining the Risk of Impacts

The risk of impacts with no mitigation is determined by combining the dust emission magnitude determined in Step 2A and the sensitivity of the area determined in Step 2B.

The following tables provide a method of assigning the level of risk for each activity.

Demolition

Table B-4. Risk of Dust Impacts, Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Earthworks

Table B-5. Risk of Dust Impacts, Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Construction

Table B-6. Risk of Dust Impacts, Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Trackout

Table B-7. Risk of Dust Impacts, Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3 – Site Specific Mitigation

The dust risk categories for each of the four activities determined in Step 2C should be used to define the appropriate, site-specific mitigation measures to be adopted.

These mitigation measures are contained within section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition and Construction.

APPENDIX C - THEORETICAL SCENARIO (NO REDUCTION IN UK FLEET EMISSIONS OVER TIME) RESULTS

Scenario Context

This additional theoretical scenario uses emission factors for 2018 for the 'do minimum' and 'do something' based on a recent appeal decision (planning reference no.APP/D3830/A/14/22269877) that favoured the uncertainty of emissions forecasts. It should be noted that this is a theoretical scenario which assumes that the government (Defra) predictions for reductions in emissions over the forthcoming years will not occur. This should not be considered as a 'more correct' scenario in accordance with the 2010 note [http://laqm.defra.gov.uk/laqm-faqs/faq5.html] which confirms that: '*There is no evidence to suggest that background concentrations associated with the other (non-traffic) source contributions should not behave as forecast. This disparity in the historical data highlights the uncertainty of future year projections of both NO_X and NO_2, but at this stage there is no robust evidence upon which to base any revised road traffic emissions projections'.*

The two assessment scenarios are defined below:

- 2026 'Do Minimum' Theoretical Scenario = Baseline Conditions + Committed Development Flows (using 2018 traffic emission factors); and,
- 2026 'Do Something' Theoretical Scenario = Baseline Conditions + Committed Development Flows + Proposed Development Flows (using 2018 traffic emission factors).

Nitrogen Dioxide

Table C-1 presents a summary of the predicted long term NO_2 concentrations at relevant proposed receptor locations based on the modelled 2026 'Do Minimum' and 'Do Something' scenarios.

Table C-1. Predicted Annual Average Concentrations of NO_2 at Receptor Locations

Receptor		NO_2 (µg/m^3)			
		2018 Baseline	2026 Do Minimum	2026 Do Something	Development Contribution
R1	28 O'Leary Drive	36.13	38.24	38.31	0.07
R2	9 Horle Close	31.63	33.21	33.32	0.11
R3	233 Corporation Road	32.92	34.65	34.76	0.11
R4	1 Avondale Way	25.06	26.00	26.09	0.09
R5	187 Penarth Road	38.12	40.23	40.27	0.04
R6	189a Penarth Road	32.04	33.57	33.59	0.02
R7	1 Clive Street	34.80	36.60	36.71	0.11
R8	2 Clive Street	36.63	38.57	38.71	0.14
R9	10 Ferry Road	27.40	28.78	29.20	0.42
R10	2 Ferry Road	26.51	27.84	28.20	0.36
R11	1A Ferry Road	25.76	26.88	27.13	0.25
R12	Flat 10 Marl Court	27.99	29.34	29.64	0.30
R13	18 York Place	28.28	29.63	29.89	0.26
R14	14 Morel Court	29.41	30.83	30.96	0.13
R15	51 St Marys Street	23.48	23.54	23.54	<0.01

PR1	Proposed Site	-	-	20.74	-
PR2	Proposed Site	-	-	20.79	-
PR3	Proposed Site	-	-	21.24	-
PR4	Proposed Site	-	-	21.78	-
PR5	Proposed Site	-	-	21.56	-
Annual Mean AQO		**40 µg/m³**			
*Located in the AQMA					

All modelled existing receptors are predicted to be below the AQO for NO_2 in both the 'do minimum' and 'do something' scenarios.

As indicated in Table C-1, the maximum predicted increase in annual average exposure to NO_2 at any existing receptor, due to changes in traffic movements associated with the construction phase is 0.42 µg/m³ at 10 Ferry Road (R9). Table C-2 below illustrates the NO_2 contribution from the proposed development across the study area.

The worst case NO_2 concentrations at any proposed receptor locations is 21.78 µg/m³, this is below the AQO for NO_2 and no additional mitigation is required. Figure C2 below illustrates the total annual average NO_2 concentrations at the proposed development site.

The impact description of changes in traffic flow associated with the construction phase with respect to annual mean NO_2 exposure has been assessed with reference to the criteria in Section 3.

Table C-2. Impact Description of Effects at Key Receptors (NO_2)

Impact Description of NO_2 Effects at Key Receptors					
Receptor	**Change Due to Development (DS-DM) (µg/m³)**	**Change due to Development (% of AQO)**	**% Change in Concentration Relative to AQO**	**% Annual Mean Concentration in Assessment Year**	**Impact Description**
R1	0.07	0.18	0%	95-102% of AQO	Negligible
R2	0.11	0.28	0%	76-94% of AQO	Negligible
R3	0.11	0.28	0%	76-94% of AQO	Negligible
R4	0.09	0.23	0%	≤75% of AQO	Negligible
R5	0.04	0.10	0%	95-102% of AQO	Negligible
R6	0.02	0.05	0%	76-94% of AQO	Negligible
R7	0.11	0.28	0%	76-94% of AQO	Negligible
R8	0.14	0.35	0%	95-102% of AQO	Negligible
R9	0.42	1.05	1%	≤75% of AQO	Negligible
R10	0.36	0.90	1%	≤75% of AQO	Negligible
R11	0.25	0.63	1%	≤75% of AQO	Negligible
R12	0.30	0.75	1%	≤75% of AQO	Negligible
R13	0.26	0.65	1%	≤75% of AQO	Negligible
R14	0.13	0.33	0%	76-94% of AQO	Negligible
R15	<0.01	<0.01	0%	≤75% of AQO	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					
*Located in the AQMA					

The impact description of the effects of changes in traffic flow as a result of the proposed development, with respect to NO_2 exposure for existing receptors, is determined to be 'negligible' at all identified receptors. This is based on the methodology outlined in Section 3.

Particulate Matter (PM_{10})

Table C-3 presents a summary of the predicted change in annual mean PM_{10} concentrations at relevant receptor locations, due to changes in traffic flow associated with the operational phase, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table C-3. Predicted Annual Average Concentrations of PM_{10} at Receptor Locations

Receptor		PM_{10} (µg/m³)			
		2018 Baseline	2026 Do Minimum	2026 Do Something	Development Contribution
R1	28 O'Leary Drive	16.74	17.09	17.10	0.01
R2	9 Horle Close	16.07	16.31	16.33	0.02
R3	233 Corporation Road	16.26	16.52	16.54	0.02
R4	1 Avondale Way	15.10	15.23	15.25	0.01
R5	187 Penarth Road	17.77	18.12	18.13	0.01
R6	189a Penarth Road	16.82	17.06	17.06	<0.01
R7	1 Clive Street	17.23	17.51	17.53	0.02
R8	2 Clive Street	17.48	17.80	17.83	0.03
R9	10 Ferry Road	15.83	16.04	16.10	0.06
R10	2 Ferry Road	15.70	15.90	15.96	0.06
R11	1A Ferry Road	15.61	15.78	15.82	0.04
R12	Flat 10 Marl Court	15.93	16.14	16.18	0.05
R13	18 York Place	15.96	16.17	16.21	0.04
R14	14 Morel Court	15.65	15.87	15.89	0.02
R15	51 St Marys Street	15.69	15.70	15.70	<0.01
PR1	Proposed Site	-	-	14.90	-
PR2	Proposed Site	-	-	14.92	-
PR3	Proposed Site	-	-	14.40	-
PR4	Proposed Site	-	-	14.49	-
PR5	Proposed Site	-	-	14.45	-
Annual Mean AQO		**40 µg/m³**			

*Located in the AQMA

All modelled existing receptors are predicted to be below the AQO for PM_{10} in both the 'Do Minimum' and 'Do Something' scenarios.

As indicated in Table C-3, the maximum predicted increase in annual average exposure to PM_{10} at any existing receptor, due to changes in traffic movements associated with the construction phase is 0.06 µg/m³ at 10 Ferry Road (R9) and 2 Ferry Road (R10).

Particulate Matter ($PM_{2.5}$)

Table C-4 presents a summary of the predicted change in annual mean $PM_{2.5}$ concentrations at relevant receptor locations, due to changes in traffic flow associated with the operational phase, based on modelled 'Do Minimum' and 'Do Something' scenarios.

Table C-4. Predicted Annual Average Concentrations of $PM_{2.5}$ at Receptor Locations

Receptor		$PM_{2.5}$ (µg/m³)			
		2018 Baseline	2022 Do Minimum	2022 Do Something	Development Contribution
R1	28 O'Leary Drive	10.40	10.61	10.61	0.01
R2	9 Horle Close	10.31	10.46	10.47	0.01
R3	233 Corporation Road	10.43	10.59	10.60	0.01
R4	1 Avondale Way	9.72	9.80	9.81	0.01
R5	187 Penarth Road	11.72	11.93	11.94	<0.01
R6	189a Penarth Road	11.14	11.29	11.29	<0.01
R7	1 Clive Street	11.39	11.56	11.58	0.01
R8	2 Clive Street	11.55	11.74	11.76	0.02
R9	10 Ferry Road	10.01	10.13	10.17	0.04
R10	2 Ferry Road	9.93	10.05	10.08	0.03
R11	1A Ferry Road	9.87	9.97	10.00	0.02
R12	Flat 10 Marl Court	10.07	10.19	10.22	0.03
R13	18 York Place	10.09	10.21	10.24	0.03
R14	14 Morel Court	9.74	9.87	9.89	0.01
R15	51 St Marys Street	9.84	9.84	9.84	<0.01
PR1	Proposed Site	-	-	9.44	-
PR2	Proposed Site	-	-	9.45	-
PR3	Proposed Site	-	-	8.99	-
PR4	Proposed Site	-	-	9.04	-
PR5	Proposed Site	-	-	9.02	-
Annual Mean AQO		**25 µg/m³**			

*Located in the AQMA

All modelled existing receptors are predicted to be below the AQO for $PM_{2.5}$ in both the 'Do Minimum' and 'Do Something' scenarios.

As indicated in Table C-4, the maximum predicted increase in annual average exposure to $PM_{2.5}$ at any existing receptor, due to changes in traffic movements associated with the construction phase is 0.04 µg/m³ at 10 Ferry Road (R9).

The worst case $PM_{2.5}$ concentrations at any proposed receptor locations is 9.45 µg/m³, this is below the AQO for $PM_{2.5}$ and no additional mitigation is required.

Ecological Sensitive Receptor Locations

Background concentrations at each of the ecologically sensitive sites were determined through a review of the NO_X pollutants published on the APIS website.

The below assessment has been undertaken in accordance with *A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites* (IAQM, 2019).

Nitrogen Oxide

Table C-5 presents a summary of the predicted change in NO_X concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'do minimum' and 'do something' scenarios.

Table C-5 Predicted Annual Average Concentrations of NO_X at Ecological Receptor Locations

Receptor ID	Ecological Receptor	Predicted Maximum Annual Mean Concentration (µg/m³)				
		Do Minimum 2026 NO_X	Do Something 2026 NO_X	Process Contribution (PC)	PC as %age of AQO	Background
E1	Cwm Cydfin, Leckwith	89.06	89.08	0.02	0.07	16.64
E2	Severn Estuary	28.80	28.80	<0.01	<0.01	28.78
E3	Cardiff Bay Wetlands and Hamadryad Park	37.87	37.88	0.01	0.05	26.86
E4	River Taff	33.62	33.66	0.04	0.13	26.86
E5	Cogan Spur	25.62	25.63	0.01	0.02	21.29
E6	SINC No. 188 Factory Wood	25.26	25.27	<0.01	0.01	23.78
E7	Leckwith Pond and Marsh	72.11	72.12	0.01	0.04	24.65
E8	SINC No. 189 Reservoir Wood	23.50	23.50	<0.01	0.02	20.03
E9	Canton Common Ditch	25.17	25.17	<0.01	0.01	23.40
E10	River Ely	48.03	48.05	0.02	0.05	26.34
E11	Grangemore Park	33.87	33.91	0.04	0.14	26.34
Annual Mean AQO/Critical Level (CL)		30 (µg/m3)				

As indicated in Table C5, the maximum predicted increase in the annual average exposure to NO_X at any ecological receptor, due to changes in traffic movements associated with the development, is 0.13 µg/m³ at River Taff (E4) and Grangemore Park (E11).

Section 5.5.4.1 of *A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites*', IAQM 2019 states:

> *Where the assessment indicates that changes in annual mean NOx concentrations within a designated site cannot be dismissed as imperceptible (i.e. an increase of over 0.4 µg/m³) and the NOx critical level is exceeded, then changes in nutrient nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance.*

The maximum predicted increase in the annual average exposure to NO_X at the identified ecological receptor, due to changes in traffic movements associated with the development, is 0.13 µg/m³ at River Taff (E4) and Grangemore Park (E11), which is below the 0.40 µg/m³ development contribution stated within the guidance of '*A Guide to the Assessment of Air Quality Impacts in Designated Nature Conservation Sites*', IAQM 2019. As a result, no further assessment is required and the impact at all ecological receptors is considered to be negligible.

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