F Air quality - Appendix

F1 Review of key national, regional and local air quality legislation, policy and guidance

Legislation

European Air Quality Management

F.1.1 In 1996 the European Commission published the Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC). This Directive defined the policy framework for 12 air pollutants, including nitrogen dioxide (NO_2), known to have harmful effects on human health and the environment. Limit values (pollutant concentrations not to be exceeded by a certain date) for each specified pollutant were set through a series of Daughter Directives, including Directive 1999/30/EC (the 1st Daughter Directive), which sets limit values for NO_2 and particulate matter (amongst other pollutants) in ambient air.

F.1.2 In May 2008, the Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force. This Directive consolidates the above (apart from the 4th Daughter Directive) and makes provision for extended compliance deadlines for NO_2 and PM_{10}.

F.1.3 The limit values defined in the Directive are legal requirements and compliance with these is reported on an annual basis by the Department for Environment, Food and Rural Affairs (Defra). The Directive requires the UK to be divided into zones for the purposes of air quality management and assessment.

F.1.4 The EU Directive was transposed into national legislation in Wales by the Air Quality Standards (Wales) Regulations 2010[1] (National Assembly for Wales, 2010).

National objectives

F.1.5 The current Air Quality Strategy for England, Scotland, Wales and Northern Ireland[2] was published in 2007. This set the strategy for meeting the air quality objectives. The Local Air Quality Management (LAQM) system, required to be undertaken by local planning authorities under the Environment Act 1995, assesses where the UK objectives may be exceeded. Where exceedances are recorded an Air Quality Management Area (AQMA) must be declared by the local

[1]Welsh Government 2010, Air Quality Standards (Wales) Regulations 2010
[2]Defra et al 2007, Air Quality Strategy for England, Scotland, Wales and Northern Ireland

authority and an Air Quality Action Plan (AQAP) prepared to implement measures to improve air quality in these areas.

Air Quality Standards and Limit Values

F.1.6 Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment, i.e. effects occur after a prolonged period of exposure to elevated concentrations. Other pollutants have standards expressed as 24-hour, 1-hour or 15-minute average concentrations due to the acute way in which they affect health or the natural environment, i.e. after a relatively short period of exposure. Some pollutants have standards expressed in terms of both long and short-term concentrations.

F.1.7 In this assessment, the term 'air quality standard' has been used to refer to both the UK objectives and European limit values. The air quality EU limit values and Welsh air quality standards applicable to the proposed development are shown in Table 1. Other pollutants have been screened out of this air quality assessment, since they are not likely to cause exceedances of their respective standards.

Table 1: Air quality standards for human health and vegetation

Pollutant	Averaging period	EU Limit Value / Welsh standard
Human health		
Nitrogen Dioxide (NO_2)(a)	Annual mean	40µg/m^3
	1-hour mean	200µg/m^3 not to be exceeded more than 18 times a year (99.8th percentile)
Fine Particulate Matter (PM_{10})(a)	Annual mean	40µg/m^3
	24-hour mean	50µg/m^3 not to be exceeded more than 35 times a year (90.4th percentile)
Very Fine Particulate Matter ($PM_{2.5}$)(a)	Annual mean	25µg/m^3
Protection of vegetation		
Oxides of Nitrogen (NO_x)(b)	Annual mean	30µg/m^3
(a) The Air Quality Standards (Wales) Regulations 2010, No. 1433 (b) Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe		

F.1.8 The United Nations Economic Commission for Europe (UNECE) and the World Health Organisation (WHO) have set a critical level for NOx (30µg/m^3), for the protection of vegetation. Therefore, the statutory nature conservation agency's (Natural Resources Wales, NRW) policy is to apply the 30µg/m^3 criterion as a

benchmark, on a precautionary basis, in internationally designated conservation sites and in Sites of Special Scientific Interest (SSSI).

F.1.9 In addition, critical loads for nitrogen deposition have been set that represent the exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem.

Policy context

Well-being of Future Generations (Wales) Act 2015

F.1.10 The Act[3] has well-being goals and objectives to achieve through implementation of sustainable development. Changes in air quality can have an impact on the health of habitat and humans. As such, the goals to create 'a resilient Wales' and 'a healthier Wales' are applicable.

F.1.11 In order for Welsh Ministers to understand the progress being made to achieving the well-being goals, national indicators have been set. One of these national indicators relates to levels of NO_2 in the air. The Well-being of Future Generations Act aims to reduce pollution exposure by assessing a weighted population average to NO_2 on an annual basis.

Planning Policy Wales, Edition 10, December 2018

F.1.12 The 10th edition of Planning Policy Wales[4] (PPW10) was published in December 2018. It sets out land-use and planning policy for Wales. The new planning policy incorporates principles derived from the Well-being of Future Generations (Wales) Act 2015.

F.1.13 The policy document is set out in themes, with air quality predominantly addressed in the Distinctive and Natural Places theme. Air Quality and Soundscape section of PPW10 highlights the importance that air quality has in a positive experience of place, public health, amenity and well-being. Specific reference is made to the contribution the planning system should make to achieving a healthier Wales through reducing population exposure to air pollution, whilst also tackling high pollution hotspots. Additionally, preventing the creation of any new or worsening of existing air quality pollution problems is important.

Local planning policy

Cardiff Council Local Development Plan

F.1.14 Cardiff Council (CC) adopted their Local Development Plan (LDP)[5] in January 2016 with it covering the years 2006-2026. The LDP recognises the importance of

[3] Wellbeing of Future Generations (Wales) Act 2015
[4] Welsh Government (2018) Planning Policy Wales Edition 10 (PPW10)
[5] Cardiff Council (2016) Local Development Plan 2006-2026

good air quality for health, quality of life and amenity. Air quality is mentioned in two sections of the LDP.

EN13 Air, Noise, Light Pollution and Land Contamination – *"Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, the character and quality of the countryside, or interests of nature conservation, landscape or built heritage importance because of air noise, light pollution, or the presence of unacceptable levels of land contamination."*

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: …iii. Minimising air pollution from industrial, domestic and road transportation sources and managing air quality."*

Planning for Health and Well-being: Supplementary Planning Guidance (SPG)

F.1.15 This guidance[6] provides details around how the council require developers to consider health impacts as a result of their development. Poor environmental quality and in particular poor air quality can have an impact on the health of local residents. Developers are required to identify what, where and for whom there is a risk to significant air, noise, light pollution and land contamination.

Managing Transportation Impacts: Supplementary Planning Guidance

F.1.16 This guidance[7] from 2018 acknowledges the impacts that traffic on local highways can have on air quality. It identifies that increases in traffic flows, new access points onto the existing highways and other interventions can worsen air quality, whilst also being detrimental to the safety and convenience of active travel routes. The council will therefore assess the impact a new development has upon the local road network.

NCC Local Development Plan (2011-2026)

F.1.17 The NCC Local Development Plan (LDP)[8] was adopted in 2015 and sets out relevant local planning policy. Policies relevant to air quality include:

SP14 Transport Proposals (ix) – "Transport proposals will be supported where they: …result in other environmental improvements, including air quality, noise reduction, sustainable drainage and enhanced biodiversity."

GP2 General Development Principles – General Amenity (i) - "Development will be permitted where, as applicable: …There will not be a significant adverse effect on local amenity, including in terms of noise, disturbance, privacy, overbearing, light, odours and air quality."

GP7 General Development Principles – Environmental Protection and Public Health – "Development will not be permitted which would cause or result in unacceptable harm to health because of land contamination, dust, instability or subsidence, air, heat, noise or light pollution, flooding, water pollution, or any other identified risk to environment, local amenity or public health and safety."

[6] Cardiff Council (2017) Planning for Health and Well-being -Supplementary Planning Guidance
[7] Cardiff Council (2017) Managing Transportation Impacts – Supplementary Planning Guidance
[8] Newport County Council 2015, Local Development Plan (2011-2026)

F.1.18 Objective 9 of the LDP identifies the role that planning can have in achieving a safe environment that encourages healthy lifestyles choices and promotes wellbeing. This includes locating and designing development to address air quality issues.

F.1.19 The LDP also acknowledges the role that climate change can play in contributing to air quality issues.

Relevant guidance

Institute of Air Quality Management Guidance on the Assessment of Dust from Demolition and Construction

F.1.20 The IAQM provide guidance to development consultants and environmental health officers (EHO) on how to assess air quality impacts from construction. The IAQM document[9] provides a method for classifying the significance of effect from construction activities based on the 'dust magnitude' (high, medium or low) and proximity of the proposed development to the closest receptors. The guidance recommends that once the significance of effect from construction is identified, the appropriate mitigation measures are implemented. Experience has shown that once the appropriate mitigation measures are applied, in most cases the resulting dust impacts can be reduced to negligible levels.

Local Air Quality Management Policy and Technical Guidance

F.1.21 The 2016 policy note from Defra, LAQM.PG(16)[10], provides additional guidance on the links between transport and air quality and the links between air quality and the land-use planning system. It summarises the main ways in which the land-use planning system can help deliver compliance with the air quality objectives. This is relevant to any external organisations who may wish to engage with the local authority to assist in the delivery of their statutory duties on managing air quality.

F.1.22 The LAQM Technical Guidance TG(16)[11] is designed to support local authorities in carrying out their duties to review and assess air quality in their area. LAQM TG(16) is published at the UK level and is relevant to England, Scotland, Wales and Northern Ireland with the exception of London. It provides detailed guidance on how to assess the impact of measures using existing air quality tools. Where relevant, this guidance has been taken into account in this assessment.

EPUK/IAQM Land-Use Planning and Development Control

F.1.23 The 2017 Land-Use Planning & Development Control guidance document[12] produced by the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) provides a framework for professionals operating in

[9] IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction (Version 1.1)
[10] Defra (2016) Local Air Quality Management Policy Guidance. PG(16)
[11] Defra (2016) Local Air Quality Management Technical Guidance.TG(16)
[12] EPUK/IAQM, (2017) Land-Use Planning & Development Control: Planning for Air Quality

the planning system to provide a means of reaching sound decisions, with regards to the air quality implications of development proposals.

F.1.24 The document provides guidance on when air quality assessments are required by providing screening criteria regarding the size of a development, changes to traffic flows/composition energy facilities or combustion processes associated with the development.

F2 Air quality assessment methodology and baseline

Methodology for construction dust risk assessment

F.2.1 The proposed development will require earthwork movements, construction of new buildings and associated trackout activities as a result of construction vehicles. There will be no demolition as there is no existing building on site. The impacts of construction and associated air quality effects upon locally sensitive receptors from earthworks, trackout and construction activities have been assessed using the qualitative approach guidance prescribed by the Institute of Air Quality Management (IAQM)[13].

F.2.2 An ‘impact’ is described as a change in pollutant concentrations or dust deposition, while an ‘effect’ is described as the consequence of an impact. The main impacts that may arise during demolition and construction of the proposed development are:

- dust deposition, resulting in the soiling of surfaces;
- visible dust plumes;
- elevated PM_{10} concentrations as a result of dust generating activities at the proposed development; and
- an increase in NO_2 and PM_{10} concentrations due to exhaust emissions from non-road mobile machinery and vehicles accessing the proposed development.

F.2.3 The IAQM guidance[13] considers the potential for dust emissions from activities such as demolition of existing structures, earthworks, construction of new structures and trackout. Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping, while trackout is the transport of dust and dirt from the proposed development onto the public road network where it may be deposited and then re-suspended by vehicles using the network. This arises when vehicles leave the site with dust materials, which may then spill onto the road, or

[13] IAQM (2016), Guidance on the Assessment of Dust from Demolition and Construction (Version 1.1)

when they travel over muddy ground on site and then transfer dust and dirt onto the road network.

F.2.4 There are five steps in the assessment process described in the IAQM guidance[1]. These are summarised in Diagram 1 and are further outlined in the paragraphs below.

Step 1: Need for assessment

F.2.5 The first step is the initial screening for the need for a detailed assessment. According to the IAQM guidance, an assessment is required where there are sensitive receptors within 350m of the proposed development boundary (or 50m where there are ecological receptors) and/or within 50m of the route(s) used by the construction vehicles on the public highway and up to 500m from the proposed development entrance(s).

Step 2: Assess the risk of dust impacts

F.2.6 This step is split into three sections as follows:

- 2A – define the potential dust emission magnitude;
- 2B – define the sensitivity of the area; and
- 2C – define the risk of impacts.

F.2.7 Each of the dust-generating activities is prescribed a dust emission magnitude depending on the scale and nature of the works (Step 2A) based on the criteria shown in Table 2.

F.2.8 The sensitivity of the surrounding area is then determined (Step 2B) for each dust effect from the above dust-generating activities, based on the proximity and number of receptors, their sensitivity to dust, the local PM_{10} background concentrations and any other site-specific factors. Table 3 to Table 5 shows the criteria for defining the sensitivity of the area to different dust effects.

F.2.9 The overall risk of the impacts for each activity is then determined (Step 2C) prior to the application of any mitigation measures (Table 6) and an overall risk for the proposed development derived.

Step 3: Determine the site-specific mitigation

F.2.10 Once each of the activities is assigned a risk rating, appropriate mitigation measures are identified. Where the risk is negligible, no mitigation measures beyond those required by legislation are necessary.

Step 4: Determine any significant residual effects

F.2.11 Once the risk of dust impacts has been determined and the appropriate dust mitigation measures identified, the final step is to determine whether there are any residual significant effects. The IAQM guidance[13] notes that it is anticipated that

with the implementation of effective site-specific mitigation measures, the environmental effect will not be significant in most cases.

Step 5: Prepare a dust assessment report

F.2.12 The last step of the assessment is the preparation of a Dust Assessment Report which forms part of the EIA.

Diagram 1: IAQM dust assessment methodology

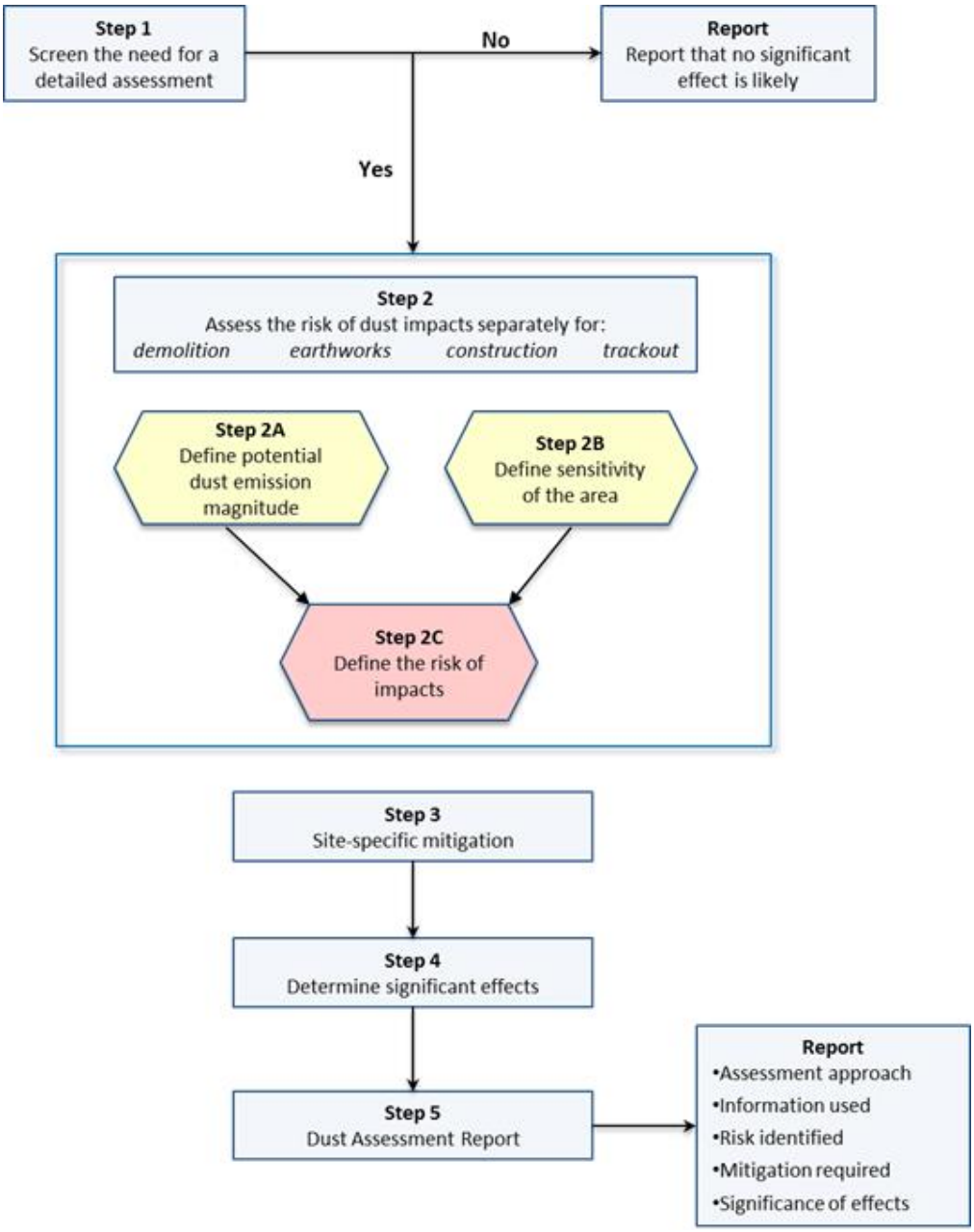


Table 2: Dust emission magnitude

Dust emission magnitude		
Small	**Medium**	**Large**
Demolition		
• 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; and • demolition during wetter months.	• total building volume 20,000 – 50,000m^3; • potentially dusty construction material; and • demolition activities 10 – 20m above ground level.	• total building volume >50,000m^3; • potentially dusty construction material (e.g. concrete); • on-site crushing and screening; and • demolition activities >20m above ground level.
Earthworks		
• total site area <2,500m^2 • soil type with large grain size (e.g. sand); • <5 heavy earth moving vehicles active at any one time; • formation of bunds <4m in height; • total material moved <10,000 tonnes; and • earthworks during wetter months.	• 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 4 – 8m in height; and • total material moved 20,000 – 100,000 tonnes.	• 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; and • total material moved >100,000 tonnes.
Construction		
• total building volume <25,000m^3; and • construction material with low potential for dust release (e.g. metal cladding or timber).	• total building volume 25,000 – 100,000m^3; • potentially dusty construction material (e.g. concrete); and • on-site concrete batching.	• total building volume >100,000m^3; • on-site concrete batching; and • sandblasting.
Trackout		
• <10 Heavy duty vehicle (HDV) (>3.5t) outward movements in any one day; • surface material with low potential for dust release; and • unpaved road length <50m.	• 10 – 50 HDV (>3.5t) outward movements in any one day; • moderately dusty surface material (e.g. high clay content); and • unpaved road length 50 – 100m.	• >50 HDV (>3.5t) outward movements in any one day; • potentially dusty surface material (e.g. high clay content); and • unpaved road length >100m.

Table 3: Sensitivity of the area to dust soiling effects

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
	< 10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low
Low	> 1	Low	Low	Low	Low

Table 4: Sensitivity of the area to human health impacts

Background PM_{10} concentrations (annual mean)	**Number of receptors**	**Distance from the source (m)**				
		< 20	**< 50**	**< 100**	**< 200**	**< 350**
High receptor sensitivity						
> 32µg/m^3	> 100	High	High	High	Medium	Low
	10 – 100			Medium	Low	
	< 10		Medium	Low		
28 – 32µg/m^3	> 100	High	High	Medium	Low	Low
	10 – 100		Medium	Low		
	< 10					

Background PM_{10} concentrations (annual mean)	Number of receptors	Distance from the source (m)				
		< 20	< 50	< 100	< 200	< 350
High receptor sensitivity						
24 – 28µg/m^3	> 100	High	Medium	Low	Low	Low
	10 – 100					
	< 10	Medium	Low			
< 24µg/m^3	> 100	Medium	Low	Low	Low	Low
	10 – 100	Low				
	< 10					
Medium receptor sensitivity						
> 32µg/m^3	> 10	High	Medium	Low	Low	Low
	< 10	Medium	Low			
28 – 32µg/m^3	> 10	Medium	Low	Low	Low	Low
	< 10	Low				
24 – 28µg/m^3	> 10	Low	Low	Low	Low	Low
	< 10					
< 24µg/m^3	> 10	Low	Low	Low	Low	Low
	< 10					
Low receptor sensitivity						
–	> 1	Low	Low	Low	Low	Low

Table 5: Sensitivity of the area to ecological impacts

Receptor sensitivity	Distance from the source (m)	
	< 20	< 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table 6: Risk of dust impacts

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
Demolition			
High	High risk site	Medium risk site	Medium risk site
Medium	High risk site	Medium risk site	Low risk site
Low	Medium risk site	Low risk site	Negligible
Earthworks			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Construction			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Trackout			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Low risk site	Negligible
Low	Low risk site	Low risk site	Negligible

Methodology for construction and operational traffic assessment

Assessment scenarios

F.2.1 The assessment scenario is as follows:

- Baseline (2019 baseline traffic data, for model verification);
- Future Do-Minimum (DM) for construction traffic (2022 future baseline traffic data);
- Future Do-Something (DS) for construction traffic (2022 future baseline traffic data plus construction traffic) using route option 1;
- Future Do-Something (DS) for construction traffic (2022 future baseline traffic data plus construction traffic) using route option 2;
- Future DM for operational traffic (2028 future baseline traffic data); and
- Future DS for operational traffic (2028 future baseline traffic data plus construction traffic).

F.2.2 Emission rates have been calculated using the Defra Emissions Factor Toolkit (EFT) V9.0[14], with road type for each link specified as either urban (not London) or motorway (not London). Vehicle emission factors and background concentrations for their respective years (2019, 2022 or 2028) have been used.

F.2.3 CC has requested sensitivity tests to be carried out by using the baseline year (2019) emission factors and background concentrations for the future predictions. Therefore, all five future prediction scenarios for construction and operational traffic were repeated accordingly.

Traffic data

F.2.4 Baseline, future baseline and future with construction and operational traffic Annual Average Daily Traffic (AADT) for the entire study area network was provided by the project's transport consultant on 28th April 2020. The data covers the roads adjacent to the air quality monitoring sites that have been used for model verification, and the roads which will be affected by the proposed development.

F.2.5 Trips generated by other committed developments have been identified by the transport consultant and are included in the respective future DM and DS scenarios.

F.2.6 Typical vehicle speeds were provided by the project's transport consultant and have been used in the modelling, with the exception of road links recognised as junctions (i.e. Road IDs labelled with 'J') and roundabouts. The modelled speeds

[14] Defra (2019); *Emissions Factors Toolkit (EFT) V9.0.* Available at: https://laqm.defra.gov.uk/documents/EFT2019_v9.0.xlsb

were assumed to be 20kph at these junctions following Defra's LAQM.TG(16)[11] as this is considered to be representative of congested conditions.

F.2.7 A minor update to the traffic data was received on 10th June 2020. The update included changes to traffic flows on two modelled road links, link IDs 75 and 76. These link IDs represent the A4051 north and south of Junction 26 on the M4. The latest traffic data flows show a slight reduction in operational traffic in the 2028 DS scenario compared to the traffic data received on 28th April 2020. The changes between the two sets of traffic data are summarised in Table 7.

Table 7: Updated traffic data for Links 75 and 76

Link ID	Road name	Data received on 28th April 2020		Data received on 10th June 2020	
		AADT	%HGV	AADT	%HGV
75	A4051 (J26 South of J26)	29,048	1.3	29,019	1.3
76	A4051 (J26 North of J26)	44,199	2.1	44,090	2.1

F.2.8 The updated traffic data was used to rescreen the modelled roads with the criteria stated in Chapter 8 Section 8.5.9. The updated data screened out Link ID 75 however since there is a reduction in traffic on the A4051 in the updated data, the modelled traffic flows in this assessment are still based on the previous traffic data received on 28th April 2020 as it is more conservative.

F.2.9 Table 8 details the traffic data used in this assessment for all scenarios.

Table 8: Traffic data used for all assessment scenarios

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
1	Heol Las (South of St Mellons Road)	375	4.8	Specific route option IDs used (see bottom of table)						388	4.8	391	4.8	48
2	St Mellons Road (East of Heol Las)	2,055	0.7	2,077	0.7	2,080	0.7	2,080	0.7	2,125	0.7	2,177	0.7	96
2J	St Mellons Road (East of Heol Las)	2,055	0.7	2,077	0.7	2,080	0.7	2,080	0.7	2,125	0.7	2,177	0.7	20
3	Fortran Road (North of St Mellons Road)	2,376	1.3	Specific route option IDs used (see bottom of table)						2,457	1.3	2,513	1.3	48
4	Fortran Road (East of Cypress Drive)	6,490	1.0	Specific route option IDs used (see bottom of table)						7,362	1.0	7,282	1.0	48
4J	Fortran Road (East of Cypress Drive)	6,490	1.0	Specific route option IDs used (see bottom of table)						7,362	1.0	7,282	1.0	20
5	Cypress Drive (South of Fortran Road)	3,640	1.1	Specific route option IDs used (see bottom of table)						4,360	1.1	12,144	1.1	48
5J	Cypress Drive (South of Fortran Road)	3,640	1.1	Specific route option IDs used (see bottom of table)						4,360	1.1	12,144	1.1	20
6	Cypress Drive (North of Fortran Road)	7,861	1.2	8,946	1.2	9,530	3.6	9,530	3.6	9,129	1.2	16,641	1.2	48
6JA	Cypress Drive (North of Fortran Road)	7,861	1.2	8,946	1.2	9,530	3.6	9,530	3.6	9,129	1.2	16,641	1.2	20
6JB	Cypress Drive (North of Fortran Road)	7,861	1.2	8,946	1.2	9,530	3.6	9,530	3.6	9,129	1.2	16,641	1.2	20
7	Cypress Drive (North of Sandbrook Road)	3,546	1.3	Specific route option IDs used (see bottom of table)						4,263	1.3	5,354	1.3	48
7JA	Cypress Drive (North of Sandbrook Road)	3,546	1.3	Specific route option IDs used (see bottom of table)						4,263	1.3	5,354	1.3	20
7JB	Cypress Drive (North of Sandbrook Road)	3,546	1.3	Specific route option IDs used (see bottom of table)						4,263	1.3	5,354	1.3	20
8	Sandbrook Road (West of Cypress Drive)	3,546	1.4	4,181	1.4	4,245	1.4	4,245	1.4	4,263	1.4	5,354	1.4	48

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
8J	Sandbrook Road (West of Cypress Drive)	3,546	1.4	4,181	1.4	4,245	1.4	4,245	1.4	4,263	1.4	5,354	1.4	20
8_J	Sandbrook Road (West of Cypress Drive)	3,546	1.4	4,181	1.4	4,245	1.4	4,245	1.4	4,263	1.4	5,354	1.4	20
9	Cypress Drive (South of Sandbrook Road)	1,072	2.9	1,084	2.9	1,084	2.9	1,084	2.9	1,108	2.9	1,108	2.9	48
9J	Cypress Drive (South of Sandbrook Road)	1,072	2.9	1,084	2.9	1,084	2.9	1,084	2.9	1,108	2.9	1,108	2.9	20
10	Cypress Drive (North of Willowdene Way)	12,702	1.5	13,841	1.5	14,424	3.1	14,424	3.1	14,135	1.5	21,537	1.5	48
10J	Cypress Drive (North of Willowdene Way)	12,702	1.5	13,841	1.5	14,424	3.1	14,424	3.1	14,135	1.5	Link removed	Link removed	20
11JA	Willowdene Way (West of Cypress Drive)	4,091	3.6	4,136	3.6	4,136	3.6	4,136	3.6	4,231	3.6	4,273	3.6	20
11	Willowdene Way (West of Cypress Drive)	4,091	3.6	4,136	3.6	4,136	3.6	4,136	3.6	4,231	3.6	4,273	3.6	48
11JB	Willowdene Way (West of Cypress Drive)	4,091	3.6	4,136	3.6	4,136	3.6	4,136	3.6	4,231	3.6	4,273	3.6	20
12	Cypress Drive (South of Willowdene Way)	10,398	1.2	11,511	1.2	12,094	3.1	12,094	3.1	11,752	1.2	19,251	1.2	48
12J	Cypress Drive (South of Willowdene Way)	10,398	1.2	11,511	1.2	12,094	3.1	12,094	3.1	11,752	1.2	19,251	1.2	20
13	A48 (East Cypress Drive Roundabout)	18,111	2.5	19,107	2.5	19,277	2.5	19,277	2.5	19,527	2.5	20,681	2.5	80
13_J	A48 (East Cypress Drive Roundabout)	18,111	2.5	19,107	2.5	19,277	2.5	19,277	2.5	19,527	2.5	Link removed	Link removed	20
14JA	Newport Road (West of Cypress Drive Roundabout)	15,346	2.2	17,396	2.2	17,451	2.2	17,451	2.2	17,752	2.2	Link removed	Link removed	20

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
14	Newport Road (West of Cypress Drive Roundabout)	15,346	2.2	17,396	2.2	17,451	2.2	17,451	2.2	17,752	2.2	Link removed	Link removed	48
14JB	Newport Road (West of Cypress Drive Roundabout)	15,346	2.2	17,396	2.2	17,451	2.2	17,451	2.2	17,752	2.2	18,499	2.2	20
16A	A48 (East of Marshfield Road)	16,601	2.7	17,274	2.7	17,440	2.7	17,440	2.7	17,659	2.7	18,875	2.7	80
16B	A48 (East of Marshfield Road)	16,601	2.7	17,274	2.7	17,440	2.7	17,440	2.7	17,659	2.7	18,875	2.7	80
16BJ	A48 (East of Marshfield Road)	16,601	2.7	17,274	2.7	17,440	2.7	17,440	2.7	17,659	2.7	18,875	2.7	20
17A	A48 (East of Marshfield Road)	17,722	2.7	18,407	2.7	18,574	2.7	18,574	2.7	18,818	2.7	19,977	2.7	80
17B	A48 (East of Marshfield Road)	17,722	2.7	18,407	2.7	18,574	2.7	18,574	2.7	18,818	2.7	19,977	2.7	80
18	Newport Road (East of Tyr Winch Road)	13,470	2.3	14,091	2.3	14,124	2.3	14,124	2.3	14,404	2.3	14,882	2.3	48
18JA	Newport Road (East of Tyr Winch Road)	13,470	2.3	14,091	2.3	14,124	2.3	14,124	2.3	14,404	2.3	14,882	2.3	20
18JB	Newport Road (East of Tyr Winch Road)	13,470	2.3	14,091	2.3	14,124	2.3	14,124	2.3	14,404	2.3	14,882	2.3	20
18A	Newport Road (East of Tyr Winch Road)	13,470	2.3	14,091	2.3	14,124	2.3	14,124	2.3	14,404	2.3	14,882	2.3	48
18BJ	Newport Road (East of Tyr Winch Road)	13,470	2.3	14,091	2.3	14,124	2.3	14,124	2.3	14,404	2.3	14,882	2.3	20
19	Newport Road (West of Tyr Winch Road)	13,837	2.3	14,461	2.3	14,491	2.3	14,491	2.3	14,782	2.3	15,269	2.3	48
19J	Newport Road (West of Tyr Winch Road)	13,837	2.3	14,461	2.3	14,491	2.3	14,491	2.3	14,782	2.3	15,269	2.3	20
20	Newport Road (East of Llanrumney Avenue)	9,018	2.5	9,315	2.5	9,325	2.5	9,325	2.5	9,524	2.5	9,683	2.5	48

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
20J	Newport Road (East of Llanrumney Avenue)	9,018	2.5	9,315	2.5	9,325	2.5	9,325	2.5	9,524	2.5	9,683	2.5	20
30	North of the Pentwyn Link Road Roundabout	32,735	2.7	40,732	2.7	40,883	3.3	40,883	3.3	41,492	2.7	42,560	2.7	64
30J	North of the Pentwyn Link Road Roundabout	32,735	2.7	40,732	2.7	40,883	3.3	40,883	3.3	41,492	2.7	42,560	2.7	20
31	Church Road (East of the Pentwyn Link Road Roundabout)	2,595	4.5	9,789	4.5	9,789	4.5	9,789	4.5	9,849	4.5	9,870	4.5	57
31J	Church Road (East of the Pentwyn Link Road Roundabout)	2,595	4.5	9,789	4.5	9,789	4.5	9,789	4.5	9,849	4.5	9,870	4.5	20
32JA	A4232 (South of the Pentwyn Link Road Roundabout)	34,670	2.6	41,493	2.6	41,662	3.2	41,662	3.2	42,297	2.6	43,580	2.6	20
32	A4232 (South of the Pentwyn Link Road Roundabout)	34,670	2.6	41,493	2.6	41,662	3.2	41,662	3.2	42,297	2.6	43,580	2.6	64
32JB	A4232 (South of the Pentwyn Link Road Roundabout)	34,670	2.6	41,493	2.6	41,662	3.2	41,662	3.2	42,297	2.6	43,580	2.6	20
33	Heol Pontprennau (West of the Pentwyn Link Road Roundabout)	16,342	2.6	23,275	2.6	23,310	2.6	23,310	2.6	23,654	2.6	23,949	2.6	57
33J	Heol Pontprennau (West of the Pentwyn Link Road Roundabout)	16,342	2.6	23,275	2.6	23,310	2.6	23,310	2.6	23,654	2.6	23,949	2.6	20
34A1	Capel Ederyn (West of A48 Eastern Avenue)	6,043	1.4	6,396	1.4	6,413	1.4	6,413	1.4	6,537	1.4	6,811	1.4	66
34B	Capel Ederyn (West of A48 Eastern Avenue)	6,043	1.4	6,396	1.4	6,413	1.4	6,413	1.4	6,537	1.4	6,811	1.4	66

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
35	Pentwyn Road (West of Eastern Avenue On-Off Slips)	11,612	2.4	16,252	2.4	16,252	2.4	16,252	2.4	16,522	2.4	16,522	2.4	48
36J	Bryn Celyn Road (West of Eastern Avenue On-Off Slips)	10,058	1.6	10,854	1.6	10,877	1.6	10,877	1.6	11,088	1.6	11,577	1.6	20
37	A4232 Southern Way (South of A48 Eastern Avenue)	48,601	6.6	53,679	6.6	53,723	6.6	53,723	6.6	54,806	6.6	55,123	6.6	80
38J	Round Wood Close (West of A48 Eastern Avenue)	17,044	2.1	19,298	2.2	19,320	2.2	19,320	2.2	19,694	2.2	20,165	2.2	20
38	Round Wood Close (West of A48 Eastern Avenue)	17,044	2.1	19,298	2.2	19,320	2.2	19,320	2.2	19,694	2.2	20,165	2.2	48
39	A48 (West of St Mellons Interchange)	73,083	4.0	76,916	4.0	77,273	4.2	77,273	4.2	78,611	4.0	82,984	4.0	80
40	A48 (West of A4232 Pentwyn Interchange)	72,750	4.4	79,275	4.4	79,431	4.4	79,431	4.4	80,963	4.4	83,173	4.4	80
41	A48 (North of Circle Way/Southrn Way)	72,802	4.6	85,075	4.6	85,208	4.6	85,208	4.6	86,764	4.6	88,371	4.6	80
42	A48 (South of Circle Way/Southrn Way)	51,960	2.6	59,571	2.5	59,638	2.5	59,638	2.5	60,776	2.5	61,594	2.5	80
43	A48 (South of M4 J28)	27,080	2.0	28,723	2.0	28,799	2.0	28,799	2.0	29,668	2.0	30,758	2.0	64
43J	A48 (South of M4 J28)	27,080	2.0	28,723	2.0	28,799	2.0	28,799	2.0	29,668	2.0	30,758	2.0	20
44A	A48 SDR (East of M4 J28)	28,433	5.7	30,158	5.7	30,170	5.7	30,170	5.7	31,149	5.7	31,318	5.7	64
44B	A48 SDR (East of M4 J28)	28,433	5.7	30,158	5.7	30,170	5.7	30,170	5.7	31,149	5.7	31,318	5.7	20
45	A467 (North West of M4 J28)	28,125	4.4	29,832	4.4	29,853	4.4	29,853	4.4	30,812	4.4	31,123	4.4	96
47	A48 (West of A470)	47,090	2.5	52,231	2.5	52,275	2.5	52,275	2.5	53,324	2.5	53,758	2.5	64
52	M4 (J34 West of A4119)	-	-	93,751	7.3	93,779	7.3	93,779	7.3	100,735	7.3	101,244	7.3	112
54_A	M4 (J34 East of A4119)	110,112	6.4	115,038	6.4	115,073	6.4	115,073	6.4	123,608	6.4	-	-	112
54_B	M4 (J34 East of A4119)	110,112	6.4	115,038	6.4	115,073	6.4	115,073	6.4	123,608	6.4	124,229	6.4	112

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
57	M4 (J33 East of A4232)	102,643	7.0	107,235	7.0	107,276	7.0	107,276	7.0	115,224	7.0	115,963	7.0	112
61B	M4 (J30 West of the A4232)	91,394	8.6	95,483	8.6	95,548	8.6	95,548	8.6	102,596	8.6	103,812	8.6	112
61A	M4 (J30 West of the A4232)	91,394	8.6	95,483	8.6	95,548	8.6	95,548	8.6	102,596	8.6	103,812	8.6	112
63	A48M (South of M4)	47,337	6.9	49,455	6.9	49,455	6.9	49,455	6.9	53,139	6.9	53,139	6.9	112
64	M4 (East of A48 (M))	126,497	9.1	132,157	9.1	132,196	9.1	132,196	9.1	142,002	9.1	142,711	9.1	112
66	M4 (J28 North of J28)	121,159	8.1	126,580	8.1	126,633	8.1	126,633	8.1	136,009	8.1	136,986	8.1	112
68	M4 (J27 North of J27)	123,763	8.3	129,300	8.3	129,351	8.3	129,351	8.3	138,932	8.3	139,855	8.3	112
68F	M4 (J27 North of J27)	123,763	8.3	129,300	8.3	129,351	8.3	129,351	8.3	138,932	8.3	139,855	8.3	112
73	Willowbrook Drive (North of Sandbrook Road)	4,102	0.2	4,285	0.2	4,322	0.2	4,322	0.2	4,604	0.2	5,136	0.2	48
73J	Willowbrook Drive (North of Sandbrook Road)	4,102	0.2	4,285	0.2	4,322	0.2	4,322	0.2	4,604	0.2	5,136	0.2	20
74AC	Willowbrook Drive (South of Sandbrook Road)	4,102	0.2	4,285	0.2	4,313	0.2	4,313	0.2	4,604	0.2	5,163	0.2	48
74J	Willowbrook Drive (South of Sandbrook Road)	4,102	0.2	4,285	0.2	4,313	0.2	4,313	0.2	4,604	0.2	5,163	0.2	20
74BJ	Willowbrook Drive (South of Sandbrook Road)	4,102	0.2	4,285	0.2	4,313	0.2	4,313	0.2	4,604	0.2	5,163	0.2	20
74B	Willowbrook Drive (South of Sandbrook Road)	4,102	0.2	4,285	0.2	4,313	0.2	4,313	0.2	4,604	0.2	5,163	0.2	48
74AJ	Willowbrook Drive (South of Sandbrook Road)	4,102	0.2	4,285	0.2	4,313	0.2	4,313	0.2	4,604	0.2	5,163	0.2	20
74AB	Willowbrook Drive (South of Sandbrook Road)	4,102	0.2	4,285	0.2	4,313	0.2	4,313	0.2	4,604	0.2	5,163	0.2	48
74ABJ	Willowbrook Drive (South of Sandbrook Road)	4,102	0.2	4,285	0.2	4,313	0.2	4,313	0.2	4,604	0.2	5,163	0.2	20
74ACJ	Willowbrook Drive (South of Sandbrook Road)	4,102	0.2	4,285	0.2	4,313	0.2	4,313	0.2	4,604	0.2	5,163	0.2	20

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
75A	A4051 (J26 South of J26)	25,765	1.3	26,918	1.3	26,925	1.3	26,925	1.3	28,923	1.3	29,048	1.3	48
75BC	A4051 (J26 South of J26)	25,765	1.3	26,918	1.3	26,925	1.3	26,925	1.3	28,923	1.3	29,048	1.3	48
75BJ	A4051 (J26 South of J26)	25,765	1.3	26,918	1.3	26,925	1.3	26,925	1.3	28,923	1.3	29,048	1.3	20
76	A4051 (J26 North of J26)	38,953	2.1	40,696	2.1	40,707	2.1	40,707	2.1	43,728	2.1	44,199	2.1	64
77	A48 (West) Offslip	7,955	2.5	9,422	2.5	9,465	2.5	9,465	2.5	9,607	2.5	9,949	2.5	20
77_J	A48 (West) Offslip	7,955	2.5	9,422	2.5	9,465	2.5	9,465	2.5	9,607	2.5	9,949	2.5	20
78	A48 (West) Onslip	11,512	2.3	13,466	2.3	13,511	2.3	13,511	2.3	13,733	2.3	14,129	2.3	20
79	A48 (East) Offslip	8,280	2.5	9,807	2.5	9,852	3.2	9,852	3.2	9,999	2.5	10,355	2.5	20
79_J	A48 (East) Offslip	8,280	2.5	9,807	2.5	9,852	3.2	9,852	3.2	9,999	2.5	10,355	2.5	20
80	A48 (East) Onslip	11,061	2.3	12,938	2.3	12,981	2.8	12,981	2.8	13,194	2.3	13,575	2.3	20
81	A48 (South) Offslip	8,678	5.2	9,843	5.2	9,852	5.2	9,852	5.2	10,045	5.2	10,144	5.2	20
81_J	A48 (South) Offslip	8,678	5.2	9,843	5.2	9,852	5.2	9,852	5.2	10,045	5.2	10,144	5.2	20
82	A48 (South) Onslip	8,583	5.7	9,320	5.7	9,329	5.7	9,329	5.7	9,519	5.7	9,628	5.7	20
83	A48 (North) Offlslip	22,114	5.2	25,085	5.2	25,106	5.2	25,106	5.2	25,598	5.2	25,851	5.2	20
83_J	A48 (North) Offlslip	22,114	5.2	25,085	5.2	25,106	5.2	25,106	5.2	25,598	5.2	25,851	5.2	20
84	A48 (North) Onslip	8,583	5.7	23,966	5.7	23,989	5.7	23,989	5.7	24,478	5.7	24,758	5.7	20
85	A48 (South) Offslip	3,865	2.3	4,919	2.3	4,923	2.3	4,923	2.3	5,009	2.3	5,106	2.3	20
85_J	A48 (South) Offslip	3,865	2.3	4,919	2.3	4,923	2.3	4,923	2.3	5,009	2.3	5,106	2.3	20
86	A48 (South) Onslip	6,590	1.8	8,112	1.8	8,118	1.8	8,118	1.8	8,265	1.8	8,399	1.8	20
87_J	A48 (North) Offslip	4,537	2.3	5,774	2.3	5,780	2.3	5,780	2.3	5,880	2.3	5,993	2.3	20
87	A48 (North) Offslip	4,537	2.3	5,774	2.3	5,780	2.3	5,780	2.3	5,880	2.3	5,993	2.3	20
88	A48 (North) Onslip	4,772	1.8	5,874	1.8	5,879	1.8	5,879	1.8	5,985	1.8	6,082	1.8	20
15a	A48(M) slips (North of Cypress Drive Roundabout)	13,432	1.5	15,114	2.2	15,293	2.2	15,293	2.2	15,426	1.5	17,726	1.5	80
15b	A48(M) slips (North of Cypress Drive Roundabout)	16,443	1.6	18,121	2.3	18,300	2.3	18,300	2.3	18,503	1.6	#N/A	#N/A	48

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
15bJ	A48(M) slips (North of Cypress Drive Roundabout)	16,443	1.6	18,121	2.3	18,300	2.3	18,300	2.3	18,503	1.6	20,654	1.6	20
34a	Capel Ederyn (West of A48 Eastern Avenue)	2,684	1.3	2,857	1.3	2,865	1.3	2,865	1.3	2,919	1.3	3,038	1.3	48
34bJ	Capel Ederyn (West of A48 Eastern Avenue)	3,359	1.5	3,539	1.5	3,548	1.5	3,548	1.5	3,617	1.5	3,773	1.5	20
35a	Pentwyn Road (West of Eastern Avenue On-Off Slips)	5,833	2.1	8,008	2.1	8,008	2.1	8,008	2.1	8,143	2.1	8,143	2.1	48
35bJ	Pentwyn Road (West of Eastern Avenue On-Off Slips)	5,779	2.6	8,245	2.6	8,245	2.6	8,245	2.6	8,379	2.6	8,379	2.6	20
36aA	Bryn Celyn Road (West of Eastern Avenue On-Off Slips)	4,529	1.9	4,876	1.9	4,888	1.9	4,888	1.9	4,981	1.9	5,240	1.9	48
36aB	Bryn Celyn Road (West of Eastern Avenue On-Off Slips)	4,529	1.9	4,876	1.9	4,888	1.9	4,888	1.9	4,981	1.9	5,240	1.9	48
37aJ	A4232 Southern Way (South of A48 Eastern Avenue)	22,387	7.1	24,756	7.1	24,778	7.1	24,778	7.1	25,275	7.1	25,428	7.1	20
37b	A4232 Southern Way (South of A48 Eastern Avenue)	26,214	6.1	28,923	6.1	28,945	6.1	28,945	6.1	29,531	6.1	29,695	6.1	80
38aAJ	Round Wood Close (West of A48 Eastern Avenue)	8,776	2.3	10,768	2.3	10,780	2.3	10,780	2.3	10,972	2.3	11,208	2.3	20
38aB	W Round Wood Close (West of A48 Eastern Avenue)	8,776	2.3	10,768	2.3	10,780	2.3	10,780	2.3	10,972	2.3	11,208	2.3	48
38bJA	Round Wood Close (West of A48 Eastern Avenue)	8,267	1.9	8,530	1.9	8,540	1.9	8,540	1.9	8,722	1.9	8,958	1.9	20

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
38bJB	Round Wood Close (West of A48 Eastern Avenue)	8,267	1.9	8,530	1.9	8,540	1.9	8,540	1.9	8,722	1.9	8,958	1.9	20
43a	A48 (South of M4 J28)	14,726	1.9	15,619	1.9	15,655	1.9	15,655	1.9	16,133	1.9	16,583	1.9	64
43b	A48 (South of M4 J28)	12,354	2.2	13,104	2.1	13,144	2.1	13,144	2.1	13,535	2.2	14,175	2.2	64
63a	A48M (South of M4 – NB)	22,981	7.1	24,009	7.1	24,009	7.1	24,009	7.1	25,798	7.1	25,798	7.1	112
63b	A48M (South of M4 – SB)	24,356	6.7	25,446	6.7	25,446	6.7	25,446	6.7	27,341	6.7	27,341	6.7	112
75aJ	A4051 (J26 South of J26)	13,834	1.3	14,453	1.3	14,457	1.3	14,457	1.3	15,529	1.3	15,602	1.3	20
75b	A4051 (J26 South of J26)	11,931	1.2	12,465	1.2	12,468	1.2	12,468	1.2	13,394	1.2	13,446	1.2	48
76a	A4051 ((J26 North of J26)	18,822	2.3	19,664	2.3	19,675	2.3	19,675	2.3	21,129	2.3	21,326	2.3	64
76bJ	A4051 (J26 North of J26)	20,131	2.0	21,032	2.0	21,032	2.0	21,032	2.0	22,599	2.0	22,873	2.0	20
RNB1J	Roundabout with links to A48, Cypress Drive and B4487	19,009	1.9	20,895	1.9	21,186	2.4	21,186	2.4	21,336	1.9	Link removed	Link removed	20
RNB2J	Roundabout with links to Pentwyn Link Road, Church Road, A4232 and Heol Pontprennau	21,585	2.7	28,822	2.8	28,911	3.2	28,911	3.2	29,323	2.8	29,990	2.8	20
RNB3J	Roundabout along Eastern Avenue (A48) with links to Capel Edeyrn and A4232	9,702	2.4	11,408	2.4	11,452	3.0	11,452	3.0	11,633	2.4	12,002	2.4	20
RNB4J	Roundabout with links to Cypress Drive and Sandbrook Road	2,721	1.5	3,149	1.5	3,191	1.5	3,342	3.8	3,212	1.5	3,939	1.5	20
RNB5J	Roundabout along Eastern Avenue (A48) with links to Southern Way A4232 and Circle Way East	14,662	5.4	16,260	5.4	16,274	5.4	16,274	5.4	16,600	5.4	16,777	5.4	20
RNB6J	Roundabout along Eastern Avenue (A48) with links to Bryn Celyn Road and Pentwyn Road	4,941	2.0	6,170	2.0	6,175	2.0	6,175	2.0	6,284	2.0	6,395	2.0	20

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
RNB7J	Roundabout along M4 with links to Malpas Road (A4051)	16,180	1.8	17,129	1.8	17,162	1.8	17,162	1.8	18,163	1.8	18,760	1.8	20
Site access	Site access road*	-	-	-	-	651	36.5	651	36.5	-	-	7,784	0.0	48
14B*	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	-	-	-	-	-	-	-	-	-	-	18,499	2.2	48
14AJ*	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	-	-	-	-	-	-	-	-	-	-	18,499	2.2	20
15bA*	New link following junction improvement at A48/B4487/Cypress Drive roundabout*											20,654	1.6	48
15bB*	New link following junction improvement at A48/B4487/Cypress Drive roundabout*											20,654	1.6	48
10aJ1*	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	-	-	-	-	-	-	-	-	-	-	9,332	1.8	20
10aJ*	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	-	-	-	-	-	-	-	-	-	-	9,332	1.8	20
10b*	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	-	-	-	-	-	-	-	-	-	-	12,206	1.2	48

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
10bJ*	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	-	-	-	-	-	-	-	-	-	-	12,206	1.2	20
Data specific to construction route option 1														
101**	Heol Las (South of St Mellons Road)			379	4.8	Specific route option IDs used		381	5.3	-	-	-	-	48
103**	Fortran Road (North of St Mellons Road)			2,402	1.3	Specific route option IDs used		2,404	1.4	-	-	-	-	48
104**	Fortran Road (East of Cypress Drive)			7,212	1.0	Specific route option IDs used		7,214	1.0	-	-	-	-	48
104J**	Fortran Road (East of Cypress Drive)			7,212	1.0	Specific route option IDs used		7,214	1.0	-	-	-	-	20
105**	Cypress Drive (South of Fortran Road)			4,276	1.1	Specific route option IDs used		4,794	5.9	-	-	-	-	48
105J**	Cypress Drive (South of Fortran Road)			4,276	1.1	Specific route option IDs used		4,794	5.9	-	-	-	-	20
107**	Cypress Drive (North of Sandbrook Road)			4,181	1.3	Specific route option IDs used		4,699	6.1	-	-	-	-	48
107JA**	Cypress Drive (North of Sandbrook Road)			4,181	1.3	Specific route option IDs used		4,699	6.1	-	-	-	-	20
107JB**	Cypress Drive (North of Sandbrook Road)			4,181	1.3	Specific route option IDs used		4,699	6.1	-	-	-	-	20
Data specific to construction route option 2														
201***	Heol Las (South of St Mellons Road)			379	4.8	1,030	24.8	Specific route option IDs used		-	-	-	-	48
203***	Fortran Road (North of St Mellons Road)			2,402	1.3	3,053	8.8	Specific route option IDs used		-	-	-	-	48
204***	Fortran Road (East of Cypress Drive)			7,212	1.0	7,862	3.9	Specific route option IDs used		-	-	-	-	48
204J***	Fortran Road (East of Cypress Drive)			7,212	1.0	7,862	3.9	Specific route option IDs used		-	-	-	-	20

Road ID	Road name	2019 baseline		2022 DM		2022 DS Route option 1		2022 DS Route option 2		2028 DM		2028DS		Speed (kph)
		24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	24hr AADT	%HGV	
205***	Cypress Drive (South of Fortran Road)			4,276	1.1	4,340	1.1	Specific route option IDs used		-	-	-	-	48
205J***	Cypress Drive (South of Fortran Road)			4,276	1.1	4,340	1.1	Specific route option IDs used		-	-	-	-	20
207***	Cypress Drive (North of Sandbrook Road)			4,181	1.3	4,245	1.2	Specific route option IDs used		-	-	-	-	48
207JA***	Cypress Drive (North of Sandbrook Road)			4,181	1.3	4,245	1.2	Specific route option IDs used		-	-	-	-	20
207JB***	Cypress Drive (North of Sandbrook Road)			4,181	1.3	4,245	1.2	Specific route option IDs used		-	-	-	-	20

Note:
* - links are only present in the 2028 DS scenario
** - links are only present in the 2022 DS construction route option 1 scenario
*** - links are only present in the 2022 DS construction route option 2 scenario

Modelled road network

F.2.10 The modelled road network for all scenarios without the junction improvement is illustrated in ES Figure 8.2, and details of the modelled roads are provided in Table 9.

F.2.11 All roads were modelled at ground level (0m elevation), with the exception of Link 68F, which is the section of M4 at Junction 26. This link has been assigned an elevation of 6m to reflect the difference in height between the link with the receptors in the vicinity.

Table 9: Modelled road type and width

Road ID	Road name	Road width (m)
1	Heol Las (South of St Mellons Road)	5.0
2	St Mellons Road (East of Heol Las)	6.0
2J	St Mellons Road (East of Heol Las)	6.0
3	Fortran Road (North of St Mellons Road)	5.0
4	Fortran Road (East of Cypress Drive)	7.0
4J	Fortran Road (East of Cypress Drive)	9.0
5	Cypress Drive (South of Fortran Road)	15.0
5J	Cypress Drive (South of Fortran Road)	15.0
6	Cypress Drive (North of Fortran Road)	17.0
6JA	Cypress Drive (North of Fortran Road)	17.0
6JB	Cypress Drive (North of Fortran Road)	17.0
7	Cypress Drive (North of Sandbrook Road)	10.0
7JA	Cypress Drive (North of Sandbrook Road)	11.0
7JB	Cypress Drive (North of Sandbrook Road)	10.0
8	Sandbrook Road (West of Cypress Drive)	11.0
8J	Sandbrook Road (West of Cypress Drive)	14.0
8_J	Sandbrook Road (West of Cypress Drive)	12.0
9	Cypress Drive (South of Sandbrook Road)	10.0
9J	Cypress Drive (South of Sandbrook Road)	12.0
10	Cypress Drive (North of Willowdene Way)	13.0
10J	Cypress Drive (North of Willowdene Way)	24.0
11JA	Willowdene Way (West of Cypress Drive)	10.0
11	Willowdene Way (West of Cypress Drive)	7.0
11JB	Willowdene Way (West of Cypress Drive)	7.0
12	Cypress Drive (South of Willowdene Way)	15.0
12J	Cypress Drive (South of Willowdene Way)	15.0
13	A48 (East Cypress Drive Roundabout)	18.0
13_J	A48 (East Cypress Drive Roundabout)	25.0
14JA	Newport Road (West of Cypress Drive Roundabout)	20.0
14	Newport Road (West of Cypress Drive Roundabout)	15.0
14JB	Newport Road (West of Cypress Drive Roundabout)	18.0
16A	A48 (East of Marshfield Road)	25.0
16B	A48 (East of Marshfield Road)	14.0
16BJ	A48 (East of Marshfield Road)	14.0
17A	A48 (East of Marshfield Road)	25.0

Road ID	Road name	Road width (m)
17B	A48 (East of Marshfield Road)	18.0
18	Newport Road (East of Tyr Winch Road)	12.0
18JA	Newport Road (East of Tyr Winch Road)	12.0
18JB	Newport Road (East of Tyr Winch Road)	12.5
18A	Newport Road (East of Tyr Winch Road)	14.0
18BJ	Newport Road (East of Tyr Winch Road)	17.0
19	Newport Road (West of Tyr Winch Road)	10.0
19J	Newport Road (West of Tyr Winch Road)	12.0
20	Newport Road (East of Llanrumney Avenue)	13.0
20J	Newport Road (East of Llanrumney Avenue)	15.0
30	North of the Pentwyn Link Road Roundabout	18.0
30J	North of the Pentwyn Link Road Roundabout	24.0
31	Church Road (East of the Pentwyn Link Road Roundabout)	12.0
31J	Church Road (East of the Pentwyn Link Road Roundabout)	22.0
32JA	A4232 (South of the Pentwyn Link Road Roundabout)	24.0
32	A4232 (South of the Pentwyn Link Road Roundabout)	24.0
32JB	A4232 (South of the Pentwyn Link Road Roundabout)	26.0
33	Heol Pontprennau (West of the Pentwyn Link Road Roundabout)	11.0
33J	Heol Pontprennau (West of the Pentwyn Link Road Roundabout)	22.0
34A1	Capel Ederyn (West of A48 Eastern Avenue)	7.0
34B	Capel Ederyn (West of A48 Eastern Avenue)	8.0
35	Pentwyn Road (West of Eastern Avenue On-Off Slips)	9.0
36J	Bryn Celyn Road (West of Eastern Avenue On-Off Slips)	8.0
37	A4232 Southern Way (South of A48 Eastern Avenue)	17.5
38J	Round Wood Close (West of A48 Eastern Avenue)	9.0
38	Round Wood Close (West of A48 Eastern Avenue)	14.0
39	A48 (West of St Mellons Interchange)	20.0
40	A48 (West of A4232 Pentwyn Interchange)	20.0
41	A48 (North of Circle Way/Southrn Way)	15.0
42	A48 (South of Circle Way/Southrn Way)	17.5
43	A48 (South of M4 J28)	17.5
43J	A48 (South of M4 J28)	17.5
44A	A48 SDR (East of M4 J28)	7.0
44B	A48 SDR (East of M4 J28)	7.0
45	A467 (North West of M4 J28)	16.5
47	A48 (West of A470)	13.5
52	M4 (J34 West of A4119)	28.0
54_A	M4 (J34 East of A4119)	28.0
54_B	M4 (J34 East of A4119)	28.0
57	M4 (J33 East of A4232)	25.5
61B	M4 (J30 West of the A4232)	25.5
61A	M4 (J30 West of the A4232)	25.5
63	A48M (South of M4)	18.5
64	M4 (East of A48 (M))	24.0
66	M4 (J28 North of J28)	24.5

Road ID	Road name	Road width (m)
68	M4 (J27 North of J27)	25.5
68F	M4 (J27 North of J27)	25.5
73	Willowbrook Drive (North of Sandbrook Road)	8.5
73J	Willowbrook Drive (North of Sandbrook Road)	8.5
74AC	Willowbrook Drive (South of Sandbrook Road)	10.0
74J	Willowbrook Drive (South of Sandbrook Road)	10.0
74BJ	Willowbrook Drive (South of Sandbrook Road)	10.0
74B	Willowbrook Drive (South of Sandbrook Road)	10.0
74AJ	Willowbrook Drive (South of Sandbrook Road)	10.0
74AB	Willowbrook Drive (South of Sandbrook Road)	10.0
74ABJ	Willowbrook Drive (South of Sandbrook Road)	10.0
74ACJ	Willowbrook Drive (South of Sandbrook Road)	10.0
75A	A4051 (J26 South of J26)	14.0
75BC	A4051 (J26 South of J26)	14.0
75BJ	A4051 (J26 South of J26)	14.0
76	A4051 (J26 North of J26)	16.5
77	A48 (West) Offslip	7.5
77_J	A48 (West) Offslip	9.5
78	A48 (West) Onslip	7.5
79	A48 (East) Offslip	7.5
79_J	A48 (East) Offslip	8.2
80	A48 (East) Onslip	7.5
81	A48 (South) Offslip	7.5
81_J	A48 (South) Offslip	9.0
82	A48 (South) Onslip	7.5
83	A48 (North) Offlslip	7.5
83_J	A48 (North) Offlslip	7.5
84	A48 (North) Onslip	7.5
85	A48 (South) Offslip	7.5
85_J	A48 (South) Offslip	9.0
86	A48 (South) Onslip	7.5
87_J	A48 (North) Offslip	6.5
87	A48 (North) Offslip	7.5
88	A48 (North) Onslip	7.5
15a	A48 (M) slips (North of Cypress Drive Roundabout)	8.0
15b	A48 (M) slips (North of Cypress Drive Roundabout)	9.0
15bJ	A48 (M) slips (North of Cypress Drive Roundabout)	9.0
34a	Capel Ederyn (West of A48 Eastern Avenue)	7.0
34bJ	Capel Ederyn (West of A48 Eastern Avenue)	8.0
35a	Pentwyn Road (West of Eastern Avenue On-Off Slips)	7.0
35bJ	Pentwyn Road (West of Eastern Avenue On-Off Slips)	7.5
36aA	Bryn Celyn Road (West of Eastern Avenue On-Off Slips)	10.0
36aB	Bryn Celyn Road (West of Eastern Avenue On-Off Slips)	17.5
37aJ	A4232 Southern Way (South of A48 Eastern Avenue)	11.5
37b	A4232 Southern Way (South of A48 Eastern Avenue)	13.0
38aAJ	Round Wood Close (West of A48 Eastern Avenue)	7.0

Road ID	Road name	Road width (m)
38aB	W Round Wood Close (West of A48 Eastern Avenue)	6.0
38bJA	Round Wood Close (West of A48 Eastern Avenue)	7.5
38bJB	Round Wood Close (West of A48 Eastern Avenue)	7.0
43a	A48 (South of M4 J28)	11.0
43b	A48 (South of M4 J28)	8.0
63a	A48M (South of M4 – NB)	6.5
63b	A48M (South of M4 – SB)	6.5
75aJ	A4051 (J26 South of J26)	6.5
75b	A4051 (J26 South of J26)	5.5
76a	A4051 ((J26 North of J26)	9.5
76bJ	A4051 (J26 North of J26)	7.0
RNB1J	Roundabout with links to A48, Cypress Drive and B4487	18.0
RNB2J	Roundabout with links to Pentwyn Link Road, Church Road, A4232 and Heol Pontprennau	10.5
RNB3J	Roundabout along Eastern Avenue (A48) with links to Capel Edeyrn and A4232	11.0
RNB4J	Roundabout with links to Cypress Drive and Sandbrook Road	10.0
RNB5J	Roundabout along Eastern Avenue (A48) with links to Southern Way A4232 and Circle Way East	11.5
RNB6J	Roundabout along Eastern Avenue (A48) with links to Bryn Celyn Road and Pentwyn Road	8.5
RNB7J	Roundabout along M4 with links to Malpas Road (A4051)	8.0
Site access	Site access road*	8.0
14B	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	15.0
14AJ	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	23.0
15bA	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	14.0
15bB	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	9.0
10aJ1	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	10.5
10aJ	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	10.5
10b	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	14.0
10bJ	New link following junction improvement at A48/B4487/Cypress Drive roundabout*	14.0
101**	Heol Las (South of St Mellons Road)	5.0
103**	Fortran Road (North of St Mellons Road)	5.0
104**	Fortran Road (East of Cypress Drive)	7.0
104J**	Fortran Road (East of Cypress Drive)	9.0
105**	Cypress Drive (South of Fortran Road)	15.0
105J**	Cypress Drive (South of Fortran Road)	15.0
107**	Cypress Drive (North of Sandbrook Road)	10.0
107JA**	Cypress Drive (North of Sandbrook Road)	11.0
107JB**	Cypress Drive (North of Sandbrook Road)	10.0
201***	Heol Las (South of St Mellons Road)	5.0

Road ID	Road name	Road width (m)
203***	Fortran Road (North of St Mellons Road)	5.0
204***	Fortran Road (East of Cypress Drive)	7.0
204J***	Fortran Road (East of Cypress Drive)	9.0
205***	Cypress Drive (South of Fortran Road)	15.0
205J***	Cypress Drive (South of Fortran Road)	15.0
207***	Cypress Drive (North of Sandbrook Road)	10.0
207JA***	Cypress Drive (North of Sandbrook Road)	11.0
207JB***	Cypress Drive (North of Sandbrook Road)	10.0

F.2.12 There are modifications to the modelled road network as junction improvement work is proposed at the existing A48/Cypress Drive roundabout. The DM road network is the same as that for the baseline. However, some links were removed, and new links were added in the DS road network. The links removed are identified in Table 9 above. Details for the new links in the DS model are provided in Table 10. All additional DS road links were modelled with no elevation.

F.2.13 Figure 8.7 shows the changes in road layout between the DM and DS operational scenarios. Note that the plan shown is indicative. Further details of the road changes can be found in the traffic chapter (Chapter 4) of the ES.

Table 10: Additional modelled road type and width for the operational DS scenario with junction improvement

Road ID	Road name	Road width (m)
14B	Newport Road (West of Cypress Drive Roundabout)	15.0
14AJ	Newport Road (West of Cypress Drive Roundabout)	23.0
10aJ1	Cypress Drive (North of Willowdene Way)	10.5
10aJ	Cypress Drive (North of Willowdene Way)	10.5
10b	Cypress Drive (North of Willowdene Way)	14.0
10bJ	Cypress Drive (North of Willowdene Way)	14.0
15bB	A48(M) slips (North of Cypress Drive Roundabout)	9.0
15bA	A48(M) slips (North of Cypress Drive Roundabout)	14.0

Sensitive human and ecological receptors

F.2.14 Modelling was undertaken to calculate predicted concentrations at sensitive receptor locations. Sensitive human receptors are defined as those residential

properties/schools/hospitals that are likely to experience a change in pollutant concentrations due to the construction of the proposed development.

F.2.15 Representative worst-case sensitive receptors have been chosen and modelled at a height representative of human health exposure (1.5m).

F.2.16 At the request of CC, receptors on the future commercial buildings in the proposed development have been included. A selection of receptors closest to the main access road have been chosen as no detailed design has been provided.

F.2.17 Predicted concentrations at the selected sensitive receptors have been compared with the long-term NO_2, PM_{10} and $PM_{2.5}$ air quality objectives. Short-term objectives have been applied at the commercial buildings in the proposed development locations as regular access by the general public at such locations is not expected.

F.2.18 There are three AQMAs located on the road network where the traffic data exceeded the EPUK/IAQM screening threshold set out in Chapter 8. Residential receptors at each of the AQMAs (Glasllwch AQMA, Newport - HighCross AQMA 2018 and Shaftesbury/Crindau AQMA) were assessed.

F.2.19 Four Sites of Scientific Interest (SSSI) have been considered as part of the air quality assessment. All of these sites lie within 200m of the road network modelled. Transects up to 200m in the SSSI have been modelled to predict changes in NOx concentrations, in accordance with IAQM guidance[15].

F.2.20 Apart from SSSIs, there are a number of local nature reserves (LNRs) and ancient woodlands (AWs) also within 200m of the road network affected by the proposed development. A selection of these ecological sites, which are considered worst-case based on their proximity of the road network where the changes in road traffic are the greatest, have been included in the assessment. All ecological receptors have been modelled at ground level (0m). Additional transects were modelled at the AW and Allt-Yr-Yn LNR site after exceedances were predicted at the points closest to the modelled road network in some scenarios. The AW transect was included in the 2028 operational scenario and both construction and operational sensitivity test scenarios. The LNR transect was included in the sensitivity test operational scenario.

F.2.21 Details of the receptor locations (human and ecological) are provided in Table 11 below and shown on ES Figure 8.3 and ES Figure 8.4 respectively.

[15] Holman et al (2019). A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/airquality-impacts-on-nature-sites-2019.pdf

Table 11: Sensitive receptors modelled (human and ecological)

Receptor ID	OS grid square		Description
	X	Y	
Residential			
R1	310620	180258	Nant Y Ffynnon
R2	317033	183598	Heol Llinos
R3	321167	183271	Parkwall Road
R4	318707	178829	Ennerdale Close
R5	320480	179283	Llanedeyrn Road
R6	320897	180985	Bryn Celyn Road
R7	321635	181785	Clos Nanteos
R8	321844	182190	A4232
R9	321928	182194	Heol Bennett
R10	322612	181890	The Dell
R11	323256	181941	Ffordd Brynhyfryd
R12	322645	180613	B4487 Newport Road
R13	322760	180604	Quarry Hall Care Home
R14	323254	181527	B4487
R15	323466	181703	B4487 Newport Road
R16	323585	181745	B4487 Newport Road
R17	323788	181968	Newport Rd B4487
R18	323864	181912	Corner of Cypress Drive and B4487
R19	324074	180482	Willowbrook Drive
R20	324608	181015	Cleddau Close
R21	324601	180969	Sandbrook Rd
R22	324042	181828	Cypress Drive
R23	324190	181765	Willowdene Way
R24	324560	181550	Brython Drive
R25	324623	181436	Maes-Y-Crochan
R26	325253	181351	Corner of Heol Las and St Mellons Road
R27	324130	182205	A48
R28	324340	182663	A48
R29	325187	183414	Wentloog Rise
R30	325329	183514	Walk Farm Drive
R31	326806	184310	A48
R32	328408	185334	Tredegar House Country Park Caravan and Motorhome Club Site
R33	328538	187011	Bassaleg Road (Glasllwch AQMA)
R34	328587	187007	Bassaleg Road (Glasllwch AQMA)
R35	328334	187872	Glasllwch Crescent (Newport - HighCross AQMA 2018)
R36	328425	187778	Glasllwch Crescent (Newport - HighCross AQMA 2018)
R37	330503	189666	Malpas Road (Shaftesbury/Crindau AQMA)
R38	330559	189610	Pant Road (Shaftesbury/Crindau AQMA)
R39	306442	179846	Pendoylan Road Pont-y-Clun
R30	307427	179514	M4 by Nant Coslech
Schools/Educational			

Receptor ID	OS grid square		Description
	X	Y	
S1	320417	179388	Red Balwn Day Nursery
S2	320593	179813	St Teilo's Church in Wales High School
S3	320593	180945	St David's C I W Primary School
S4	321902	181447	St Cadoc's R C Primary School
S5	322691	180483	St Illtyd's Catholic High School
S6	322651	181024	St Mellons Church In Wales Primary School
S7	323047	181615	St John's College
S8	323960	180438	Meadowlane Primary School
S9	324422	180948	Willowbrook Primary School
S10	327819	184784	Teddies Nursery
S11	328723	185826	ONS Acorns Nursery school
Healthcare			
H1	317535	179232	University Hospital of Wales
Future receptors			
F1	324834	181312	Proposed building future receptor
F2	324965	181362	Proposed building future receptor
F3	325012	181137	Proposed building future receptor
Glamorganshire Canal LNR			
E1_A	313500	181578	Northern point
E1_B	313201	181455	Southern point
Glamorgan Canal and Long Wood SSSI			
E2_A	313647	181366	Closest point
E2_B	313650	181321	200m from road
Fforestganol A Chwm Nofydd SSSI			
E3_A	315277	182480	Closest point
E3_B	315262	182522	200m from road
Howardian LNR			
E4_A	320362	178902	Western point
Ancient semi natural woodland (to the west) (transect - operational impact and sensitivity test only)			
E5_A_original	322427	181928	Roadside
E5_A_transect	322386	181932	Roadside
E5_B_transect	322386	181927	5m from road
E5_C_transect	322385	181922	10m from road
E5_D_transect	322385	181917	15m from road
E5_E_transect	322385	181912	20m from road
E5_F_transect	322384	181907	25m from road
E5_G_transect	322384	181902	Furthest point in AW, 30.5m from road
Ancient semi natural woodland (to the east) (transect - operational impact and sensitivity test only)			
E6_A_original	322530	181915	Roadside
E6_B_transect	322529	181910	5m from road
E6_C_transect	322529	181905	10m from road
E6_D_transect	322528	181900	15m from road
E6_E_transect	322527	181895	20m from road

Receptor ID	OS grid square		Description
	X	Y	
E6_F_transect	322526	181890	25m from road
E6_G_transect	322526	181885	30m from road
E6_H_transect	322525	181880	35m from road
E6_I_transect	322524	181875	40m from road
Gwent Levels - Rumney and Peterstone SSSI (transect 1)			
E7_A	325180	181433	Roadside
E7_B	325189	181438	10m from roadside
E7_C	325198	181442	20m from roadside
E7_D	325207	181447	30m from roadside
E7_E	325215	181451	40m from roadside
E7_F	325224	181456	50m from roadside
E7_G	325246	181467	75m from roadside
E7_H	325269	181479	100m from roadside
E7_I	325313	181502	150m from roadside
E7_J	325358	181525	200m from roadside
Gwent Levels - Rumney and Peterstone SSSI (transect 2)			
E8_A	325669	180881	Roadside
E8_B	325672	180890	10m from roadside
E8_C	325675	180900	20m from roadside
E8_D	325678	180909	30m from roadside
E8_E	325682	180919	40m from roadside
E8_F	325685	180928	50m from roadside
E8_G	325693	180952	75m from roadside
E8_H	325701	180976	100m from roadside
E8_I	325717	181023	150m from roadside
E8_J	325733	181070	200m from roadside
Gwent Levels - Rumney and Peterstone SSSI (transect 3)			
E9_A	325812	180788	Roadside
E9_B	325807	180780	10m from roadside
E9_C	325802	180771	20m from roadside
E9_D	325798	180762	30m from roadside
E9_E	325793	180753	40m from roadside
E9_F	325788	180745	50m from roadside
E9_G	325776	180723	75m from roadside
E9_H	325764	180701	100m from roadside
E9_I	325740	180657	150m from roadside
E9_J	325716	180613	200m from roadside
Allt-Yr-Yn LNR (transect - operational sensitivity test impact only)			
E9_12_original	328643	188310	Closest point to road
E9_12_B	328648	188308	5m from closest point
E9_12_C	328650	188307	Furthest point in LNR, 8m from closest point
Gwent Levels - Rumney and Peterstone SSSI – near site entrance crossing of Feandre Reen (transect 4, operational impact only)			
E10_A	324670	181412	Roadside

Receptor ID	OS grid square		Description
	X	Y	
E10_B	324670	181402	10m from roadside
E10_C	324670	181392	20m from roadside
E10_D	324671	181382	30m from roadside
E10_E	324671	181372	40m from roadside
E10_F	324671	181362	50m from roadside
E10_G	324671	181337	75m from roadside
E10_H	324672	181312	100m from roadside
E10_I	324673	181262	150m from roadside
E10_J	324673	181212	200m from roadside
Gwent Levels - Rumney and Peterstone SSSI - near site entrance crossing of Feandre Reen (transect 5, operational impact only)			
E11_A	324670	181423	Roadside
E11_B	324670	181433	10m from roadside
E11_C	324669	181443	20m from roadside
E11_D	324669	181453	30m from roadside
E11_E	324669	181463	40m from roadside
E11_F	324668	181473	50m from roadside
E11_G	324668	181498	75m from roadside
E11_H	324667	181523	100m from roadside
Ely Valley SSSI (northern transect)			
E12_A	305615	180072	Roadside
E12_B	305617	180082	10m from roadside
E12_C	305620	180091	20m from roadside
E12_D	305623	180101	30m from roadside
E12_E	305625	180111	40m from roadside
E12_F	305628	180120	50m from roadside
E12_G	305635	180144	75m from roadside
E12_H	305642	180168	100m from roadside
Ely Valley SSSI (southern transect)			
E13_A	305619	180009	Roadside
E13_B	305616	179999	10m from roadside
E13_C	305614	179989	20m from roadside
E13_D	305611	179980	30m from roadside
E13_E	305609	179970	40m from roadside
E13_F	305606	179960	50m from roadside
E13_G	305599	179936	75m from roadside
E13_H	305593	179912	100m from roadside
E13_I	305580	179864	150m from roadside

Dispersion model

F.2.22 For assessment of emissions from road traffic (operational and construction) the latest ADMS-Roads atmospheric dispersion model has been used.

Meteorological data

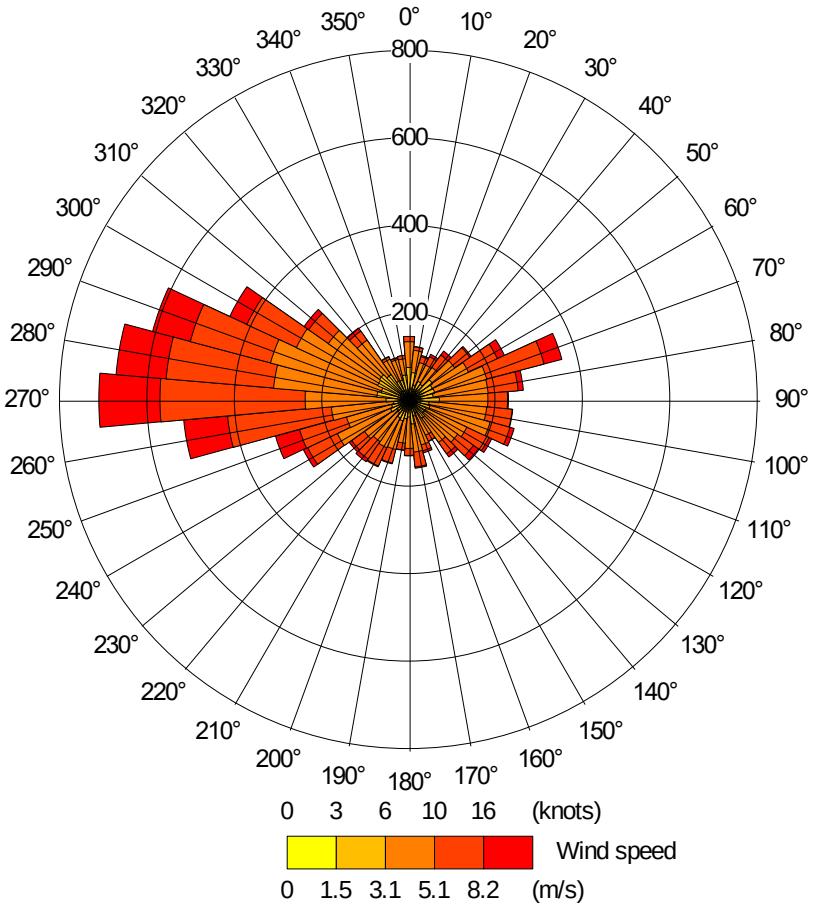
F.2.23 The meteorological data used in this assessment were from Cardiff Airport meteorological station. The data were collected over the period 1 January 2019 to 31 December 2019 (inclusive). Cardiff Airport is located at NGR 306557, 306557 which is approximately 22.5km south west of the closest point of the proposed development. This meteorological site was chosen due to its proximity to the proposed development.

F.2.24 Most road dispersion models cannot perform calculations in calm wind conditions, as the equations of dispersion require wind speeds to be above zero and have a wind direction (wind direction is not measured if wind speed is zero or close to it). ADMS-Roads 4.1 treats calm wind conditions by setting the minimum wind speed in the model to 0.75m/s. Defra's LAQM.TG16[11] guidance recommends that the meteorological data file is tested in a dispersion model and the relevant output log file checked to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. The guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 75% and preferably 90%.

F.2.25 Hourly sequential observation data were used. The Cardiff Airport dataset includes 8,653 lines of usable hourly data out of a total of 8,760 hours in the year (98.8%). This is above the 90% threshold, so meets the requirements of the Defra guidance and is adequate for the dispersion modelling.

F.2.26 Diagram 2 presents the Windrose for Cardiff Airport data, 2019. It can be seen that the prevailing wind direction in the study area is from the west.

Diagram 2: Windrose for Cardiff Airport 2019



Other input parameters

F.2.27 The extent of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the surface/ground over which the air is passing. Typical surface roughness values range from 1.5m (for cities, forests and industrial areas) to 0.0001m (for water or sandy deserts). In this assessment, a surface roughness value of 0.5m has been used for the dispersion site. For the meteorological site a surface roughness value of 0.2m has been used.

F.2.28 The minimum Monin-Obukhov length is a model parameter which describes the extent to which the urban heat island effect limits stable atmospheric conditions. The minimum Monin-Obukhov length of 10m has been used in both the dispersion and meteorological station site.

NOx to NO_2 Conversion

F.2.29 The dispersion model predicts NOx concentrations which comprise nitric oxide (NO) and NO_2. NOx is emitted from combustion processes, primarily as NO with a small percentage of NO_2. The emitted NO reacts with oxidants in the air (mainly ozone) to form NO_2. NO_2 is associated with effects on human health. The air

quality standards for the protection of human health are based on NO_2 rather than total NOx or NO. A suitable NOx:NO_2 conversion has been applied to the modelled NOx concentrations in order to determine the impact of the NOx emissions on ambient concentrations of NO_2.

F.2.30 LAQM.TG16[11] details an approach for calculating the roadside conversion of NOx to NO_2. This approach takes into account the difference between ambient NOx concentrations with and without the proposed development, the concentration of ozone and the different proportions of primary NO_2 emissions in different years. This approach is viable as a spreadsheet calculator, with the most up-to-date version being version 7.1, released in April 2019[16]. The appropriate local authorities (Cardiff, Newport, Vale of Glamorgan and Rhondda Cynon Taf) have been selected for the respective receptors in the assessment.

Model verification

F.2.31 Model verification refers to the comparison of modelled and measured pollutant concentrations at the same locations to determine the performance of the model. Should the majority of model results for NO_2 be within ±25% of the measured values and there is no systematic over or under-prediction of concentrations, then the LAQM.TG16[11] guidance advises that no adjustment is necessary. If this is not the case, modelled concentrations are adjusted based on the observed relationship between modelled and measured NO_2 concentrations to provide a better agreement.

F.2.32 The outcome of the model verification is reported in Section F3.

Baseline environment

Receptor background concentrations

F.2.33 The background concentrations for NO_2, PM_{10} and $PM_{2.5}$ at each sensitive receptor for 2019, 2022 and 2028 are presented in Table 12. In order to avoid double counting the contribution from modelled road emission sources, the in-square contributions in Defra background maps from motorways, trunk A-road and primary A-roads were removed from the total background concentrations of NOx, PM_{10} and $PM_{2.5}$ and NO_2 using the NO_2 Adjustment for NO_x Sector Removal Tool[17].

[16] Defra NOx to NO_2 calculator (version 7.1), https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html; [Accessed: March 2020]
[17] Defra sector removal tool https://laqm.Defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxsector (version 7.0 May 2019)

Table 12: Sector removed backgrounds used at modelled receptors

Receptor ID	OS grid square		2019				2022				2028			
	X	Y	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$
R1	310620	180258	9.4	12.5	12.3	7.7	8.1	10.6	12.0	7.5	6.2	8.1	11.7	7.2
R2	317033	183598	12.8	17.5	13.2	8.7	11.0	14.8	12.9	8.4	8.5	11.3	12.5	8.1
R3	321167	183271	11.5	15.6	13.4	8.6	9.9	13.2	13.1	8.3	7.8	10.2	12.7	8.0
R4	318707	178829	17.2	24.6	13.4	9.4	15.0	21.0	13.1	9.1	12.0	16.4	12.7	8.8
R5	320480	179283	14.5	20.3	13.3	9.0	12.7	17.4	12.9	8.7	10.1	13.6	12.6	8.4
R6	320897	180985	14.1	19.5	12.9	8.9	12.2	16.7	12.6	8.6	9.7	13.0	12.3	8.3
R7	321635	181785	14.0	19.3	13.9	9.2	12.2	16.6	13.6	8.9	9.7	13.1	13.3	8.7
R8	321844	182190	13.8	19.0	13.5	8.8	12.0	16.3	13.1	8.5	9.5	12.6	12.8	8.2
R9	321928	182194	13.8	19.0	13.5	8.8	12.0	16.3	13.1	8.5	9.5	12.6	12.8	8.2
R10	322612	181890	15.2	21.2	13.4	9.2	13.1	18.0	13.1	8.9	10.3	13.9	12.8	8.6
R11	323256	181941	14.8	20.6	12.8	8.9	12.9	17.7	12.4	8.6	10.3	13.9	12.1	8.3
R12	322645	180613	15.7	22.1	12.8	8.8	13.6	18.9	12.4	8.6	10.8	14.6	12.1	8.3
R13	322760	180604	15.7	22.1	12.8	8.8	13.6	18.9	12.4	8.6	10.8	14.6	12.1	8.3
R14	323254	181527	14.8	20.6	12.8	8.9	12.9	17.7	12.4	8.6	10.3	13.9	12.1	8.3
R15	323466	181703	14.8	20.6	12.8	8.9	12.9	17.7	12.4	8.6	10.3	13.9	12.1	8.3
R16	323585	181745	14.8	20.6	12.8	8.9	12.9	17.7	12.4	8.6	10.3	13.9	12.1	8.3
R17	323788	181968	14.8	20.6	12.8	8.9	12.9	17.7	12.4	8.6	10.3	13.9	12.1	8.3
R18	323864	181912	14.8	20.6	12.8	8.9	12.9	17.7	12.4	8.6	10.3	13.9	12.1	8.3
R19	324074	180482	13.1	18.1	12.1	8.1	11.5	15.7	11.8	7.9	9.5	12.8	11.4	7.6
R20	324608	181015	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
R21	324601	180969	13.1	18.1	12.1	8.1	11.5	15.7	11.8	7.9	9.5	12.8	11.4	7.6
R22	324042	181828	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1

Receptor ID	OS grid square		2019				2022				2028			
	X	Y	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$
R23	324190	181765	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
R24	324560	181550	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
R25	324623	181436	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
R26	325253	181351	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
R27	324130	182205	12.5	17.1	12.3	8.2	10.9	14.7	12.0	7.9	8.7	11.5	11.6	7.6
R28	324340	182663	12.5	17.1	12.3	8.2	10.9	14.7	12.0	7.9	8.7	11.5	11.6	7.6
R29	325187	183414	12.2	16.6	12.6	8.3	10.6	14.2	12.3	8.0	8.3	11.0	11.9	7.7
R30	325329	183514	12.2	16.6	12.6	8.3	10.6	14.2	12.3	8.0	8.3	11.0	11.9	7.7
R31	326806	184310	12.1	16.4	13.9	8.8	10.4	13.9	13.6	8.5	8.2	10.8	13.3	8.2
R32	328408	185334	13.1	18.0	14.4	8.9	11.4	15.5	14.0	8.6	9.3	12.3	13.7	8.3
R33	328538	187011	12.5	17.1	13.8	9.0	10.8	14.5	13.5	8.7	8.5	11.3	13.2	8.5
R34	328587	187007	12.5	17.1	13.8	9.0	10.8	14.5	13.5	8.7	8.5	11.3	13.2	8.5
R35	328334	187872	12.5	17.1	13.8	9.0	10.8	14.5	13.5	8.7	8.5	11.3	13.2	8.5
R36	328425	187778	12.5	17.1	13.8	9.0	10.8	14.5	13.5	8.7	8.5	11.3	13.2	8.5
R37	330503	189666	13.1	18.1	14.3	9.3	11.4	15.5	13.9	9.1	9.1	12.2	13.6	8.8
R38	330559	189610	13.1	18.1	14.3	9.3	11.4	15.5	13.9	9.1	9.1	12.2	13.6	8.8
R39	306442	179846	8.3	11.0	12.2	7.5	7.3	9.5	11.9	7.3	5.9	7.7	11.6	7.0
R40	307427	179514	8.6	11.4	12.0	7.5	7.5	9.7	11.7	7.2	5.9	7.6	11.4	7.0
S1	320417	179388	14.5	20.3	13.3	9.0	12.7	17.4	12.9	8.7	10.1	13.6	12.6	8.4
S2	320593	179813	14.5	20.3	13.3	9.0	12.7	17.4	12.9	8.7	10.1	13.6	12.6	8.4
S3	320593	180945	14.1	19.5	12.9	8.9	12.2	16.7	12.6	8.6	9.7	13.0	12.3	8.3
S4	321902	181447	14.0	19.3	13.9	9.2	12.2	16.6	13.6	8.9	9.7	13.1	13.3	8.7
S5	322691	180483	15.7	22.1	12.8	8.8	13.6	18.9	12.4	8.6	10.8	14.6	12.1	8.3

Receptor ID	OS grid square		2019				2022				2028			
	X	Y	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$
S6	322651	181024	15.2	21.2	13.4	9.2	13.1	18.0	13.1	8.9	10.3	13.9	12.8	8.6
S7	323047	181615	14.8	20.6	12.8	8.9	12.9	17.7	12.4	8.6	10.3	13.9	12.1	8.3
S8	323960	180438	14.5	20.2	12.5	8.7	12.7	17.4	12.1	8.4	10.2	13.7	11.8	8.1
S9	324422	180948	13.1	18.1	12.1	8.1	11.5	15.7	11.8	7.9	9.5	12.8	11.4	7.6
S10	327819	184784	14.1	19.5	14.8	9.0	12.4	16.9	14.5	8.7	10.1	13.6	14.1	8.4
S11	328723	185826	13.1	18.0	14.4	8.9	11.4	15.5	14.0	8.6	9.3	12.3	13.7	8.3
H1	317535	179232	16.5	23.5	12.5	8.5	14.5	20.3	12.1	8.2	11.8	16.1	11.8	7.9
F1	324834	181312	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
F2	324965	181362	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
F3	325012	181137	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E1_A	313500	181578	11.9	16.1	13.5	8.5	10.2	13.7	13.2	8.3	8.1	10.6	12.9	8.0
E1_B	313201	181455	11.9	16.1	13.5	8.5	10.2	13.7	13.2	8.3	8.1	10.6	12.9	8.0
E2_A	313647	181366	11.9	16.1	13.5	8.5	10.2	13.7	13.2	8.3	8.1	10.6	12.9	8.0
E2_B	313650	181321	11.9	16.1	13.5	8.5	10.2	13.7	13.2	8.3	8.1	10.6	12.9	8.0
E3_A	315277	182480	12.2	16.6	13.4	8.6	10.5	14.0	13.1	8.3	8.1	10.7	12.7	8.1
E3_B	315262	182522	12.2	16.6	13.4	8.6	10.5	14.0	13.1	8.3	8.1	10.7	12.7	8.1
E4_A	320362	178902	16.1	22.9	14.3	9.3	14.2	19.8	13.9	9.0	11.6	15.8	13.6	8.8
E5_A	322427	181928	15.2	21.2	13.4	9.2	13.1	18.0	13.1	8.9	10.3	13.9	12.8	8.6
E6_A	322530	181915	15.2	21.2	13.4	9.2	13.1	18.0	13.1	8.9	10.3	13.9	12.8	8.6
E7_A	325180	181433	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E7_B	325189	181438	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E7_C	325198	181442	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E7_D	325207	181447	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5

Receptor ID	OS grid square		2019				2022				2028			
	X	Y	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$
E7_E	325215	181451	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E7_F	325224	181456	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E7_G	325246	181467	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E7_H	325269	181479	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E7_I	325313	181502	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E7_J	325358	181525	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E8_A	325669	180881	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E8_B	325672	180890	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E8_C	325675	180900	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E8_D	325678	180909	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E8_E	325682	180919	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E8_F	325685	180928	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E8_G	325693	180952	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E8_H	325701	180976	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E8_I	325717	181023	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E8_J	325733	181070	12.9	17.8	12.6	8.1	11.5	15.6	12.3	7.8	9.6	12.9	12.0	7.5
E9_12	328643	188310	11.0	14.9	13.3	8.6	9.5	12.7	13.0	8.4	7.6	10.0	12.7	8.1
E9_A	325812	180788	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E9_B	325807	180780	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E9_C	325802	180771	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E9_D	325798	180762	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E9_E	325793	180753	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E9_F	325788	180745	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9

Receptor ID	OS grid square		2019				2022				2028			
	X	Y	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$
E9_G	325776	180723	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E9_H	325764	180701	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E9_I	325740	180657	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E9_J	325716	180613	10.9	14.7	11.0	7.4	9.6	12.9	10.6	7.1	8.1	10.7	10.3	6.9
E10_A	324670	181412	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_B	324670	181402	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_C	324670	181392	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_D	324671	181382	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_E	324671	181372	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_F	324671	181362	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_G	324671	181337	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_H	324672	181312	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_I	324673	181262	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E10_J	324673	181212	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E11_A	324670	181423	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E11_B	324670	181433	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E11_C	324669	181443	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E11_D	324669	181453	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E11_E	324669	181463	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E11_F	324668	181473	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E11_G	324668	181498	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E11_H	324667	181523	13.9	19.4	13.1	8.7	12.2	16.8	12.8	8.4	9.9	13.4	12.5	8.1
E12_A	305615	180072	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1

Receptor ID	OS grid square		2019				2022				2028			
	X	Y	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$	NO_2	NOx	PM_{10}	$PM_{2.5}$
E12_B	305617	180082	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1
E12_C	305620	180091	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1
E12_D	305623	180101	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1
E12_E	305625	180111	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1
E12_F	305628	180120	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1
E12_G	305635	180144	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1
E12_H	305642	180168	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1
E13_A	305619	180009	9.7	12.9	12.3	7.7	8.4	11.1	12.0	7.4	6.8	8.9	11.7	7.1
E13_B	305616	179999	8.3	11.0	10.7	6.8	7.3	9.5	10.3	6.6	6.0	7.7	10.0	6.3
E13_C	305614	179989	8.3	11.0	10.7	6.8	7.3	9.5	10.3	6.6	6.0	7.7	10.0	6.3
E13_D	305611	179980	8.3	11.0	10.7	6.8	7.3	9.5	10.3	6.6	6.0	7.7	10.0	6.3
E13_E	305609	179970	8.3	11.0	10.7	6.8	7.3	9.5	10.3	6.6	6.0	7.7	10.0	6.3
E13_F	305606	179960	8.3	11.0	10.7	6.8	7.3	9.5	10.3	6.6	6.0	7.7	10.0	6.3
E13_G	305599	179936	8.3	11.0	10.7	6.8	7.3	9.5	10.3	6.6	6.0	7.7	10.0	6.3
E13_H	305593	179912	8.3	11.0	10.7	6.8	7.3	9.5	10.3	6.6	6.0	7.7	10.0	6.3
E13_I	305580	179864	8.3	11.0	10.7	6.8	7.3	9.5	10.3	6.6	6.0	7.7	10.0	6.3

F3 Air quality assessment results and verification

Construction dust

F.3.1 This section provides the results of the assessment of construction-related activities on air quality. The IAQM guidance[18] considers four dust-generating activities: demolition, earthworks, construction and trackout. The proposed development covers an area of approximately 86 hectares. There are currently no buildings at the proposed development site therefore there will not be any demolition activity and demolition effects have not considered further as part of this assessment.

Sensitive receptors

F.3.2 Sensitive receptors are defined as those residential properties/schools/hospitals that are likely to experience a change in pollutant concentrations and/or dust nuisance due to the construction and operation of the proposed development. The proposed development is defined as a "high sensitivity receptor with high occupancy" by the IAQM guidance[18]. As such the area's sensitivity has been classified as **high**. ES Figure 8.8 shows the location of sensitive receptors with construction dust buffers at 20, 50, 100, 200 and 350m from the boundary of the proposed development.

F.3.3 The proposed development lies on the SSSI Gwent Levels – Rumney and Peterstone. The sensitivity of the SSSI to ecological impacts is assigned as **medium**.

Dust emission magnitude

F.4.1 Following the methodology outlined in Section 0, each dust-generating activity has been assigned a dust emission magnitude as shown in Table 13. This has been determined based on information provided for the proposed development and some assumptions in the absence of detailed design information.

Table 13: Dust emission magnitude for dust generating activities

Activity	Dust emission magnitude	Reasoning
Earthworks	Large	Total site area >10,000m^2.
Construction	Large	Total building volume >100,000m^3 as a worst-case assumption by using the maximum dimension of proposed development redline boundary.

[18] Holman et al (2014). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf

Activity	Dust emission magnitude	Reasoning
		Potentially dusty construction material (e.g. concrete).
Trackout	Large	>50 HDV (>3.5t) outward movements per day (The construction vehicles on the access road are 273 HGV outward movements per day.)

Sensitivity of the area

F.4.2 The sensitivity of the area to dust soiling has been assigned as **high**, due to the presence of 10-100 residential buildings within 20m of the proposed development. The PM_{10} background concentration in the area of the proposed development is 12.2µg/m^3 for 2019 which is well below the 24µg/m^3 threshold. Taking both of these factors into account, the sensitivity of the area to human health has been assigned as **low**.

F.4.3 There are designated ecological receptors (SSSI Gwent Levels – Rumney and Peterstone) sensitive to dust within 50m of the redline boundary, and therefore the sensitivity of the area to ecological impacts is **medium**.

Risk of impacts

F.4.4 Considering the dust emission magnitude and the sensitivity of the area, the risk of impact has been classified as **high** for dust soiling, **low** for human health and **medium** for ecological (Table 14). Specific mitigation to minimise the risk of dust soiling, human health and ecological impacts are therefore required and are provided in section 0.

Table 14: Summary dust risk table prior to mitigation

Activity	Dust soiling	Human health	Ecological
Earthworks	High risk	Low risk	Medium risk
Construction	High risk	Low risk	Medium risk
Trackout	High risk	Low risk	Low risk

Verification

F.4.5 Model verification was carried out by comparing the modelled output with the monitoring data from CC, NCC and scheme-specific NO_2 diffusion tube sites on the modelled road network. All local monitoring within 200m of the road network was investigated and those deemed representative were chosen to be included in the model verification.

F.4.6 The verification sites are shown in Figure 8.9 with the details of the sites used for verification presented in Table 15.

Table 15: Monitoring sites used for model verification

Site ID	X	Y	Description	Height (m)	Type
Arup					
1	325172	181431	Heol Las	2.1	Roadside
3	324652	180888	Cypress Drive (South)	2.2	Roadside
7	322498	180491	Newport Road Schools	2.5	Roadside
Newport City Council					
NCC2C	328333	187869	69 Glasllwch Crescent	1.7	Façade
NCC4B	328363	187895	67 Glasllwch Crescent	2.0	Façade
NCC6B	330565	189618	153 Malpas Road	2.2	Roadside
NCC7B	328421	187778	64 Glasllwch Crescent	1.1	Façade
NCC15	328443	187809	Glasllwch Crescent	2.1	Roadside
NCC17A	330515	189674	179 Malpas Road	2.2	Façade
NCC18C	328586	187008	Bassaleg Road (158/3)	1.9	Façade
NCC63	330743	189444	88 Malpas Road	2.0	Roadside
Cardiff Council					
211	320263	178905	19 Well Wood Close, Penylan	2.0	Roadside

F.4.7 The monitoring sites within 200m of the modelled road network but not included in the verification, alongside justifications for their exclusion, are summarised in Table 16.

Table 16: Monitoring sites excluded from model verification

Site ID	X	Y	Description	Height (m)	Type	Reason for exclusion
Arup						
2	324352	180507	Harrison Drive	2.1	Urban background	Monitoring site was only installed to compare with Defra predicted background concentration values.
4	324275	181765	Cypress Drive (North)	2.2	Kerbside	Kerbside site is not recommended for model verification according to Defra LAQM TG(16).
5	324877	183120	Channel View	2.2	Kerbside	
6	323356	181605	Newport Road/Park Store Avenue	2.3	Roadside	Modelled predictions do not match well with monitored concentrations at this location. All modelling parameters (e.g. receptor height, distance to kerb, presence of junction, vehicle speed, street canyon) have been checked and there is no obvious reason for the poor prediction at this location. Given that predictions at other locations in the same local area are satisfactory, it is considered this site should not be included in the verification process.

Site ID	X	Y	Description	Height (m)	Type	Reason for exclusion
Newport City Council						
NCC 14A	330834	189310	48 Malpas Road	2.4	Roadside	Neighbouring 'A-road' within 200m not included in modelled road network
NCC 41B	328537	187005	69 Glasllwch Crescent	1.7	Façade	The monitoring location is behind dense vegetation which cannot be represented in the modelling.
NCC 56	328015	186383	29 Forge Lane	1.8	Facade	Road immediately adjacent to monitoring location is not included in modelled road network
NCC 64	330891	189199	4-6 Malpas Road	2.6	Roadside	End of road network. Neighbouring 'A-road' within 200m is not included in modelled road network
Cardiff City Council						
86	318452	178805	19 Fairoak Road	1.5	Roadside	Monitoring location is over 90m from modelled road network, and it is also adjacent to a roundabout which is not included in the modelling.
200	317038	179073	350 Whitchurch Road	2.0	Roadside	Other major roads within 200m such as A469 and A470 not included in modelled road network
239	320592	179940	St Teilos School near entrance	2.0	Other	Monitoring location is at a car park. It is also over 100m from modelled road network
240	320578	179786	St Teilos School rear playground	2.0	Other	Low data capture rate (58%).

F.4.8 Monitoring results from 2018 for the CC and NCC tubes and annualised representative 2019 data for the scheme-specific tubes were obtained and compared with modelled concentrations at the same locations. The model verification was undertaken following the methodology described in LAQM.TG16[11].

F.4.9 There was a clear difference in the model performance on the local minor roads, and on the major A-roads and motorway. Therefore, it is considered that that two zones of verification are appropriate for this assessment.

F.4.10 Pollutant concentrations were under-predicting at verification sites (Arup 1, 3, 7) on the local minor roads in the St. Mellons/Llanrumney area. As a result, an adjustment factor of 1.780 was applied to receptors in the vicinity of the local roads in this area.

F.4.11 No adjustment factor was applied to the receptors along the major A-roads or motorway as there was no systematic over-

/underprediction for total NO_2 concentration between the local authority monitoring sites and the model.

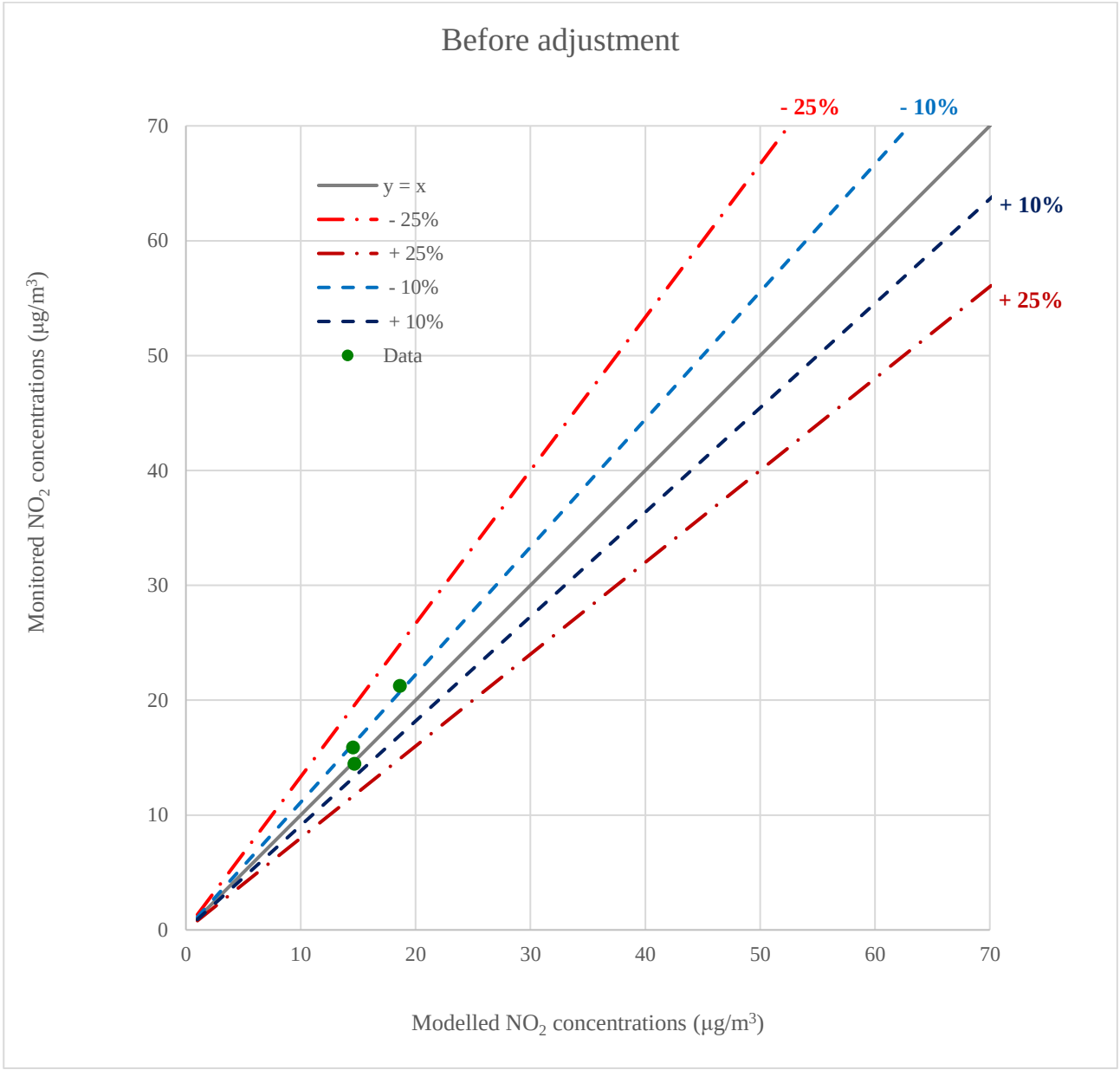
F.4.12 In terms of road-NOx prediction, the model was generally over-predicting at the majority of the A-road/motorway monitoring sites. Applying a calculated adjustment factor of (0.859) would have lowered the results. Therefore, not applying any adjustment factor for receptors along the major A-roads or motorway will provide more conservative results.

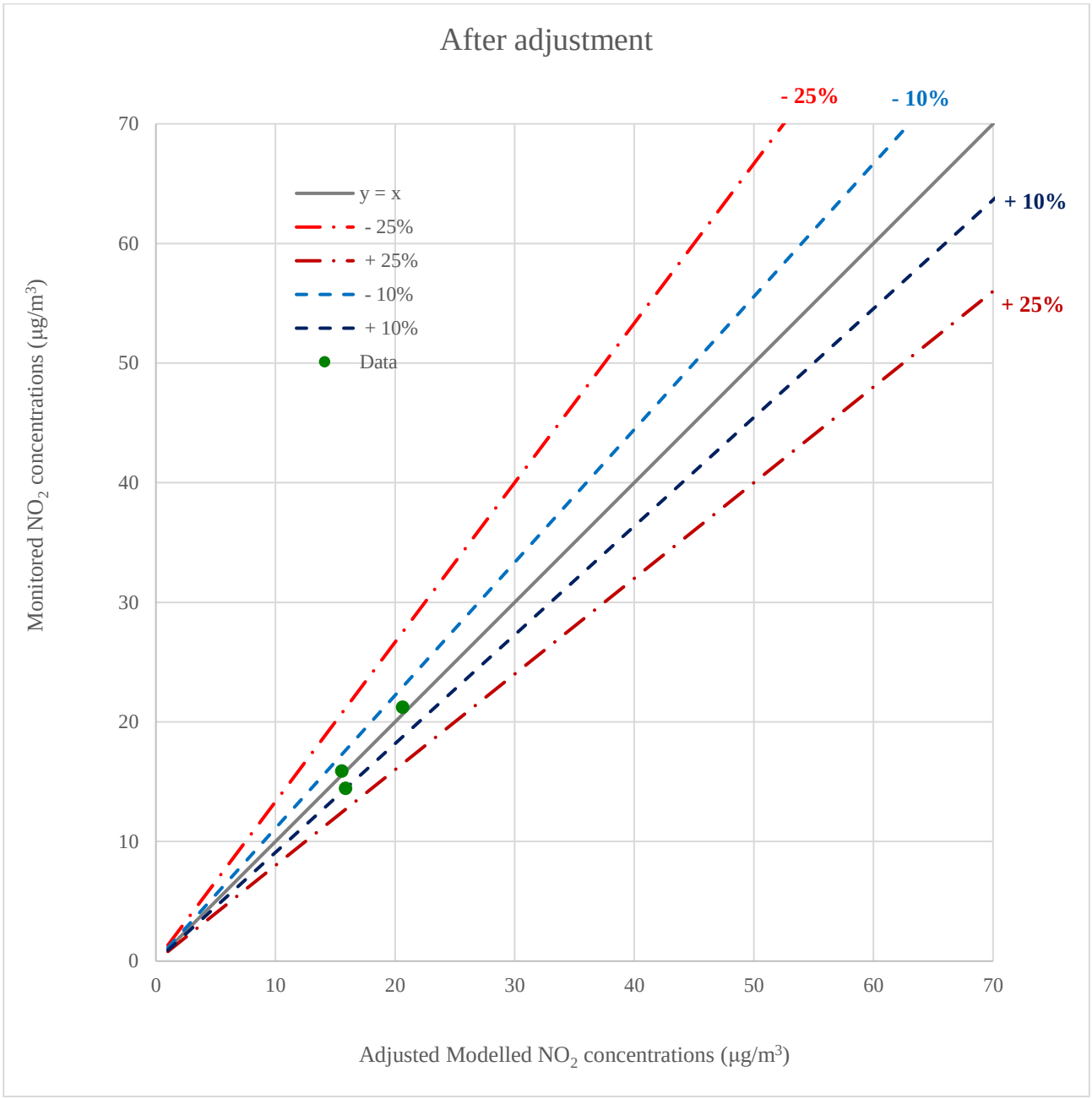
F.4.13 A comparison of monitored and modelled annual mean NO_2 concentrations in the St. Mellons/Llanrumney area before and after adjustment are shown in Table 17 with the graphical representations presented in Diagram 3.

Table 17: Comparison of modelled and monitored annual mean NO_2 concentrations before and after adjustment in the St. Mellons/Llanrumney area

Site ID	Background NO_2 concentration ($\mu g/m^3$)	Monitored NO_2 concentration ($\mu g/m^3$)	Modelled NO_2 concentration ($\mu g/m^3$)	% Difference (modelled – monitored)/monitored
Before adjustment				
1	12.9	14.6	14.7	0.4%
3	13.1	16.0	14.5	-9.5%
7	15.7	21.5	18.6	-13.2%
After adjustment				
1	12.9	14.6	16.0	9.5%
3	13.1	16.0	15.7	-2.5%
7	15.7	21.5	20.9	-2.8%
Note: only Arup diffusion tubes in the local roads verification zone were adjusted				

Diagram 3: Monitored and modelled annual mean NO_2 concentrations for local minor roads before and after adjustment




After adjustment
- 25%
- 10%
+ 10%
+ 25%
y = x
- 25%
+ 25%
- 10%
+ 10%
Data
Monitored NO2 concentrations (µg/m3)
Adjusted Modelled NO2 concentrations (µg/m3)
0
10
20
30
40
50
60
70

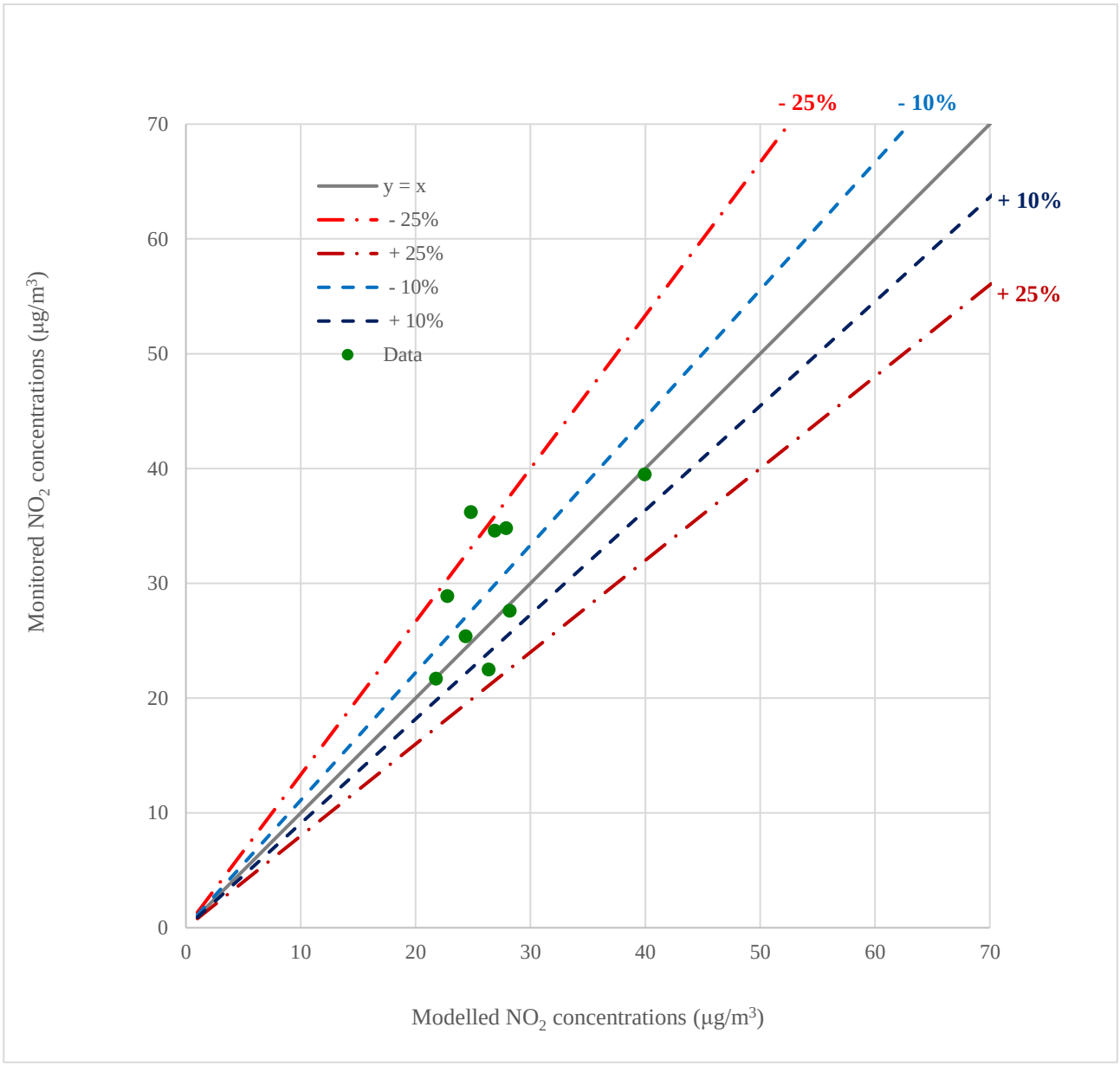
F.4.14 A comparison of monitored and modelled annual mean NO_2 concentrations along the major A-roads and motorway are shown in Table 18 with the graphical representations presented in Diagram 4.

F.4.15 NCC2C is located at Junction 27 of the M4. Only the main M4 carriageway has been included in the model and the lack of inclusion of other sources (e.g. the B4591 and the roundabout) is likely to contribute to the underprediction at this location.

Table 18: Comparison of modelled and monitored annual mean NO_2 concentrations along major A-roads and motorway

Site ID	**Background NO_2 concentration ($\mu g/m^3$)**	**Monitored NO_2 concentration ($\mu g/m^3$)**	**Modelled NO_2 concentration ($\mu g/m^3$)**	**% Difference (modelled – monitored)/ monitored**
NCC2C	17.4	36.2	24.8	-31.5%
NCC4B	17.4	34.8	27.9	-19.9%
NCC6B	19.6	34.6	26.9	-22.3%
NCC7B	17.4	27.6	28.2	2.1%
NCC15	17.4	22.5	26.4	17.1%
NCC17A	19.6	25.4	24.3	-4.2%
NCC18C	17.4	39.5	39.9	1.1%
NCC63	19.6	28.9	22.7	-21.3%
211	18.9	21.7	21.8	0.3%

Diagram 4: Monitored and modelled annual mean NO_2 concentrations for major A-roads and motorways



Construction traffic assessment results

Model results – human with route option 1

F.4.16 The predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the construction scenario (DM 2022 and DS 2022 route option 1) at each receptor are presented in Table 19, Table 20 and Table 21.

Table 19: Predicted annual mean NO_2 concentrations for the construction scenario in 2022 route option 1

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	24.5	24.5	<0.1	Negligible
R2	26.6	26.6	<0.1	Negligible
R3	20.9	20.9	<0.1	Negligible
R4	22.8	22.8	<0.1	Negligible
R5	21.3	21.3	<0.1	Negligible
R6	16.3	16.3	<0.1	Negligible
R7	19.6	19.7	0.1	Negligible
R8	19.0	19.1	0.1	Negligible
R9	21.4	21.5	0.1	Negligible
R10	23.5	23.5	<0.1	Negligible
R11	24.2	24.2	<0.1	Negligible
R12	19.7	19.7	<0.1	Negligible
R13	16.0	16.0	<0.1	Negligible
R14	21.5	21.6	0.1	Negligible
R15	19.8	19.8	<0.1	Negligible
R16	21.6	21.7	0.1	Negligible
R17	27.0	27.2	0.2	Negligible
R18	22.9	23.1	0.2	Negligible
R19	14.6	14.6	<0.1	Negligible
R20	15.2	15.3	0.1	Negligible
R21	14.9	14.9	<0.1	Negligible
R22	21.1	21.5	0.4	Negligible
R23	18.0	18.2	0.2	Negligible
R24	15.5	15.6	0.1	Negligible
R25	16.0	16.3	0.3	Negligible
R26	13.6	13.8	0.2	Negligible
R27	16.1	16.1	<0.1	Negligible
R28	16.5	16.5	<0.1	Negligible
R29	14.5	14.5	<0.1	Negligible
R30	14.2	14.2	<0.1	Negligible
R31	23.7	23.8	0.1	Negligible
R32	16.2	16.2	<0.1	Negligible
R33 (Glasllwch AQMA)	33.6	33.6	<0.1	Negligible
R34 (Glasllwch AQMA)	33.7	33.7	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	20.8	20.8	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	22.8	22.8	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	22.5	22.5	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R38 (Shaftesbury/Crindau AQMA)	23.8	23.8	<0.1	Negligible
R39	14.0	14.0	<0.1	Negligible
R40	13.5	13.5	<0.1	Negligible
S1	18.4	18.4	<0.1	Negligible
S2	17.0	17.0	<0.1	Negligible
S3	14.3	14.3	<0.1	Negligible
S4	14.6	14.6	<0.1	Negligible
S5	15.7	15.7	<0.1	Negligible
S6	15.7	15.8	0.1	Negligible
S7	16.8	16.8	<0.1	Negligible
S8	15.0	15.0	<0.1	Negligible
S9	14.6	14.7	0.1	Negligible
S10	17.1	17.1	<0.1	Negligible
S11	15.8	15.8	<0.1	Negligible
H1	17.5	17.5	<0.1	Negligible
F1	14.0	14.2	0.2	Negligible
F2	13.9	14.0	0.1	Negligible
F3	12.9	13.0	0.1	Negligible

Table 20: Predicted annual mean PM_{10} concentrations and number of 24-hour mean exceedances for the construction scenario in 2022 route option 1

ID	Annual mean concentration				No. 24-hour mean exceedances	
	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R1	13.7	13.7	<0.1	Negligible	0	0
R2	14.5	14.5	<0.1	Negligible	0	0
R3	14.2	14.2	<0.1	Negligible	0	0
R4	15.0	15.0	<0.1	Negligible	0	0
R5	14.7	14.7	<0.1	Negligible	0	0
R6	13.5	13.5	<0.1	Negligible	0	0
R7	15.1	15.2	0.1	Negligible	0	0
R8	14.6	14.6	<0.1	Negligible	0	0
R9	14.9	14.9	<0.1	Negligible	0	0
R10	15.7	15.7	<0.1	Negligible	0	0
R11	14.2	14.3	0.1	Negligible	0	0
R12	13.0	13.0	<0.1	Negligible	1	1
R13	12.7	12.7	<0.1	Negligible	1	1
R14	13.5	13.5	<0.1	Negligible	0	0
R15	13.2	13.2	<0.1	Negligible	0	0
R16	13.4	13.4	<0.1	Negligible	0	0
R17	13.9	14.0	0.1	Negligible	0	0
R18	13.5	13.5	<0.1	Negligible	0	0
R19	12.1	12.1	<0.1	Negligible	1	1
R20	13.1	13.1	<0.1	Negligible	0	0

ID	Annual mean concentration				No. 24-hour mean exceedances	
	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R21	12.1	12.1	<0.1	Negligible	1	1
R22	13.8	13.9	0.1	Negligible	0	0
R23	13.4	13.4	<0.1	Negligible	0	0
R24	13.1	13.1	<0.1	Negligible	0	0
R25	13.2	13.2	<0.1	Negligible	0	0
R26	12.5	12.5	<0.1	Negligible	1	1
R27	13.0	13.0	<0.1	Negligible	1	1
R28	13.0	13.0	<0.1	Negligible	1	1
R29	13.0	13.0	<0.1	Negligible	1	1
R30	12.9	12.9	<0.1	Negligible	1	1
R31	15.5	15.5	<0.1	Negligible	0	0
R32	14.8	14.8	<0.1	Negligible	0	0
R33 (Glasllwch AQMA)	16.0	16.0	<0.1	Negligible	0	0
R34 (Glasllwch AQMA)	16.0	16.0	<0.1	Negligible	0	0
R35 (Newport - HighCross AQMA 2018)	14.5	14.5	<0.1	Negligible	0	0
R36 (Newport - HighCross AQMA 2018)	14.7	14.7	<0.1	Negligible	0	0
R37 (Shaftesbury/Crindau AQMA)	15.5	15.5	<0.1	Negligible	0	0
R38 (Shaftesbury/Crindau AQMA)	15.7	15.7	<0.1	Negligible	0	0
R39	12.5	12.5	<0.1	Negligible	1	1
R40	12.2	12.2	<0.1	Negligible	1	1
S1	14.1	14.1	<0.1	Negligible	0	0
S2	14.0	14.0	<0.1	Negligible	0	0
S3	13.0	13.0	<0.1	Negligible	1	1
S4	14.1	14.1	<0.1	Negligible	0	0
S5	12.6	12.6	<0.1	Negligible	1	1
S6	13.4	13.4	<0.1	Negligible	0	0
S7	12.9	12.9	<0.1	Negligible	1	1
S8	12.4	12.4	<0.1	Negligible	1	1
S9	12.1	12.1	<0.1	Negligible	1	1
S10	15.0	15.0	<0.1	Negligible	0	0
S11	14.8	14.8	<0.1	Negligible	0	0
H1	12.8	12.8	<0.1	Negligible	1	1
F1	12.9	13.0	0.1	Negligible	1	1
F2	12.9	12.9	<0.1	Negligible	1	1
F3	12.4	12.4	<0.1	Negligible	1	1

Table 21: Predicted annual mean $PM_{2.5}$ concentrations for the construction scenario in 2022 route option 1

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	8.5	8.5	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R2	9.5	9.5	<0.1	Negligible
R3	9.1	9.1	<0.1	Negligible
R4	10.2	10.2	<0.1	Negligible
R5	9.7	9.7	<0.1	Negligible
R6	9.1	9.1	<0.1	Negligible
R7	9.8	9.8	<0.1	Negligible
R8	9.3	9.3	<0.1	Negligible
R9	9.5	9.5	<0.1	Negligible
R10	10.4	10.4	<0.1	Negligible
R11	9.6	9.6	<0.1	Negligible
R12	8.9	8.9	<0.1	Negligible
R13	8.7	8.7	<0.1	Negligible
R14	9.2	9.2	<0.1	Negligible
R15	9.0	9.0	<0.1	Negligible
R16	9.1	9.1	<0.1	Negligible
R17	9.4	9.4	<0.1	Negligible
R18	9.2	9.2	<0.1	Negligible
R19	8.1	8.1	<0.1	Negligible
R20	8.6	8.6	<0.1	Negligible
R21	8.1	8.1	<0.1	Negligible
R22	9.0	9.0	<0.1	Negligible
R23	8.8	8.8	<0.1	Negligible
R24	8.6	8.6	<0.1	Negligible
R25	8.6	8.7	0.1	Negligible
R26	7.9	7.9	<0.1	Negligible
R27	8.5	8.5	<0.1	Negligible
R28	8.5	8.5	<0.1	Negligible
R29	8.4	8.4	<0.1	Negligible
R30	8.4	8.4	<0.1	Negligible
R31	9.6	9.6	<0.1	Negligible
R32	9.1	9.1	<0.1	Negligible
R33 (Glasllwch AQMA)	10.3	10.3	<0.1	Negligible
R34 (Glasllwch AQMA)	10.3	10.3	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	9.4	9.4	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	9.5	9.5	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	10.0	10.0	<0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	10.1	10.1	<0.1	Negligible
R39	7.7	7.7	<0.1	Negligible
R40	7.6	7.6	<0.1	Negligible
S1	9.4	9.4	<0.1	Negligible
S2	9.3	9.3	<0.1	Negligible
S3	8.8	8.8	<0.1	Negligible
S4	9.2	9.2	<0.1	Negligible
S5	8.7	8.7	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
S6	9.1	9.1	<0.1	Negligible
S7	8.8	8.8	<0.1	Negligible
S8	8.5	8.5	<0.1	Negligible
S9	8.0	8.0	<0.1	Negligible
S10	9.0	9.0	<0.1	Negligible
S11	9.0	9.0	<0.1	Negligible
H1	8.6	8.6	<0.1	Negligible
F1	8.5	8.5	<0.1	Negligible
F2	8.5	8.5	<0.1	Negligible
F3	7.9	7.9	<0.1	Negligible

Model results – ecological with route option 1

F.4.17 The predicted annual mean concentrations of NOx at all modelled ecological receptors for the construction scenario (DM 2022 and DS 2022 with route option 1) are presented in Table 22.

Table 22: Predicted NOx concentrations for the construction scenario in 2022 with route option 1

ID	OS grid reference		NOx concentrations (2022) with route option 1			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
Glamorganshire Canal LNR						
E1_A	313500	181578	31.4	31.4	<0.1	Above standard
E1_B	313201	181455	44.4	44.5	<0.1	Above standard
Glamorgan Canal and Long Wood SSSI						
E2_A	313647	181366	22.6	22.6	<0.1	Below standard
E2_B	313650	181321	20.9	20.9	<0.1	Below standard
Fforestganol A Chwm Nofydd SSSI						
E3_A	315277	182480	20.3	20.3	<0.1	Below standard
E3_B	315262	182522	19.3	19.3	<0.1	Below standard
Howardian LNR						
E4_A	320362	178902	37.3	37.4	<0.1	Above standard
Ancient Semi Natural Woodland (A38)						
E5_A (to the west)	322427	181928	66.3	66.6	0.3	Above standard
E6_A (to the east)	322530	181915	60.8	61.1	0.3	Above standard
Gwent Levels - Rumney and Peterstone SSSI (transect 1)						
E7_A	325180	181433	19.6	20.7	1.1	Below standard
E7_B	325189	181438	18.1	18.6	0.4	Below standard
E7_C	325198	181442	17.8	18.1	0.3	Below standard
E7_D	325207	181447	17.6	17.8	0.2	Below standard
E7_E	325215	181451	17.5	17.7	0.2	Below standard
E7_F	325224	181456	17.5	17.6	0.2	Below standard
E7_G	325246	181467	17.4	17.5	0.1	Below standard
E7_H	325269	181479	17.3	17.4	0.1	Below standard
E7_I	325313	181502	17.3	17.3	0.1	Below standard

ID	OS grid reference		NOx concentrations (2022) with route option 1			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E7_J	325358	181525	17.2	17.3	<0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 2)						
E8_A	325669	180881	14.4	15.5	1.1	Below standard
E8_B	325672	180890	14.2	14.6	0.5	Below standard
E8_C	325675	180900	14.1	14.4	0.3	Below standard
E8_D	325678	180909	14.1	14.3	0.2	Below standard
E8_E	325682	180919	14.0	14.2	0.2	Below standard
E8_F	325685	180928	14.0	14.2	0.1	Below standard
E8_G	325693	180952	14.0	14.1	0.1	Below standard
E8_H	325701	180976	14.0	14.1	0.1	Below standard
E8_I	325717	181023	16.8	16.8	0.1	Below standard
E8_J	325733	181070	16.8	16.8	<0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 3)						
E9_A	325812	180788	14.3	15.4	1.0	Below standard
E9_B	325807	180780	14.1	14.5	0.4	Below standard
E9_C	325802	180771	14.0	14.3	0.3	Below standard
E9_D	325798	180762	14.0	14.2	0.2	Below standard
E9_E	325793	180753	14.0	14.1	0.2	Below standard
E9_F	325788	180745	14.0	14.1	0.1	Below standard
E9_G	325776	180723	14.0	14.0	0.1	Below standard
E9_H	325764	180701	13.9	14.0	0.1	Below standard
E9_I	325740	180657	13.9	14.0	<0.1	Below standard
E9_J	325716	180613	13.9	14.0	<0.1	Below standard
Allt-Yr-Yn LNR						
E9_12	328643	188310	67.7	67.8	<0.1	Above standard
Ely Valley SSSI (Transect 1)						
E12_A	305615	180072	41.9	41.9	<0.1	Above standard
E12_B	305617	180082	33.6	33.6	<0.1	Above standard
E12_C	305620	180091	28.7	28.7	<0.1	Below standard
E12_D	305623	180101	25.6	25.6	<0.1	Below standard
E12_E	305625	180111	23.3	23.3	<0.1	Below standard
E12_F	305628	180120	21.6	21.6	<0.1	Below standard
E12_G	305635	180144	18.9	18.9	<0.1	Below standard
E12_H	305642	180168	17.2	17.2	<0.1	Below standard
Ely Valley SSSI (Transect 2)						
E13_A	305619	180009	45.4	45.4	<0.1	Above standard
E13_B	305616	179999	35.0	35.0	<0.1	Above standard
E13_C	305614	179989	29.8	29.8	<0.1	Below standard
E13_D	305611	179980	26.5	26.5	<0.1	Below standard
E13_E	305609	179970	24.1	24.1	<0.1	Below standard
E13_F	305606	179960	22.3	22.3	<0.1	Below standard

ID	OS grid reference		NOx concentrations (2022) with route option 1			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E13_G	305599	179936	19.3	19.3	<0.1	Below standard
E13_H	305593	179912	17.4	17.4	<0.1	Below standard
E13_I	305580	179864	15.3	15.3	<0.1	Below standard

Model results – human with route option 2

F.4.18 The predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the construction scenario (DM 2022 and DS 2022 with route option 2) at each receptor are presented in Table 23, Table 24 and Table 25.

Table 23: Predicted annual mean NO_2 concentrations for the construction scenario in in 2022 route option 2

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	24.5	24.5	<0.1	Negligible
R2	26.6	26.6	<0.1	Negligible
R3	20.9	20.9	<0.1	Negligible
R4	22.8	22.8	<0.1	Negligible
R5	21.3	21.3	<0.1	Negligible
R6	16.3	16.3	<0.1	Negligible
R7	19.6	19.7	0.1	Negligible
R8	19.0	19.1	0.1	Negligible
R9	21.4	21.5	0.1	Negligible
R10	23.5	23.5	<0.1	Negligible
R11	24.2	24.2	<0.1	Negligible
R12	19.7	19.7	<0.1	Negligible
R13	16.0	16.0	<0.1	Negligible
R14	21.5	21.6	0.1	Negligible
R15	19.8	19.8	<0.1	Negligible
R16	21.6	21.7	0.1	Negligible
R17	27.0	27.2	0.2	Negligible
R18	22.9	23.1	0.2	Negligible
R19	14.6	14.6	<0.1	Negligible
R20	15.2	15.5	0.3	Negligible
R21	14.9	15.0	0.1	Negligible
R22	21.1	21.5	0.4	Negligible
R23	18.0	18.2	0.2	Negligible
R24	15.5	15.6	0.1	Negligible
R25	16.0	16.7	0.7	Negligible
R26	13.6	13.6	<0.1	Negligible
R27	16.1	16.1	<0.1	Negligible
R28	16.5	16.5	<0.1	Negligible
R29	14.5	14.5	<0.1	Negligible
R30	14.2	14.2	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R31	23.7	23.8	0.1	Negligible
R32	16.2	16.2	<0.1	Negligible
R33 (Glasllwch AQMA)	33.6	33.6	<0.1	Negligible
R34 (Glasllwch AQMA)	33.7	33.7	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	20.8	20.8	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	22.8	22.8	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	22.5	22.5	<0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	23.8	23.8	<0.1	Negligible
R39	14.0	14.0	<0.1	Negligible
R40	13.5	13.5	<0.1	Negligible
S1	18.4	18.4	<0.1	Negligible
S2	17.0	17.0	<0.1	Negligible
S3	14.3	14.3	<0.1	Negligible
S4	14.6	14.6	<0.1	Negligible
S5	15.7	15.7	<0.1	Negligible
S6	15.7	15.8	0.1	Negligible
S7	16.8	16.8	<0.1	Negligible
S8	15.0	15.0	<0.1	Negligible
S9	14.6	14.7	0.1	Negligible
S10	17.1	17.1	<0.1	Negligible
S11	15.8	15.8	<0.1	Negligible
H1	17.5	17.5	<0.1	Negligible
F1	14.0	14.2	0.2	Negligible
F2	13.9	14.0	0.1	Negligible
F3	12.9	13.0	0.1	Negligible

Table 24: Predicted annual mean PM_{10} concentrations and number of 24-hour mean exceedances for the construction scenario in 2022 route option 2

ID	Annual mean concentration				No. 24-hour mean exceedances	
	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R1	13.7	13.7	<0.1	Negligible	0	0
R2	14.5	14.5	<0.1	Negligible	0	0
R3	14.2	14.2	<0.1	Negligible	0	0
R4	15.0	15.0	<0.1	Negligible	0	0
R5	14.7	14.7	<0.1	Negligible	0	0
R6	13.5	13.5	<0.1	Negligible	0	0
R7	15.1	15.2	0.1	Negligible	0	0
R8	14.6	14.6	<0.1	Negligible	0	0
R9	14.9	14.9	<0.1	Negligible	0	0
R10	15.7	15.7	<0.1	Negligible	0	0
R11	14.2	14.3	0.1	Negligible	0	0
R12	13.0	13.0	<0.1	Negligible	1	1
R13	12.7	12.7	<0.1	Negligible	1	1
R14	13.5	13.5	<0.1	Negligible	0	0

ID	Annual mean concentration				No. 24-hour mean exceedances	
	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R15	13.2	13.2	<0.1	Negligible	0	0
R16	13.4	13.4	<0.1	Negligible	0	0
R17	13.9	14.0	0.1	Negligible	0	0
R18	13.5	13.5	<0.1	Negligible	0	0
R19	12.1	12.1	<0.1	Negligible	1	1
R20	13.1	13.1	<0.1	Negligible	0	0
R21	12.1	12.1	<0.1	Negligible	1	1
R22	13.8	13.9	0.1	Negligible	0	0
R23	13.4	13.4	<0.1	Negligible	0	0
R24	13.1	13.1	<0.1	Negligible	0	0
R25	13.2	13.2	<0.1	Negligible	0	0
R26	12.5	12.5	<0.1	Negligible	1	1
R27	13.0	13.0	<0.1	Negligible	1	1
R28	13.0	13.0	<0.1	Negligible	1	1
R29	13.0	13.0	<0.1	Negligible	1	1
R30	12.9	12.9	<0.1	Negligible	1	1
R31	15.5	15.5	<0.1	Negligible	0	0
R32	14.8	14.8	<0.1	Negligible	0	0
R33 (Glasllwch AQMA)	16.0	16.0	<0.1	Negligible	0	0
R34 (Glasllwch AQMA)	16.0	16.0	<0.1	Negligible	0	0
R35 (Newport - HighCross AQMA 2018)	14.5	14.5	<0.1	Negligible	0	0
R36 (Newport - HighCross AQMA 2018)	14.7	14.7	<0.1	Negligible	0	0
R37 (Shaftesbury/Crindau AQMA)	15.5	15.5	<0.1	Negligible	0	0
R38 (Shaftesbury/Crindau AQMA)	15.7	15.7	<0.1	Negligible	0	0
R39	12.5	12.5	<0.1	Negligible	1	1
R40	12.2	12.2	<0.1	Negligible	1	1
S1	14.1	14.1	<0.1	Negligible	0	0
S2	14.0	14.0	<0.1	Negligible	0	0
S3	13.0	13.0	<0.1	Negligible	1	1
S4	14.1	14.1	<0.1	Negligible	0	0
S5	12.6	12.6	<0.1	Negligible	1	1
S6	13.4	13.4	<0.1	Negligible	0	0
S7	12.9	12.9	<0.1	Negligible	1	1
S8	12.4	12.4	<0.1	Negligible	1	1
S9	12.1	12.1	<0.1	Negligible	1	1
S10	15.0	15.0	<0.1	Negligible	0	0
S11	14.8	14.8	<0.1	Negligible	0	0
H1	12.8	12.8	<0.1	Negligible	1	1
F1	12.9	13.0	0.1	Negligible	1	1

ID	Annual mean concentration				No. 24-hour mean exceedances	
	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
F2	12.9	12.9	<0.1	Negligible	1	1
F3	12.4	12.4	<0.1	Negligible	1	1

Table 25: Predicted annual mean $PM_{2.5}$ concentrations for the construction scenario in 2022 route option 2

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	8.5	8.5	<0.1	Negligible
R2	9.5	9.5	<0.1	Negligible
R3	9.1	9.1	<0.1	Negligible
R4	10.2	10.2	<0.1	Negligible
R5	9.7	9.7	<0.1	Negligible
R6	9.1	9.1	<0.1	Negligible
R7	9.8	9.8	<0.1	Negligible
R8	9.3	9.3	<0.1	Negligible
R9	9.5	9.5	<0.1	Negligible
R10	10.4	10.4	<0.1	Negligible
R11	9.6	9.6	<0.1	Negligible
R12	8.9	8.9	<0.1	Negligible
R13	8.7	8.7	<0.1	Negligible
R14	9.2	9.2	<0.1	Negligible
R15	9.0	9.0	<0.1	Negligible
R16	9.1	9.1	<0.1	Negligible
R17	9.4	9.4	<0.1	Negligible
R18	9.2	9.2	<0.1	Negligible
R19	8.1	8.1	<0.1	Negligible
R20	8.6	8.6	<0.1	Negligible
R21	8.1	8.1	<0.1	Negligible
R22	9.0	9.0	<0.1	Negligible
R23	8.8	8.8	<0.1	Negligible
R24	8.6	8.6	<0.1	Negligible
R25	8.6	8.7	0.1	Negligible
R26	7.9	7.9	<0.1	Negligible
R27	8.5	8.5	<0.1	Negligible
R28	8.5	8.5	<0.1	Negligible
R29	8.4	8.4	<0.1	Negligible
R30	8.4	8.4	<0.1	Negligible
R31	9.6	9.6	<0.1	Negligible
R32	9.1	9.1	<0.1	Negligible
R33 (Glasllwch AQMA)	10.3	10.3	<0.1	Negligible
R34 (Glasllwch AQMA)	10.3	10.3	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	9.4	9.4	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	9.5	9.5	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	10.0	10.0	<0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	10.1	10.1	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R39	7.7	7.7	<0.1	Negligible
R40	7.6	7.6	<0.1	Negligible
S1	9.4	9.4	<0.1	Negligible
S2	9.3	9.3	<0.1	Negligible
S3	8.8	8.8	<0.1	Negligible
S4	9.2	9.2	<0.1	Negligible
S5	8.7	8.7	<0.1	Negligible
S6	9.1	9.1	<0.1	Negligible
S7	8.8	8.8	<0.1	Negligible
S8	8.5	8.5	<0.1	Negligible
S9	8.0	8.0	<0.1	Negligible
S10	9.0	9.0	<0.1	Negligible
S11	9.0	9.0	<0.1	Negligible
H1	8.6	8.6	<0.1	Negligible
F1	8.5	8.5	<0.1	Negligible
F2	8.5	8.5	<0.1	Negligible
F3	7.9	7.9	<0.1	Negligible

Model results – ecological with route option 2

F.4.19 The predicted annual mean concentrations of NOx at all modelled ecological receptors for the construction scenario (DM 2022 and DS 2022 with route option 2) are presented in Table 26.

Table 26: Predicted NOx concentrations for the construction scenario in 2022 with route option 2

ID	OS grid reference		NOx concentrations (2022) with route option 2			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
Glamorganshire Canal LNR						
E1_A	313500	181578	31.4	31.4	<0.1	Above standard
E1_B	313201	181455	44.4	44.5	<0.1	Above standard
Glamorgan Canal and Long Wood SSSI						
E2_A	313647	181366	22.6	22.6	<0.1	Below standard
E2_B	313650	181321	20.9	20.9	<0.1	Below standard
Fforestganol A Chwm Nofydd SSSI						
E3_A	315277	182480	20.3	20.3	<0.1	Below standard
E3_B	315262	182522	19.3	19.3	<0.1	Below standard
Howardian LNR						
E4_A	320362	178902	37.3	37.4	<0.1	Above standard
Ancient Semi Natural Woodland (A38)						
E5_A (to the west)	322427	181928	66.3	66.6	0.3	Above standard
E6_A (to the east)	322530	181915	60.8	61.1	0.3	Above standard
Gwent Levels - Rumney and Peterstone SSSI (transect 1)						
E7_A	325180	181433	19.6	19.6	<0.1	Below standard
E7_B	325189	181438	18.1	18.2	<0.1	Below standard

ID	OS grid reference		NOx concentrations (2022) with route option 2			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E7_C	325198	181442	17.8	17.8	<0.1	Below standard
E7_D	325207	181447	17.6	17.6	<0.1	Below standard
E7_E	325215	181451	17.5	17.6	<0.1	Below standard
E7_F	325224	181456	17.5	17.5	<0.1	Below standard
E7_G	325246	181467	17.4	17.4	<0.1	Below standard
E7_H	325269	181479	17.3	17.3	<0.1	Below standard
E7_I	325313	181502	17.3	17.3	<0.1	Below standard
E7_J	325358	181525	17.2	17.2	<0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 2)						
E8_A	325669	180881	14.4	14.4	<0.1	Below standard
E8_B	325672	180890	14.2	14.2	<0.1	Below standard
E8_C	325675	180900	14.1	14.1	<0.1	Below standard
E8_D	325678	180909	14.1	14.1	<0.1	Below standard
E8_E	325682	180919	14.0	14.1	<0.1	Below standard
E8_F	325685	180928	14.0	14.1	<0.1	Below standard
E8_G	325693	180952	14.0	14.0	<0.1	Below standard
E8_H	325701	180976	14.0	14.0	<0.1	Below standard
E8_I	325717	181023	16.8	16.8	<0.1	Below standard
E8_J	325733	181070	16.8	16.8	<0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 3)						
E9_A	325812	180788	14.3	14.3	<0.1	Below standard
E9_B	325807	180780	14.1	14.1	<0.1	Below standard
E9_C	325802	180771	14.0	14.0	<0.1	Below standard
E9_D	325798	180762	14.0	14.0	<0.1	Below standard
E9_E	325793	180753	14.0	14.0	<0.1	Below standard
E9_F	325788	180745	14.0	14.0	<0.1	Below standard
E9_G	325776	180723	14.0	14.0	<0.1	Below standard
E9_H	325764	180701	13.9	13.9	<0.1	Below standard
E9_I	325740	180657	13.9	13.9	<0.1	Below standard
E9_J	325716	180613	13.9	13.9	<0.1	Below standard
Allt-Yr-Yn LNR						
E9_12	328643	188310	67.7	67.8	<0.1	Above standard
Ely Valley SSSI (Transect 1)						
E12_A	305615	180072	41.9	41.9	<0.1	Above standard
E12_B	305617	180082	33.6	33.6	<0.1	Above standard
E12_C	305620	180091	28.7	28.7	<0.1	Below standard
E12_D	305623	180101	25.6	25.6	<0.1	Below standard
E12_E	305625	180111	23.3	23.3	<0.1	Below standard
E12_F	305628	180120	21.6	21.6	<0.1	Below standard
E12_G	305635	180144	18.9	18.9	<0.1	Below standard
E12_H	305642	180168	17.2	17.2	<0.1	Below standard

ID	OS grid reference		NOx concentrations (2022) with route option 2			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
Ely Valley SSSI (Transect 2)						
E13_A	305619	180009	45.4	45.4	<0.1	Above standard
E13_B	305616	179999	35.0	35.0	<0.1	Above standard
E13_C	305614	179989	29.8	29.8	<0.1	Below standard
E13_D	305611	179980	26.5	26.5	<0.1	Below standard
E13_E	305609	179970	24.1	24.1	<0.1	Below standard
E13_F	305606	179960	22.3	22.3	<0.1	Below standard
E13_G	305599	179936	19.3	19.3	<0.1	Below standard
E13_H	305593	179912	17.4	17.4	<0.1	Below standard
E13_I	305580	179864	15.3	15.3	<0.1	Below standard

Operational traffic assessment results

Model results - human

F.4.20 The predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the operational scenario (DM 2028 and DS 2028) at each receptor are presented in Table 27, Table 28 and Table 29.

Table 27: Predicted annual mean NO_2 concentrations for the operational scenario in 2028

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	17.0	17.1	0.1	Negligible
R2	18.7	18.9	0.2	Negligible
R3	14.9	15.0	0.1	Negligible
R4	16.8	16.8	<0.1	Negligible
R5	15.3	15.3	<0.1	Negligible
R6	12.1	12.2	0.1	Negligible
R7	14.2	14.4	0.2	Negligible
R8	13.7	13.9	0.2	Negligible
R9	15.1	15.3	0.2	Negligible
R10	16.7	17.0	0.3	Negligible
R11	17.5	17.8	0.3	Negligible
R12	14.4	14.5	0.1	Negligible
R13	12.2	12.3	0.1	Negligible
R14	15.6	15.8	0.2	Negligible
R15	14.5	14.7	0.2	Negligible
R16	15.6	15.9	0.3	Negligible
R17	19.0	16.7	-2.3	Slight beneficial
R18	16.4	18.2	1.8	Negligible
R19	11.5	11.7	0.2	Negligible
R20	11.8	12.0	0.2	Negligible
R21	11.6	11.9	0.3	Negligible
R22	15.4	17.1	1.7	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R23	13.5	14.4	0.9	Negligible
R24	11.9	12.5	0.6	Negligible
R25	12.2	13.4	1.2	Negligible
R26	10.9	11.0	0.1	Negligible
R27	11.9	12.0	0.1	Negligible
R28	12.2	12.3	0.1	Negligible
R29	10.8	10.9	0.1	Negligible
R30	10.6	10.7	0.1	Negligible
R31	16.7	16.9	0.2	Negligible
R32	12.3	12.3	<0.1	Negligible
R33 (Glasllwch AQMA)	23.6	23.7	0.1	Negligible
R34 (Glasllwch AQMA)	23.7	23.8	0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	15.0	15.0	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	16.3	16.3	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	16.2	16.3	0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	17.0	17.2	0.2	Negligible
R39	10.2	10.2	<0.1	Negligible
R40	9.8	9.7	-0.1	Negligible
S1	13.5	13.6	0.1	Negligible
S2	12.7	12.8	0.1	Negligible
S3	10.9	11.0	0.1	Negligible
S4	11.2	11.3	0.1	Negligible
S5	12.0	12.1	0.1	Negligible
S6	11.9	11.9	<0.1	Negligible
S7	12.7	12.8	0.1	Negligible
S8	11.6	11.7	0.1	Negligible
S9	11.5	11.7	0.2	Negligible
S10	13.1	13.1	<0.1	Negligible
S11	11.9	12.0	0.1	Negligible
H1	13.6	13.6	<0.1	Negligible
F1	11.0	12.0	1.0	Negligible
F2	11.0	11.3	0.3	Negligible
F3	10.5	10.9	0.4	Negligible

Table 28: Predicted PM_{10} concentrations for the operational scenario in 2028

ID	Annual mean concentration				No. 24-hour mean exceedances	
	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R1	13.4	13.4	<0.1	Negligible	0	0
R2	14.3	14.3	<0.1	Negligible	0	0
R3	13.9	14.0	0.1	Negligible	0	0
R4	14.7	14.7	<0.1	Negligible	0	0
R5	14.3	14.4	0.1	Negligible	0	0
R6	13.1	13.1	<0.1	Negligible	0	0
R7	14.8	14.9	0.1	Negligible	0	0

ID	Annual mean concentration				No. 24-hour mean exceedances	
	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R8	14.2	14.3	0.1	Negligible	0	0
R9	14.6	14.6	<0.1	Negligible	0	0
R10	15.4	15.5	0.1	Negligible	0	0
R11	13.9	14.0	0.1	Negligible	0	0
R12	12.7	12.7	<0.1	Negligible	1	1
R13	12.3	12.3	<0.1	Negligible	1	1
R14	13.1	13.2	0.1	Negligible	0	0
R15	12.8	12.9	0.1	Negligible	1	1
R16	13.1	13.1	<0.1	Negligible	0	0
R17	13.6	13.2	-0.4	Negligible	0	0
R18	13.1	13.4	0.3	Negligible	0	0
R19	11.8	11.8	<0.1	Negligible	1	1
R20	12.8	12.8	<0.1	Negligible	1	1
R21	11.8	11.9	0.1	Negligible	1	1
R22	13.5	13.9	0.4	Negligible	0	0
R23	13.1	13.3	0.2	Negligible	0	0
R24	12.8	12.9	0.1	Negligible	1	1
R25	12.8	13.1	0.3	Negligible	1	0
R26	12.2	12.2	<0.1	Negligible	1	1
R27	12.7	12.7	<0.1	Negligible	1	1
R28	12.7	12.7	<0.1	Negligible	1	1
R29	12.7	12.7	<0.1	Negligible	1	1
R30	12.6	12.6	<0.1	Negligible	1	1
R31	15.2	15.2	<0.1	Negligible	0	0
R32	14.5	14.5	<0.1	Negligible	0	0
R33 (Glasllwch AQMA)	15.7	15.7	<0.1	Negligible	0	0
R34 (Glasllwch AQMA)	15.7	15.7	<0.1	Negligible	0	0
R35 (Newport - HighCross AQMA 2018)	14.2	14.2	<0.1	Negligible	0	0
R36 (Newport - HighCross AQMA 2018)	14.4	14.4	<0.1	Negligible	0	0
R37 (Shaftesbury/Crindau AQMA)	15.3	15.3	<0.1	Negligible	0	0
R38 (Shaftesbury/Crindau AQMA)	15.4	15.4	<0.1	Negligible	0	0
R39	12.2	12.2	<0.1	Negligible	1	1
R40	11.9	12.0	0.1	Negligible	1	1
S1	13.7	13.7	<0.1	Negligible	0	0
S2	13.6	13.6	<0.1	Negligible	0	0
S3	12.7	12.7	<0.1	Negligible	1	1
S4	13.8	13.8	<0.1	Negligible	0	0
S5	12.3	12.3	<0.1	Negligible	1	1
S6	13.0	13.0	<0.1	Negligible	1	1

ID	Annual mean concentration				No. 24-hour mean exceedances	
	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
S7	12.5	12.5	<0.1	Negligible	1	1
S8	12.0	12.1	0.1	Negligible	1	1
S9	11.8	11.8	<0.1	Negligible	1	1
S10	14.7	14.7	<0.1	Negligible	0	0
S11	14.4	14.5	0.1	Negligible	0	0
H1	12.5	12.5	<0.1	Negligible	1	1
F1	12.6	12.8	0.2	Negligible	1	1
F2	12.6	12.7	0.1	Negligible	1	1
F3	12.1	12.2	0.1	Negligible	1	1

Table 29: Predicted annul mean $PM_{2.5}$ concentrations for the operational scenario in 2028

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	8.3	8.3	<0.1	Negligible
R2	9.2	9.2	<0.1	Negligible
R3	8.8	8.8	<0.1	Negligible
R4	9.9	9.9	<0.1	Negligible
R5	9.4	9.4	<0.1	Negligible
R6	8.8	8.8	<0.1	Negligible
R7	9.5	9.5	<0.1	Negligible
R8	9.0	9.0	<0.1	Negligible
R9	9.2	9.2	<0.1	Negligible
R10	10.1	10.1	<0.1	Negligible
R11	9.3	9.4	0.1	Negligible
R12	8.6	8.6	<0.1	Negligible
R13	8.4	8.4	<0.1	Negligible
R14	8.9	8.9	<0.1	Negligible
R15	8.7	8.7	<0.1	Negligible
R16	8.8	8.8	<0.1	Negligible
R17	9.1	8.9	-0.2	Negligible
R18	8.9	9.0	0.1	Negligible
R19	7.8	7.8	<0.1	Negligible
R20	8.3	8.3	<0.1	Negligible
R21	7.8	7.8	<0.1	Negligible
R22	8.7	8.9	0.2	Negligible
R23	8.5	8.6	0.1	Negligible
R24	8.3	8.4	0.1	Negligible
R25	8.3	8.5	0.2	Negligible
R26	7.7	7.7	<0.1	Negligible
R27	8.2	8.3	0.1	Negligible
R28	8.2	8.2	<0.1	Negligible
R29	8.1	8.1	<0.1	Negligible
R30	8.1	8.1	<0.1	Negligible
R31	9.3	9.3	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R32	8.8	8.8	<0.1	Negligible
R33 (Glasllwch AQMA)	10.0	10.0	<0.1	Negligible
R34 (Glasllwch AQMA)	10.0	10.1	0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	9.1	9.1	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	9.2	9.2	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	9.7	9.8	0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	9.8	9.9	0.1	Negligible
R39	7.4	7.4	<0.1	Negligible
R40	7.3	7.4	0.1	Negligible
S1	9.0	9.1	0.1	Negligible
S2	9.0	9.0	<0.1	Negligible
S3	8.5	8.5	<0.1	Negligible
S4	9.0	9.0	<0.1	Negligible
S5	8.4	8.4	<0.1	Negligible
S6	8.8	8.8	<0.1	Negligible
S7	8.5	8.5	<0.1	Negligible
S8	8.2	8.2	<0.1	Negligible
S9	7.8	7.8	<0.1	Negligible
S10	8.8	8.8	<0.1	Negligible
S11	8.8	8.8	<0.1	Negligible
H1	8.3	8.3	<0.1	Negligible
F1	8.2	8.3	0.1	Negligible
F2	8.2	8.3	0.1	Negligible
F3	7.6	7.7	0.1	Negligible

Model results - ecological

F.4.21 The predicted annual mean concentrations of NOx at all modelled ecological receptors for the operational scenario (DM 2028 and DS 2028) are presented in Table 30.

Table 30: Predicted NOx concentrations for the operational scenario in 2028

ID	OS grid reference		NOx concentrations (2028)			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
Glamorganshire Canal LNR						
E1_A	313500	181578	22.0	22.1	0.1	Below standard
E1_B	313201	181455	30.6	30.7	0.1	Above standard
Glamorgan Canal and Long Wood SSSI						
E2_A	313647	181366	16.3	16.4	<0.1	Below standard
E2_B	313650	181321	15.2	15.3	<0.1	Below standard
Fforestganol A Chwm Nofydd SSSI						
E3_A	315277	182480	14.7	14.7	<0.1	Below standard
E3_B	315262	182522	14.0	14.0	<0.1	Below standard
Howardian LNR						

ID	OS grid reference		NOx concentrations (2028)			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E4_A	320362	178902	26.5	26.7	0.1	Below standard
Ancient Semi Natural Woodland (A38) (to the west)						
E5_A	322427	181928	43.4	45.0	1.6	Above standard
E5_A_transect	322386	181932	45.0	46.6	1.6	Above standard
E5_B_transect	322386	181927	34.6	35.7	1.1	Above standard
E5_C_transect	322385	181922	30.1	30.9	0.8	Above standard
E5_D_transect	322385	181917	27.4	28.1	0.7	Below standard
E5_E_transect	322385	181912	25.6	26.1	0.6	Below standard
E5_F_transect	322384	181907	24.2	24.7	0.5	Below standard
E5_G_transect	322384	181902	23.2	23.7	0.5	Below standard
Ancient Semi Natural Woodland (A38) (to the east)						
E6_A	322530	181915	40.2	41.6	1.4	Above standard
E6_B_transect	322529	181910	32.7	33.7	1.4	Above standard
E6_C_transect	322529	181905	29.0	29.8	1.0	Below standard
E6_D_transect	322528	181900	26.6	27.3	0.8	Below standard
E6_E_transect	322527	181895	24.9	25.5	0.6	Below standard
E6_F_transect	322526	181890	23.7	24.2	0.6	Below standard
E6_G_transect	322526	181885	22.8	23.2	0.5	Below standard
E6_H_transect	322525	181880	22.0	22.5	0.4	Below standard
E6_I_transect	322524	181875	21.4	21.8	0.4	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 1)						
E7_A	325180	181433	15.4	15.5	0.1	Below standard
E7_B	325189	181438	14.5	14.6	0.1	Below standard
E7_C	325198	181442	14.3	14.4	0.1	Below standard
E7_D	325207	181447	14.2	14.3	0.1	Below standard
E7_E	325215	181451	14.1	14.2	0.1	Below standard
E7_F	325224	181456	14.1	14.2	0.1	Below standard
E7_G	325246	181467	14.0	14.1	0.1	Below standard
E7_H	325269	181479	14.0	14.1	0.1	Below standard
E7_I	325313	181502	14.0	14.0	0.1	Below standard
E7_J	325358	181525	13.9	14.0	0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 2)						
E8_A	325669	180881	11.6	11.7	<0.1	Below standard
E8_B	325672	180890	11.5	11.5	<0.1	Below standard
E8_C	325675	180900	11.4	11.5	<0.1	Below standard
E8_D	325678	180909	11.4	11.5	<0.1	Below standard
E8_E	325682	180919	11.4	11.4	<0.1	Below standard
E8_F	325685	180928	11.4	11.4	<0.1	Below standard
E8_G	325693	180952	11.4	11.4	<0.1	Below standard
E8_H	325701	180976	11.4	11.4	<0.1	Below standard
E8_I	325717	181023	13.7	13.7	<0.1	Below standard

ID	OS grid reference		NOx concentrations (2028)			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E8_J	325733	181070	13.7	13.7	<0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 3)						
E9_A	325812	180788	11.6	11.6	<0.1	Below standard
E9_B	325807	180780	11.4	11.5	<0.1	Below standard
E9_C	325802	180771	11.4	11.4	<0.1	Below standard
E9_D	325798	180762	11.4	11.4	<0.1	Below standard
E9_E	325793	180753	11.4	11.4	<0.1	Below standard
E9_F	325788	180745	11.4	11.4	<0.1	Below standard
E9_G	325776	180723	11.3	11.4	<0.1	Below standard
E9_H	325764	180701	11.3	11.4	<0.1	Below standard
E9_I	325740	180657	11.3	11.4	<0.1	Below standard
E9_J	325716	180613	11.3	11.4	<0.1	Below standard
Allt-Yr-Yn LNR						
E9_12	328643	188310	45.5	45.7	0.2	Above standard
Gwent Levels - Rumney and Peterstone SSSI – near site entrance crossing of Feandre Reen (transect 4)						
E10_A	324670	181412	15.1	19.5	4.4	Below standard
E10_B	324670	181402	15.1	17.1	2.0	Below standard
E10_C	324670	181392	15.1	16.4	1.3	Below standard
E10_D	324671	181382	15.1	16.1	1.0	Below standard
E10_E	324671	181372	15.1	15.9	0.8	Below standard
E10_F	324671	181362	15.1	15.8	0.7	Below standard
E10_G	324671	181337	15.1	15.6	0.5	Below standard
E10_H	324672	181312	15.1	15.5	0.5	Below standard
E10_I	324673	181262	15.0	15.4	0.4	Below standard
E10_J	324673	181212	15.0	15.3	0.3	Below standard
Gwent Levels - Rumney and Peterstone SSSI - near site entrance crossing of Feandre Reen (transect 5)						
E11_A	324670	181423	19.4	19.4	4.3	Below standard
E11_B	324670	181433	17.2	17.2	2.1	Below standard
E11_C	324669	181443	16.7	16.7	1.6	Below standard
E11_D	324669	181453	16.4	16.4	1.2	Below standard
E11_E	324669	181463	16.2	16.2	1.1	Below standard
E11_F	324668	181473	16.2	16.2	1.0	Below standard
E11_G	324668	181498	16.2	16.2	0.8	Below standard
E11_H	324667	181523	16.4	16.4	0.8	Below standard
Ely Valley SSSI (transect 1)						
E12_A	305615	180072	28.6	28.7	0.1	Below standard
E12_B	305617	180082	23.3	23.3	0.1	Below standard
E12_C	305620	180091	20.2	20.2	<0.1	Below standard
E12_D	305623	180101	18.2	18.2	<0.1	Below standard
E12_E	305625	180111	16.7	16.7	<0.1	Below standard
E12_F	305628	180120	15.6	15.7	<0.1	Below standard
E12_G	305635	180144	13.9	13.9	<0.1	Below standard

ID	OS grid reference		NOx concentrations (2028)			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E12_H	305642	180168	12.8	12.8	<0.1	Below standard
Ely Valley SSSI (transect 2)						
E13_A	305619	180009	31.1	31.2	0.1	Above standard
E13_B	305616	179999	24.2	24.3	0.1	Below standard
E13_C	305614	179989	20.9	20.9	0.1	Below standard
E13_D	305611	179980	18.7	18.7	<0.1	Below standard
E13_E	305609	179970	17.1	17.1	<0.1	Below standard
E13_F	305606	179960	15.9	16.0	<0.1	Below standard
E13_G	305599	179936	14.0	14.0	<0.1	Below standard
E13_H	305593	179912	12.8	12.8	<0.1	Below standard
E13_I	305580	179864	11.5	11.5	<0.1	Below standard

Sensitivity test traffic assessment results - Construction

Model results – human with route option 1 (sensitivity test)

F.4.22 The predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the sensitivity construction scenario (DM 2022 and DS 2022 route option 2 using 2019 backgrounds and emissions) at each receptor are presented in Table 31, Table 32 and Table 33.

Table 31: Predicted NO_2 concentrations for the sensitivity construction scenario route option 1

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	30.3	30.3	<0.1	Negligible
R2	32.7	32.7	<0.1	Negligible
R3	25.6	25.6	<0.1	Negligible
R4	27.2	27.2	<0.1	Negligible
R5	25.8	25.8	<0.1	Negligible
R6	19.3	19.3	<0.1	Negligible
R7	23.6	23.8	0.2	Negligible
R8	22.9	23.1	0.2	Negligible
R9	25.9	26.1	0.2	Negligible
R10	28.3	28.5	0.2	Negligible
R11	29.1	29.2	0.1	Negligible
R12	23.6	23.6	<0.1	Negligible
R13	18.8	18.8	<0.1	Negligible
R14	25.8	25.8	<0.1	Negligible
R15	23.6	23.6	<0.1	Negligible
R16	25.9	26.0	0.1	Negligible
R17	32.6	33.0	0.4	Negligible
R18	27.5	27.9	0.4	Negligible
R19	17.0	17.0	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R20	17.8	17.8	<0.1	Negligible
R21	17.4	17.5	0.1	Negligible
R22	25.2	25.8	0.6	Negligible
R23	21.4	21.7	0.3	Negligible
R24	18.1	18.4	0.3	Negligible
R25	18.8	19.1	0.3	Negligible
R26	15.6	16.0	0.4	Negligible
R27	19.2	19.2	<0.1	Negligible
R28	19.8	19.8	<0.1	Negligible
R29	17.3	17.3	<0.1	Negligible
R30	16.9	17.0	0.1	Negligible
R31	29.1	29.2	0.1	Negligible
R32	19.3	19.3	<0.1	Negligible
R33 (Glasllwch AQMA)	41.2	41.2	<0.1	Negligible
R34 (Glasllwch AQMA)	41.4	41.4	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	25.4	25.4	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	27.9	27.9	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	27.3	27.3	<0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	28.9	28.9	<0.1	Negligible
R39	17.1	17.1	<0.1	Negligible
R40	16.5	16.5	<0.1	Negligible
S1	22.1	22.1	<0.1	Negligible
S2	20.2	20.2	<0.1	Negligible
S3	16.7	16.7	<0.1	Negligible
S4	17.1	17.2	0.1	Negligible
S5	18.4	18.4	<0.1	Negligible
S6	18.5	18.6	0.1	Negligible
S7	19.8	19.8	<0.1	Negligible
S8	17.5	17.5	<0.1	Negligible
S9	17.0	17.1	0.1	Negligible
S10	20.2	20.2	<0.1	Negligible
S11	18.8	18.8	<0.1	Negligible
H1	20.3	20.3	<0.1	Negligible
F1	16.2	16.6	0.4	Negligible
F2	16.1	16.3	0.2	Negligible
F3	14.8	15.0	0.2	Negligible

Table 32: Predicted PM_{10} concentrations for the sensitivity construction scenario route option 1

Annual mean concentration					No. 24-hour mean exceedances	
ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R1	14.2	14.2	<0.1	Negligible	0	0
R2	15.1	15.1	<0.1	Negligible	0	0
R3	14.7	14.7	<0.1	Negligible	0	0
R4	15.5	15.5	<0.1	Negligible	0	0
R5	15.1	15.1	<0.1	Negligible	0	0

Annual mean concentration					No. 24-hour mean exceedances	
ID	**DM (µg/m^3)**	**DS (µg/m^3)**	**Change (µg/m^3)**	**Impact**	**DM**	**DS**
R6	13.8	13.8	<0.1	Negligible	0	0
R7	15.5	15.6	0.1	Negligible	0	0
R8	15.0	15.0	<0.1	Negligible	0	0
R9	15.3	15.4	0.1	Negligible	0	0
R10	16.1	16.2	0.1	Negligible	0	0
R11	14.7	14.7	<0.1	Negligible	0	0
R12	13.4	13.4	<0.1	Negligible	0	0
R13	13.0	13.0	<0.1	Negligible	1	1
R14	13.9	13.9	<0.1	Negligible	0	0
R15	13.6	13.6	<0.1	Negligible	0	0
R16	13.8	13.8	<0.1	Negligible	0	0
R17	14.4	14.4	<0.1	Negligible	0	0
R18	13.9	13.9	<0.1	Negligible	0	0
R19	12.5	12.5	<0.1	Negligible	1	1
R20	13.4	13.4	<0.1	Negligible	0	0
R21	12.5	12.5	<0.1	Negligible	1	1
R22	14.2	14.3	0.1	Negligible	0	0
R23	13.8	13.8	<0.1	Negligible	0	0
R24	13.4	13.5	0.1	Negligible	0	0
R25	13.5	13.6	0.1	Negligible	0	0
R26	12.8	12.8	<0.1	Negligible	1	1
R27	13.4	13.4	<0.1	Negligible	0	0
R28	13.4	13.4	<0.1	Negligible	0	0
R29	13.4	13.4	<0.1	Negligible	0	0
R30	13.3	13.3	<0.1	Negligible	0	0
R31	15.9	16.0	0.1	Negligible	0	0
R32	15.2	15.2	<0.1	Negligible	0	0
R33 (Glasllwch AQMA)	16.6	16.6	<0.1	Negligible	1	1
R34 (Glasllwch AQMA)	16.6	16.6	<0.1	Negligible	1	1
R35 (Newport - HighCross AQMA 2018)	15.0	15.0	<0.1	Negligible	0	0
R36 (Newport - HighCross AQMA 2018)	15.2	15.2	<0.1	Negligible	0	0
R37 (Shaftesbury/ Crindau AQMA)	16.0	16.0	<0.1	Negligible	0	0
R38	16.1	16.1	<0.1	Negligible	0	0

Annual mean concentration					No. 24-hour mean exceedances	
ID	**DM (µg/m^3)**	**DS (µg/m^3)**	**Change (µg/m^3)**	**Impact**	**DM**	**DS**
(Shaftesbury/ Crindau AQMA)						
R39	12.9	12.9	<0.1	Negligible	1	1
R40	12.6	12.6	<0.1	Negligible	1	1
S1	14.5	14.5	<0.1	Negligible	0	0
S2	14.3	14.3	<0.1	Negligible	0	0
S3	13.4	13.4	<0.1	Negligible	0	0
S4	14.5	14.5	<0.1	Negligible	0	0
S5	13.0	13.0	<0.1	Negligible	1	1
S6	13.7	13.7	<0.1	Negligible	0	0
S7	13.2	13.2	<0.1	Negligible	0	0
S8	12.7	12.7	<0.1	Negligible	1	1
S9	12.5	12.5	<0.1	Negligible	1	1
S10	15.4	15.4	<0.1	Negligible	0	0
S11	15.1	15.1	<0.1	Negligible	0	0
H1	13.2	13.2	<0.1	Negligible	0	0
F1	13.3	13.3	<0.1	Negligible	0	0
F2	13.3	13.3	<0.1	Negligible	0	0
F3	12.7	12.7	<0.1	Negligible	1	1

Table 33: Predicted $PM_{2.5}$ annual mean concentrations for the sensitivity construction scenario route option 1

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	9.0	9.0	<0.1	Negligible
R2	9.9	9.9	<0.1	Negligible
R3	9.5	9.5	<0.1	Negligible
R4	10.5	10.5	<0.1	Negligible
R5	10.1	10.1	<0.1	Negligible
R6	9.4	9.4	<0.1	Negligible
R7	10.2	10.2	<0.1	Negligible
R8	9.6	9.7	0.1	Negligible
R9	9.9	9.9	<0.1	Negligible
R10	10.7	10.8	0.1	Negligible
R11	10.0	10.1	0.1	Negligible
R12	9.2	9.2	<0.1	Negligible
R13	9.0	9.0	<0.1	Negligible
R14	9.5	9.5	<0.1	Negligible
R15	9.3	9.3	<0.1	Negligible
R16	9.5	9.5	<0.1	Negligible
R17	9.8	9.8	<0.1	Negligible
R18	9.5	9.5	<0.1	Negligible
R19	8.4	8.4	<0.1	Negligible
R20	8.9	8.9	<0.1	Negligible
R21	8.4	8.4	<0.1	Negligible
R22	9.3	9.4	0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R23	9.1	9.1	<0.1	Negligible
R24	8.9	8.9	<0.1	Negligible
R25	8.9	9.0	0.1	Negligible
R26	8.2	8.2	<0.1	Negligible
R27	8.9	8.9	<0.1	Negligible
R28	8.9	8.9	<0.1	Negligible
R29	8.7	8.7	<0.1	Negligible
R30	8.7	8.7	<0.1	Negligible
R31	10.0	10.0	<0.1	Negligible
R32	9.4	9.4	<0.1	Negligible
R33 (Glasllwch AQMA)	10.9	10.9	<0.1	Negligible
R34 (Glasllwch AQMA)	10.9	10.9	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	9.8	9.8	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	10.0	10.0	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	10.4	10.4	<0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	10.5	10.5	<0.1	Negligible
R39	8.0	8.0	<0.1	Negligible
R40	7.9	7.9	<0.1	Negligible
S1	9.7	9.7	<0.1	Negligible
S2	9.6	9.6	<0.1	Negligible
S3	9.1	9.1	<0.1	Negligible
S4	9.5	9.5	<0.1	Negligible
S5	9.0	9.0	<0.1	Negligible
S6	9.4	9.4	<0.1	Negligible
S7	9.1	9.1	<0.1	Negligible
S8	8.8	8.8	<0.1	Negligible
S9	8.3	8.3	<0.1	Negligible
S10	9.4	9.4	<0.1	Negligible
S11	9.4	9.4	<0.1	Negligible
H1	8.9	8.9	<0.1	Negligible
F1	8.8	8.8	<0.1	Negligible
F2	8.8	8.8	<0.1	Negligible
F3	8.2	8.2	<0.1	Negligible

Model results – ecological with route option 1 (sensitivity test)

F.4.23 The predicted annual mean concentrations of NOx (using 2019 background and emissions) at all modelled ecological receptors for the sensitivity test construction scenario route option 1 are presented in Table 34.

Table 34: Predicted NOx concentrations for the sensitivity construction scenario

ID	OS grid reference		NOx concentrations (2022) with route option 1			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
Glamorganshire Canal LNR						
E1_A	313500	181578	39.4	39.4	<0.1	Above standard
E1_B	313201	181455	56.1	56.1	<0.1	Above standard
Glamorgan Canal and Long Wood SSSI						
E2_A	313647	181366	27.8	27.8	<0.1	Below standard
E2_B	313650	181321	25.6	25.6	<0.1	Below standard
Fforestganol A Chwm Nofydd SSSI						
E3_A	315277	182480	24.9	24.9	<0.1	Below standard
E3_B	315262	182522	23.5	23.5	<0.1	Below standard
Howardian LNR						
E4_A	320362	178902	45.6	45.6	<0.1	Above standard
Ancient Semi Natural Woodland (A38) (to the west)						
E5_A	322427	181928	83.8	84.3	0.6	Above standard
E5_A_new	322386	181932	87.0	87.6	0.6	Above standard
E5_B	322386	181927	65.3	65.7	0.4	Above standard
E5_C	322385	181922	55.7	56.0	0.3	Above standard
E5_D	322385	181917	50.0	50.3	0.3	Above standard
E5_E	322385	181912	46.2	46.4	0.2	Above standard
E5_F	322384	181907	43.3	43.5	0.2	Above standard
E5_G	322384	181902	41.2	41.4	0.2	Above standard
Ancient Semi Natural Woodland (A38) (to the east)						
E6_A	322530	181915	77.0	77.5	0.5	Above standard
E6_B_transect	322529	181910	61.3	61.7	0.4	Above standard
E6_C_transect	322529	181905	53.4	53.7	0.3	Above standard
E6_D_transect	322528	181900	48.4	48.6	0.2	Above standard
E6_E_transect	322527	181895	44.8	45.1	0.2	Above standard
E6_F_transect	322526	181890	42.3	42.4	0.2	Above standard
E6_G_transect	322526	181885	40.3	40.5	0.2	Above standard
E6_H_transect	322525	181880	38.7	38.9	0.2	Above standard
E6_I_transect	322524	181875	37.4	37.5	0.1	Above standard
Gwent Levels - Rumney and Peterstone SSSI (transect 1)						
E7_A	325180	181433	22.9	24.7	1.8	Below standard
E7_B	325189	181438	21.1	21.8	0.7	Below standard
E7_C	325198	181442	20.6	21.1	0.5	Below standard
E7_D	325207	181447	20.4	20.8	0.4	Below standard
E7_E	325215	181451	20.3	20.6	0.3	Below standard

ID	OS grid reference		NOx concentrations (2022) with route option 1			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E7_F	325224	181456	20.2	20.5	0.2	Below standard
E7_G	325246	181467	20.1	20.3	0.2	Below standard
E7_H	325269	181479	20.0	20.2	0.1	Below standard
E7_I	325313	181502	19.9	20.0	0.1	Below standard
E7_J	325358	181525	19.9	20.0	0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 2)						
E8_A	325669	180881	16.7	18.5	1.8	Below standard
E8_B	325672	180890	16.4	17.1	0.7	Below standard
E8_C	325675	180900	16.3	16.8	0.4	Below standard
E8_D	325678	180909	16.3	16.6	0.3	Below standard
E8_E	325682	180919	16.3	16.5	0.2	Below standard
E8_F	325685	180928	16.3	16.5	0.2	Below standard
E8_G	325693	180952	16.2	16.4	0.1	Below standard
E8_H	325701	180976	16.2	16.4	0.1	Below standard
E8_I	325717	181023	19.3	19.4	0.1	Below standard
E8_J	325733	181070	19.3	19.4	0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 3)						
E9_A	325812	180788	16.6	18.3	1.7	Below standard
E9_B	325807	180780	16.3	17.0	0.7	Below standard
E9_C	325802	180771	16.2	16.7	0.4	Below standard
E9_D	325798	180762	16.2	16.5	0.3	Below standard
E9_E	325793	180753	16.2	16.4	0.3	Below standard
E9_F	325788	180745	16.2	16.4	0.2	Below standard
E9_G	325776	180723	16.1	16.3	0.2	Below standard
E9_H	325764	180701	16.1	16.2	0.1	Below standard
E9_I	325740	180657	16.1	16.2	0.1	Below standard
E9_J	325716	180613	16.1	16.1	0.1	Below standard
Allt-Yr-Yn LNR						
E9_12	328643	188310	86.9	86.9	<0.1	Above standard
Ely Valley SSSI (Transect 1)						
E12_A	305615	180072	53.3	53.3	<0.1	Above standard
E12_B	305617	180082	42.4	42.4	<0.1	Above standard
E12_C	305620	180091	36.1	36.1	<0.1	Above standard
E12_D	305623	180101	31.9	31.9	<0.1	Above standard
E12_E	305625	180111	29.0	29.0	<0.1	Below standard
E12_F	305628	180120	26.8	26.8	<0.1	Below standard
E12_G	305635	180144	23.1	23.2	<0.1	Below standard
E12_H	305642	180168	20.9	20.9	<0.1	Below standard
Ely Valley SSSI (Transect 2)						
E13_A	305619	180009	57.6	57.7	<0.1	Above standard
E13_B	305616	179999	44.2	44.2	<0.1	Above standard

ID	OS grid reference		NOx concentrations (2022) with route option 1			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E13_C	305614	179989	37.5	37.5	<0.1	Above standard
E13_D	305611	179980	33.1	33.1	<0.1	Above standard
E13_E	305609	179970	30.0	30.0	<0.1	Above standard
E13_F	305606	179960	27.7	27.7	<0.1	Below standard
E13_G	305599	179936	23.8	23.8	<0.1	Below standard
E13_H	305593	179912	21.4	21.4	<0.1	Below standard
E13_I	305580	179864	18.6	18.6	<0.1	Below standard

Model results – human with route option 2 (sensitivity test)

F.4.24 The predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the sensitivity construction scenario (DM 2022 and DS 2022 route option 2 using 2019 backgrounds and emissions) at each receptor are presented in Table 35, Table 36 and Table 37.

Table 35: Predicted NO_2 concentrations for the sensitivity construction scenario route option 2

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	30.3	30.3	<0.1	Negligible
R2	32.7	32.7	<0.1	Negligible
R3	25.6	25.6	<0.1	Negligible
R4	27.2	27.2	<0.1	Negligible
R5	25.8	25.8	<0.1	Negligible
R6	19.3	19.3	<0.1	Negligible
R7	23.6	23.8	0.2	Negligible
R8	22.9	23.1	0.2	Negligible
R9	25.9	26.1	0.2	Negligible
R10	28.3	28.5	0.2	Negligible
R11	29.1	29.2	0.1	Negligible
R12	23.6	23.6	<0.1	Negligible
R13	18.8	18.8	<0.1	Negligible
R14	25.8	25.8	<0.1	Negligible
R15	23.6	23.6	<0.1	Negligible
R16	25.9	26.0	0.1	Negligible
R17	32.6	33.0	0.4	Negligible
R18	27.5	27.9	0.4	Negligible
R19	17.0	17.0	<0.1	Negligible
R20	17.8	18.2	0.4	Negligible
R21	17.4	17.6	0.2	Negligible
R22	25.2	25.8	0.6	Negligible
R23	21.4	21.7	0.3	Negligible
R24	18.1	18.4	0.3	Negligible
R25	18.8	19.8	1.0	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R26	15.6	15.7	0.1	Negligible
R27	19.2	19.2	<0.1	Negligible
R28	19.8	19.8	<0.1	Negligible
R29	17.3	17.3	<0.1	Negligible
R30	16.9	17.0	0.1	Negligible
R31	29.1	29.2	0.1	Negligible
R32	19.3	19.3	<0.1	Negligible
R33 (Glasllwch AQMA)	41.2	41.2	<0.1	Negligible
R34 (Glasllwch AQMA)	41.4	41.4	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	25.4	25.4	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	27.9	27.9	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	27.3	27.3	<0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	28.9	28.9	<0.1	Negligible
R39	17.1	17.1	<0.1	Negligible
R40	16.5	16.5	<0.1	Negligible
S1	22.1	22.1	<0.1	Negligible
S2	20.2	20.2	<0.1	Negligible
S3	16.7	16.7	<0.1	Negligible
S4	17.1	17.2	0.1	Negligible
S5	18.4	18.4	<0.1	Negligible
S6	18.5	18.6	0.1	Negligible
S7	19.8	19.8	<0.1	Negligible
S8	17.5	17.5	<0.1	Negligible
S9	17.0	17.1	0.1	Negligible
S10	20.2	20.2	<0.1	Negligible
S11	18.8	18.8	<0.1	Negligible
H1	20.3	20.3	<0.1	Negligible
F1	16.2	16.6	0.4	Negligible
F2	16.1	16.2	0.1	Negligible
F3	14.8	15.0	0.2	Negligible

Table 36: Predicted PM_{10} concentrations for the sensitivity construction scenario route option 2

Annual mean concentration					No. 24-hour mean exceedances	
ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R1	14.2	14.2	<0.1	Negligible	0	0
R2	15.1	15.1	<0.1	Negligible	0	0
R3	14.7	14.7	<0.1	Negligible	0	0
R4	15.5	15.5	<0.1	Negligible	0	0
R5	15.1	15.1	<0.1	Negligible	0	0
R6	13.8	13.8	<0.1	Negligible	0	0
R7	15.5	15.6	0.1	Negligible	0	0
R8	15.0	15.0	<0.1	Negligible	0	0
R9	15.3	15.4	0.1	Negligible	0	0

Annual mean concentration					No. 24-hour mean exceedances	
ID	**DM ($\mu g/m^3$)**	**DS ($\mu g/m^3$)**	**Change ($\mu g/m^3$)**	**Impact**	**DM**	**DS**
R10	16.1	16.2	0.1	Negligible	0	0
R11	14.7	14.7	<0.1	Negligible	0	0
R12	13.4	13.4	<0.1	Negligible	0	0
R13	13.0	13.0	<0.1	Negligible	1	1
R14	13.9	13.9	<0.1	Negligible	0	0
R15	13.6	13.6	<0.1	Negligible	0	0
R16	13.8	13.8	<0.1	Negligible	0	0
R17	14.4	14.4	<0.1	Negligible	0	0
R18	13.9	13.9	<0.1	Negligible	0	0
R19	12.5	12.5	<0.1	Negligible	1	1
R20	13.4	13.5	0.1	Negligible	0	0
R21	12.5	12.5	<0.1	Negligible	1	1
R22	14.2	14.3	0.1	Negligible	0	0
R23	13.8	13.8	<0.1	Negligible	0	0
R24	13.4	13.5	0.1	Negligible	0	0
R25	13.5	13.6	0.1	Negligible	0	0
R26	12.8	12.8	<0.1	Negligible	1	1
R27	13.4	13.4	<0.1	Negligible	0	0
R28	13.4	13.4	<0.1	Negligible	0	0
R29	13.4	13.4	<0.1	Negligible	0	0
R30	13.3	13.3	<0.1	Negligible	0	0
R31	15.9	16.0	0.1	Negligible	0	0
R32	15.2	15.2	<0.1	Negligible	0	0
R33 (Glasllwch AQMA)	16.6	16.6	<0.1	Negligible	1	1
R34 (Glasllwch AQMA)	16.6	16.6	<0.1	Negligible	1	1
R35 (Newport - HighCross AQMA 2018)	15.0	15.0	<0.1	Negligible	0	0
R36 (Newport - HighCross AQMA 2018)	15.2	15.2	<0.1	Negligible	0	0
R37 (Shaftesbury/Crindau AQMA)	16.0	16.0	<0.1	Negligible	0	0
R38 (Shaftesbury/Crindau AQMA)	16.1	16.1	<0.1	Negligible	0	0
R39	12.9	12.9	<0.1	Negligible	1	1
R40	12.6	12.6	<0.1	Negligible	1	1
S1	14.5	14.5	<0.1	Negligible	0	0
S2	14.3	14.3	<0.1	Negligible	0	0
S3	13.4	13.4	<0.1	Negligible	0	0
S4	14.5	14.5	<0.1	Negligible	0	0
S5	13.0	13.0	<0.1	Negligible	1	1
S6	13.7	13.7	<0.1	Negligible	0	0
S7	13.2	13.2	<0.1	Negligible	0	0

Annual mean concentration					No. 24-hour mean exceedances	
ID	**DM ($\mu g/m^3$)**	**DS ($\mu g/m^3$)**	**Change ($\mu g/m^3$)**	**Impact**	**DM**	**DS**
S8	12.7	12.7	<0.1	Negligible	1	1
S9	12.5	12.5	<0.1	Negligible	1	1
S10	15.4	15.4	<0.1	Negligible	0	0
S11	15.1	15.1	<0.1	Negligible	0	0
H1	13.2	13.2	<0.1	Negligible	0	0
F1	13.3	13.3	<0.1	Negligible	0	0
F2	13.3	13.3	<0.1	Negligible	0	0
F3	12.7	12.7	<0.1	Negligible	1	1

Table 37: Predicted $PM_{2.5}$ annual mean concentrations for the sensitivity construction scenario route option 2

ID	DM ($\mu g/m^3$)	DS ($\mu g/m^3$)	Change ($\mu g/m^3$)	Impact
R1	9.0	9.0	<0.1	Negligible
R2	9.9	9.9	<0.1	Negligible
R3	9.5	9.5	<0.1	Negligible
R4	10.5	10.5	<0.1	Negligible
R5	10.1	10.1	<0.1	Negligible
R6	9.4	9.4	<0.1	Negligible
R7	10.2	10.2	<0.1	Negligible
R8	9.6	9.7	0.1	Negligible
R9	9.9	9.9	<0.1	Negligible
R10	10.7	10.8	0.1	Negligible
R11	10.0	10.1	0.1	Negligible
R12	9.2	9.2	<0.1	Negligible
R13	9.0	9.0	<0.1	Negligible
R14	9.5	9.5	<0.1	Negligible
R15	9.3	9.3	<0.1	Negligible
R16	9.5	9.5	<0.1	Negligible
R17	9.8	9.8	<0.1	Negligible
R18	9.5	9.5	<0.1	Negligible
R19	8.4	8.4	<0.1	Negligible
R20	8.9	8.9	<0.1	Negligible
R21	8.4	8.4	<0.1	Negligible
R22	9.3	9.4	0.1	Negligible
R23	9.1	9.1	<0.1	Negligible
R24	8.9	8.9	<0.1	Negligible
R25	8.9	9.0	0.1	Negligible
R26	8.2	8.2	<0.1	Negligible
R27	8.9	8.9	<0.1	Negligible
R28	8.9	8.9	<0.1	Negligible
R29	8.7	8.7	<0.1	Negligible
R30	8.7	8.7	<0.1	Negligible
R31	10.0	10.0	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R32	9.4	9.4	<0.1	Negligible
R33 (Glasllwch AQMA)	10.9	10.9	<0.1	Negligible
R34 (Glasllwch AQMA)	10.9	10.9	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	9.8	9.8	<0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	10.0	10.0	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	10.4	10.4	<0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	10.5	10.5	<0.1	Negligible
R39	8.0	8.0	<0.1	Negligible
R40	7.9	7.9	<0.1	Negligible
S1	9.7	9.7	<0.1	Negligible
S2	9.6	9.6	<0.1	Negligible
S3	9.1	9.1	<0.1	Negligible
S4	9.5	9.5	<0.1	Negligible
S5	9.0	9.0	<0.1	Negligible
S6	9.4	9.4	<0.1	Negligible
S7	9.1	9.1	<0.1	Negligible
S8	8.8	8.8	<0.1	Negligible
S9	8.3	8.3	<0.1	Negligible
S10	9.4	9.4	<0.1	Negligible
S11	9.4	9.4	<0.1	Negligible
H1	8.9	8.9	<0.1	Negligible
F1	8.8	8.8	<0.1	Negligible
F2	8.8	8.8	<0.1	Negligible
F3	8.2	8.2	<0.1	Negligible

Model results – ecological with route option 2 (sensitivity test)

F.4.25 The predicted annual mean concentrations of NOx (using 2019 background and emissions) at all modelled ecological receptors for the sensitivity test construction scenario route option 2 are presented in Table 38.

Table 38: Predicted NOx concentrations for the sensitivity construction scenario

ID	OS grid reference		NOx concentrations (2022) with route option 2			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
Glamorganshire Canal LNR						
E1_A	313500	181578	39.4	39.4	<0.1	Above standard
E1_B	313201	181455	56.1	56.1	<0.1	Above standard
Glamorgan Canal and Long Wood SSSI						
E2_A	313647	181366	27.8	27.8	<0.1	Below standard
E2_B	313650	181321	25.6	25.6	<0.1	Below standard
Fforestganol A Chwm Nofydd SSSI						
E3_A	315277	182480	24.9	24.9	<0.1	Below standard
E3_B	315262	182522	23.5	23.5	<0.1	Below standard
Howardian LNR						

ID	OS grid reference		NOx concentrations (2022) with route option 2			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E4_A	320362	178902	45.6	45.6	<0.1	Above standard
Ancient Semi Natural Woodland (A38) (to the west)						
E5_A	322427	181928	83.8	84.3	0.6	Above standard
E5_A_transect	322386	181932	87.0	87.6	0.6	Above standard
E5_B_transect	322386	181927	65.3	65.7	0.4	Above standard
E5_C_transect	322385	181922	55.7	56.0	0.3	Above standard
E5_D_transect	322385	181917	50.0	50.3	0.3	Above standard
E5_E_transect	322385	181912	46.2	46.4	0.2	Above standard
E5_F_transect	322384	181907	43.3	43.5	0.2	Above standard
E5_G_transect	322384	181902	41.2	41.4	0.2	Above standard
Ancient Semi Natural Woodland (A38) (to the east)						
E6_A	322530	181915	77.0	77.5	0.5	Above standard
E6_B_transect	322529	181910	61.3	61.7	0.4	Above standard
E6_C_transect	322529	181905	53.4	53.7	0.3	Above standard
E6_D_transect	322528	181900	48.4	48.6	0.2	Above standard
E6_E_transect	322527	181895	44.8	45.1	0.2	Above standard
E6_F_transect	322526	181890	42.3	42.4	0.2	Above standard
E6_G_transect	322526	181885	40.3	40.5	0.2	Above standard
E6_H_transect	322525	181880	38.7	38.9	0.2	Above standard
E6_I_transect	322524	181875	37.4	37.5	0.1	Above standard
Gwent Levels - Rumney and Peterstone SSSI (transect 1)						
E7_A	325180	181433	22.9	23.0	0.1	Below standard
E7_B	325189	181438	21.1	21.1	<0.1	Below standard
E7_C	325198	181442	20.6	20.7	<0.1	Below standard
E7_D	325207	181447	20.4	20.4	<0.1	Below standard
E7_E	325215	181451	20.3	20.3	<0.1	Below standard
E7_F	325224	181456	20.2	20.3	<0.1	Below standard
E7_G	325246	181467	20.1	20.1	<0.1	Below standard
E7_H	325269	181479	20.0	20.1	<0.1	Below standard
E7_I	325313	181502	19.9	20.0	<0.1	Below standard
E7_J	325358	181525	19.9	19.9	<0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 2)						
E8_A	325669	180881	16.7	16.8	<0.1	Below standard
E8_B	325672	180890	16.4	16.4	<0.1	Below standard
E8_C	325675	180900	16.3	16.3	<0.1	Below standard
E8_D	325678	180909	16.3	16.3	<0.1	Below standard
E8_E	325682	180919	16.3	16.3	<0.1	Below standard
E8_F	325685	180928	16.3	16.3	<0.1	Below standard
E8_G	325693	180952	16.2	16.3	<0.1	Below standard
E8_H	325701	180976	16.2	16.3	<0.1	Below standard
E8_I	325717	181023	19.3	19.3	<0.1	Below standard

ID	OS grid reference		NOx concentrations (2022) with route option 2			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E8_J	325733	181070	19.3	19.3	<0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 3)						
E9_A	325812	180788	16.6	16.7	<0.1	Below standard
E9_B	325807	180780	16.3	16.3	<0.1	Below standard
E9_C	325802	180771	16.2	16.3	<0.1	Below standard
E9_D	325798	180762	16.2	16.2	<0.1	Below standard
E9_E	325793	180753	16.2	16.2	<0.1	Below standard
E9_F	325788	180745	16.2	16.2	<0.1	Below standard
E9_G	325776	180723	16.1	16.2	<0.1	Below standard
E9_H	325764	180701	16.1	16.1	<0.1	Below standard
E9_I	325740	180657	16.1	16.1	<0.1	Below standard
E9_J	325716	180613	16.1	16.1	<0.1	Below standard
Allt-Yr-Yn LNR						
E9_12	328643	188310	86.9	86.9	<0.1	Above standard
Ely Valley SSSI (Transect 1)						
E12_A	305615	180072	53.3	53.3	<0.1	Above standard
E12_B	305617	180082	42.4	42.4	<0.1	Above standard
E12_C	305620	180091	36.1	36.1	<0.1	Above standard
E12_D	305623	180101	31.9	31.9	<0.1	Above standard
E12_E	305625	180111	29.0	29.0	<0.1	Below standard
E12_F	305628	180120	26.8	26.8	<0.1	Below standard
E12_G	305635	180144	23.1	23.2	<0.1	Below standard
E12_H	305642	180168	20.9	20.9	<0.1	Below standard
Ely Valley SSSI (Transect 2)						
E13_A	305619	180009	57.6	57.7	<0.1	Above standard
E13_B	305616	179999	44.2	44.2	<0.1	Above standard
E13_C	305614	179989	37.5	37.5	<0.1	Above standard
E13_D	305611	179980	33.1	33.1	<0.1	Above standard
E13_E	305609	179970	30.0	30.0	<0.1	Above standard
E13_F	305606	179960	27.7	27.7	<0.1	Below standard
E13_G	305599	179936	23.8	23.8	<0.1	Below standard
E13_H	305593	179912	21.4	21.4	<0.1	Below standard
E13_I	305580	179864	18.6	18.6	<0.1	Below standard

Sensitivity test traffic assessment results - Operation

Model results – human (sensitivity test)

F.4.26 The predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the sensitivity operational scenario (DM 2028 and DS 2028 using 2019 backgrounds and emissions) at each receptor are presented in Table 39, Table 40 and Table 41.

Table 39: Predicted annual mean NO_2 concentrations for the operational sensitivity scenario

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	31.7	31.8	0.1	Negligible
R2	34.0	34.2	0.2	Negligible
R3	26.5	26.7	0.2	Negligible
R4	27.4	27.5	0.1	Negligible
R5	26.1	26.2	0.1	Negligible
R6	19.4	19.6	0.2	Negligible
R7	23.8	24.1	0.3	Negligible
R8	23.1	23.3	0.2	Negligible
R9	26.2	26.5	0.3	Negligible
R10	28.7	29.3	0.6	Negligible
R11	29.8	30.4	0.6	Negligible
R12	23.8	24.0	0.2	Negligible
R13	18.9	19.0	0.1	Negligible
R14	26.1	26.5	0.4	Negligible
R15	23.9	24.2	0.3	Negligible
R16	26.3	26.7	0.4	Negligible
R17	33.1	28.4	-4.7	Moderate beneficial
R18	27.9	31.6	3.7	Moderate adverse
R19	17.3	17.6	0.3	Negligible
R20	17.9	18.5	0.6	Negligible
R21	17.5	18.2	0.7	Negligible
R22	25.5	28.9	3.4	Slight adverse
R23	21.6	23.4	1.8	Negligible
R24	18.2	19.6	1.4	Negligible
R25	18.9	21.4	2.5	Slight adverse
R26	15.8	16.0	0.2	Negligible
R27	19.4	19.7	0.3	Negligible
R28	20.1	20.3	0.2	Negligible
R29	17.5	17.7	0.2	Negligible
R30	17.2	17.3	0.1	Negligible
R31	30.1	30.4	0.3	Negligible
R32	19.7	19.8	0.1	Negligible
R33 (Glasllwch AQMA)	43.0	43.1	0.1	Negligible
R34 (Glasllwch AQMA)	43.2	43.4	0.2	Negligible
R35 (Newport - HighCross AQMA 2018)	26.2	26.3	0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	28.9	29.1	0.2	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R37 (Shaftesbury/Crindau AQMA)	28.2	28.4	0.2	Negligible
R38 (Shaftesbury/Crindau AQMA)	29.9	30.2	0.3	Negligible
R39	17.7	17.8	0.1	Negligible
R40	17.0	16.9	-0.1	Negligible
S1	22.3	22.4	0.1	Negligible
S2	20.3	20.4	0.1	Negligible
S3	16.8	16.9	0.1	Negligible
S4	17.2	17.3	0.1	Negligible
S5	18.5	18.6	0.1	Negligible
S6	18.7	18.8	0.1	Negligible
S7	20.0	20.2	0.2	Negligible
S8	17.6	17.9	0.3	Negligible
S9	17.3	17.7	0.4	Negligible
S10	20.6	20.7	0.1	Negligible
S11	19.1	19.1	<0.1	Negligible
H1	20.4	20.4	<0.1	Negligible
F1	16.3	18.2	1.9	Negligible
F2	16.2	16.9	0.7	Negligible
F3	14.9	15.7	0.8	Negligible

Table 40: Predicted PM_{10} concentrations for the operational sensitivity scenario

Annual mean concentration					No. 24-hour mean exceedances	
ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact	DM	DS
R1	14.3	14.3	<0.1	Negligible	0	0
R2	15.2	15.2	<0.1	Negligible	0	0
R3	14.8	14.8	<0.1	Negligible	0	0
R4	15.5	15.5	<0.1	Negligible	0	0
R5	15.2	15.2	<0.1	Negligible	0	0
R6	13.9	13.9	<0.1	Negligible	0	0
R7	15.6	15.6	<0.1	Negligible	0	0
R8	15.0	15.0	<0.1	Negligible	0	0
R9	15.4	15.4	<0.1	Negligible	0	0
R10	16.2	16.3	0.1	Negligible	0	0
R11	14.8	14.9	0.1	Negligible	0	0
R12	13.4	13.4	<0.1	Negligible	0	0
R13	13.0	13.0	<0.1	Negligible	1	1
R14	13.9	13.9	<0.1	Negligible	0	0
R15	13.6	13.6	<0.1	Negligible	0	0
R16	13.8	13.9	0.1	Negligible	0	0
R17	14.4	13.9	-0.5	Negligible	0	0
R18	13.9	14.2	0.3	Negligible	0	0
R19	12.5	12.5	<0.1	Negligible	1	1
R20	13.4	13.5	0.1	Negligible	0	0
R21	12.5	12.6	0.1	Negligible	1	1
R22	14.2	14.6	0.4	Negligible	0	0

Annual mean concentration					No. 24-hour mean exceedances	
ID	**DM (µg/m^3)**	**DS (µg/m^3)**	**Change (µg/m^3)**	**Impact**	**DM**	**DS**
R23	13.8	14.0	0.2	Negligible	0	0
R24	13.5	13.6	0.1	Negligible	0	0
R25	13.5	13.8	0.3	Negligible	0	0
R26	12.8	12.8	<0.1	Negligible	1	1
R27	13.4	13.5	0.1	Negligible	0	0
R28	13.4	13.5	0.1	Negligible	0	0
R29	13.4	13.4	<0.1	Negligible	0	0
R30	13.3	13.3	<0.1	Negligible	0	0
R31	16.1	16.1	<0.1	Negligible	0	0
R32	15.2	15.2	<0.1	Negligible	0	0
R33 (Glasllwch AQMA)	16.8	16.8	<0.1	Negligible	1	1
R34 (Glasllwch AQMA)	16.8	16.8	<0.1	Negligible	1	1
R35 (Newport - HighCross AQMA 2018)	15.0	15.1	0.1	Negligible	0	0
R36 (Newport - HighCross AQMA 2018)	15.3	15.3	<0.1	Negligible	0	0
R37 (Shaftesbury/Crindau AQMA)	16.1	16.1	<0.1	Negligible	0	0
R38 (Shaftesbury/Crindau AQMA)	16.3	16.3	<0.1	Negligible	0	0
R39	12.9	12.9	<0.1	Negligible	1	1
R40	12.7	12.7	<0.1	Negligible	1	1
S1	14.5	14.5	<0.1	Negligible	0	0
S2	14.4	14.4	<0.1	Negligible	0	0
S3	13.4	13.4	<0.1	Negligible	0	0
S4	14.5	14.5	<0.1	Negligible	0	0
S5	13.0	13.0	<0.1	Negligible	1	1
S6	13.7	13.7	<0.1	Negligible	0	0
S7	13.2	13.3	0.1	Negligible	0	0
S8	12.7	12.8	0.1	Negligible	1	1
S9	12.5	12.5	<0.1	Negligible	1	1
S10	15.5	15.5	<0.1	Negligible	0	0
S11	15.2	15.2	<0.1	Negligible	0	0
H1	13.2	13.2	<0.1	Negligible	0	0
F1	13.3	13.5	0.2	Negligible	0	0
F2	13.3	13.3	<0.1	Negligible	0	0
F3	12.7	12.8	0.1	Negligible	1	1

Table 41: Predicted annual mean $PM_{2.5}$ concentrations for the operational sensitivity scenario

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
R1	9.1	9.1	<0.1	Negligible
R2	10.0	10.0	<0.1	Negligible
R3	9.5	9.5	<0.1	Negligible
R4	10.6	10.6	<0.1	Negligible
R5	10.1	10.1	<0.1	Negligible
R6	9.4	9.4	<0.1	Negligible
R7	10.2	10.2	<0.1	Negligible
R8	9.7	9.7	<0.1	Negligible
R9	9.9	9.9	<0.1	Negligible
R10	10.8	10.9	0.1	Negligible
R11	10.1	10.2	0.1	Negligible
R12	9.2	9.2	<0.1	Negligible
R13	9.0	9.0	<0.1	Negligible
R14	9.5	9.5	<0.1	Negligible
R15	9.3	9.4	0.1	Negligible
R16	9.5	9.5	<0.1	Negligible
R17	9.8	9.6	-0.2	Negligible
R18	9.5	9.7	0.2	Negligible
R19	8.4	8.4	<0.1	Negligible
R20	8.9	8.9	<0.1	Negligible
R21	8.4	8.4	<0.1	Negligible
R22	9.4	9.6	0.2	Negligible
R23	9.1	9.2	0.1	Negligible
R24	8.9	9.0	0.1	Negligible
R25	8.9	9.1	0.2	Negligible
R26	8.2	8.2	<0.1	Negligible
R27	8.9	8.9	<0.1	Negligible
R28	8.9	8.9	<0.1	Negligible
R29	8.7	8.8	0.1	Negligible
R30	8.7	8.7	<0.1	Negligible
R31	10.1	10.1	<0.1	Negligible
R32	9.4	9.4	<0.1	Negligible
R33 (Glasllwch AQMA)	11.0	11.0	<0.1	Negligible
R34 (Glasllwch AQMA)	11.0	11.0	<0.1	Negligible
R35 (Newport - HighCross AQMA 2018)	9.8	9.9	0.1	Negligible
R36 (Newport - HighCross AQMA 2018)	10.0	10.0	<0.1	Negligible
R37 (Shaftesbury/Crindau AQMA)	10.5	10.5	<0.1	Negligible
R38 (Shaftesbury/Crindau AQMA)	10.6	10.6	<0.1	Negligible
R39	8.0	8.0	<0.1	Negligible
R40	8.0	8.0	<0.1	Negligible
S1	9.7	9.7	<0.1	Negligible
S2	9.6	9.6	<0.1	Negligible
S3	9.1	9.1	<0.1	Negligible
S4	9.5	9.5	<0.1	Negligible

ID	DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Impact
S5	9.0	9.0	<0.1	Negligible
S6	9.4	9.4	<0.1	Negligible
S7	9.1	9.1	<0.1	Negligible
S8	8.8	8.8	<0.1	Negligible
S9	8.3	8.4	0.1	Negligible
S10	9.4	9.4	<0.1	Negligible
S11	9.4	9.4	<0.1	Negligible
H1	8.9	8.9	<0.1	Negligible
F1	8.8	8.9	0.1	Negligible
F2	8.8	8.8	<0.1	Negligible
F3	8.2	8.2	<0.1	Negligible

Model results – ecological (sensitivity test)

F.4.27 The predicted annual mean concentrations of NOx (using 2019 background and emissions) at all modelled ecological receptors for the sensitivity operational scenario are presented in Table 42.

Table 42: Predicted NOx concentrations for the sensitivity operational scenario

ID	OS grid reference		NOx concentrations (2028)			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
Glamorganshire Canal LNR						
E1_A	313500	181578	41.2	41.3	0.2	Above standard
E1_B	313201	181455	59.0	59.3	0.3	Above standard
Glamorgan Canal and Long Wood SSSI						
E2_A	313647	181366	28.6	28.7	0.1	Below standard
E2_B	313650	181321	26.3	26.4	0.1	Below standard
Fforestganol A Chwm Nofydd SSSI						
E3_A	315277	182480	25.5	25.6	0.1	Below standard
E3_B	315262	182522	24.0	24.1	0.1	Below standard
Howardian LNR						
E4_A	320362	178902	46.1	46.4	0.3	Above standard
Ancient Semi Natural Woodland (A38) (to the west)						
E5_A	322427	181928	85.2	88.5	3.3	Above standard
E5_A_transect	322386	181932	88.5	91.9	3.5	Above standard
E5_B_transect	322386	181927	66.3	68.6	2.3	Above standard
E5_C_transect	322385	181922	56.5	58.3	1.8	Above standard
E5_D_transect	322385	181917	50.7	52.2	1.5	Above standard
E5_E_transect	322385	181912	46.8	48.0	1.3	Above standard
E5_F_transect	322384	181907	43.9	45.0	1.1	Above standard
E5_G_transect	322384	181902	41.7	42.7	1.0	Above standard
Ancient Semi Natural Woodland (A38) (to the east)						
E6_A	322530	181915	78.2	81.2	2.9	Above standard
E6_B_transect	322529	181910	62.3	64.3	2.1	Above standard

ID	OS grid reference		NOx concentrations (2028)			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E6_C_transect	322529	181905	54.2	55.9	1.7	Above standard
E6_D_transect	322528	181900	49.0	50.4	1.4	Above standard
E6_E_transect	322527	181895	45.4	46.6	1.2	Above standard
E6_F_transect	322526	181890	42.8	43.9	1.1	Above standard
E6_G_transect	322526	181885	40.8	41.8	1.0	Above standard
E6_H_transect	322525	181880	39.2	40.0	0.9	Above standard
E6_I_transect	322524	181875	37.8	38.6	0.8	Above standard
Gwent Levels - Rumney and Peterstone SSSI (transect 1)						
E7_A	325180	181433	23.1	23.4	0.3	Below standard
E7_B	325189	181438	21.2	21.4	0.2	Below standard
E7_C	325198	181442	20.7	21.0	0.2	Below standard
E7_D	325207	181447	20.5	20.7	0.2	Below standard
E7_E	325215	181451	20.4	20.6	0.2	Below standard
E7_F	325224	181456	20.3	20.5	0.2	Below standard
E7_G	325246	181467	20.2	20.4	0.2	Below standard
E7_H	325269	181479	20.1	20.3	0.2	Below standard
E7_I	325313	181502	20.1	20.2	0.1	Below standard
E7_J	325358	181525	20.0	20.1	0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 2)						
E8_A	325669	180881	16.8	16.9	0.1	Below standard
E8_B	325672	180890	16.5	16.6	0.1	Below standard
E8_C	325675	180900	16.4	16.5	0.1	Below standard
E8_D	325678	180909	16.4	16.5	0.1	Below standard
E8_E	325682	180919	16.3	16.4	0.1	Below standard
E8_F	325685	180928	16.3	16.4	0.1	Below standard
E8_G	325693	180952	16.3	16.4	0.1	Below standard
E8_H	325701	180976	16.3	16.4	0.1	Below standard
E8_I	325717	181023	19.4	19.5	0.1	Below standard
E8_J	325733	181070	19.4	19.5	0.1	Below standard
Gwent Levels - Rumney and Peterstone SSSI (transect 3)						
E9_A	325812	180788	16.7	16.8	0.1	Below standard
E9_B	325807	180780	16.4	16.5	0.1	Below standard
E9_C	325802	180771	16.3	16.4	0.1	Below standard
E9_D	325798	180762	16.3	16.3	0.1	Below standard
E9_E	325793	180753	16.3	16.3	0.1	Below standard
E9_F	325788	180745	16.2	16.3	0.1	Below standard
E9_G	325776	180723	16.2	16.3	0.1	Below standard
E9_H	325764	180701	16.2	16.3	0.1	Below standard
E9_I	325740	180657	16.2	16.2	0.1	Below standard
E9_J	325716	180613	16.2	16.2	0.1	Below standard
Allt-Yr-Yn LNR						
E9_12	328643	188310	92.5	93.0	0.5	Above standard

ID	OS grid reference		NOx concentrations (2028)			
			DM (µg/m^3)	DS (µg/m^3)	Change (µg/m^3)	Comparison against standard of 30µg/m^3
E9_12_B_transect	328648	188308	79.6	80.0	0.4	Above standard
E9_12_C_transect	328650	188307	75.5	75.9	0.4	Above standard
Gwent Levels - Rumney and Peterstone SSSI – near site entrance crossing of Feandre Reen (transect 4)						
E10_A	324670	181412	23.1	32.2	9.1	Above standard
E10_B	324670	181402	23.1	27.3	4.2	Below standard
E10_C	324670	181392	23.1	25.9	2.8	Below standard
E10_D	324671	181382	23.1	25.2	2.2	Below standard
E10_E	324671	181372	23.1	24.8	1.8	Below standard
E10_F	324671	181362	23.1	24.6	1.5	Below standard
E10_G	324671	181337	23.1	24.3	1.2	Below standard
E10_H	324672	181312	23.1	24.0	1.0	Below standard
E10_I	324673	181262	23.0	23.7	0.8	Below standard
E10_J	324673	181212	22.8	23.5	0.7	Below standard
Gwent Levels - Rumney and Peterstone SSSI - near site entrance crossing of Feandre Reen (transect 5)						
E11_A	324670	181423	23.1	32.2	9.0	Above standard
E11_B	324670	181433	23.2	27.6	4.5	Below standard
E11_C	324669	181443	23.2	26.5	3.3	Below standard
E11_D	324669	181453	23.3	25.9	2.6	Below standard
E11_E	324669	181463	23.3	25.5	2.2	Below standard
E11_F	324668	181473	23.4	25.4	2.1	Below standard
E11_G	324668	181498	23.6	25.4	1.8	Below standard
E11_H	324667	181523	24.2	25.9	1.7	Below standard
Ely Valley SSSI (transect 1)						
E12_A	305615	180072	56.3	56.5	0.2	Above standard
E12_B	305617	180082	44.6	44.7	0.1	Above standard
E12_C	305620	180091	37.8	37.9	0.1	Above standard
E12_D	305623	180101	33.3	33.4	0.1	Above standard
E12_E	305625	180111	30.2	30.3	0.1	Above standard
E12_F	305628	180120	27.8	27.9	0.1	Below standard
E12_G	305635	180144	23.9	24.0	<0.1	Below standard
E12_H	305642	180168	21.5	21.6	<0.1	Below standard
Ely Valley SSSI (transect 2)						
E13_A	305619	180009	60.9	61.1	0.2	Above standard
E13_B	305616	179999	46.6	46.8	0.2	Above standard
E13_C	305614	179989	39.5	39.6	0.1	Above standard
E13_D	305611	179980	34.7	34.8	0.1	Above standard
E13_E	305609	179970	31.4	31.5	0.1	Above standard
E13_F	305606	179960	28.9	29.0	0.1	Below standard
E13_G	305599	179936	24.7	24.8	<0.1	Below standard
E13_H	305593	179912	22.2	22.2	<0.1	Below standard
E13_I	305580	179864	19.2	19.2	<0.1	Below standard

F4 Air quality mitigation measures for construction activities

Construction dust

F.4.28 This section presents the specific mitigation to minimise the risk of dust soiling, human health and ecological impacts required for the proposed development.

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 proposed development boundary. This may be the environment manager/engineer or the site manager;
- Display the head or regional office contact information; and
- 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.

Site management

- 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 log book; and
- Hold regular liaison meetings with other high risk construction sites within 500m of the proposed development boundary, if any, 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.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary;
- 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; and
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase

commences. Further guidance is provided by IAQM on monitoring during earthworks and construction.

Preparing and maintaining site

- 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 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; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- 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 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- 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; and
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management

- Avoid bonfires and burning of waste materials.

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; and
- 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; and
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

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 log book;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- 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; and
- Access gates to be located at least 10m from receptors where possible.