

9 AIR QUALITY

Introduction

- 9.1 This chapter details the air quality assessment undertaken for the Proposed Development. The Proposed Development site is not located within an Air Quality Management Area (AQMA) and existing air quality at the site and in the immediate surrounding area is very good. The local authority, Pembrokeshire County Council (PCC), has currently designated two AQMAs, the closest of which is approximately 3 km from the site.
- 9.2 This air quality assessment covers the:
- Construction phase - an evaluation of the temporary effects from fugitive construction dust and construction-vehicle exhaust emissions; and the
 - Operational phase – an evaluation of the impacts of the development traffic on the local area.
- 9.3 This chapter begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential air quality effects are then described. The baseline air quality conditions have been established taking into account Defra estimates, local authority documents and the results of any local monitoring. The results of the assessment of air quality impacts are then presented and conclusions are drawn on the significance of the residual construction-phase effects and the residual operational-phase effects.

Assessment Methodology

Planning Policy Context

- 9.4 Current land use policies for Wales are set out in Planning Policy Wales (PPW) (Welsh Government, Edition 10, 2018). This document is intended to provide a strategic policy framework to assist local authorities in the preparation of their development plans. PPW is supported by Technical Advice Notes (TANs) which give further guidance on specific topics. Procedural advice is also given in the Welsh Government/Welsh Office Circulars.
- 9.5 Section 6.7 of PPW concerns Air Quality and Soundscape. Most relevant to this assessment, it states that:

“Planning authorities must consider the potential for temporary environmental risks, including airborne pollution and surface and subsurface risks, arising during the construction phases of development. Where appropriate planning authorities should require a construction management plan, covering pollution prevention, noisy plant, hours of operation, dust mitigation and details for keeping residents informed about temporary risks.”

Ambient Air Quality Legislation

The Ambient Air Quality Directive and Air Quality Standards Regulations

- 9.6 The 2008 Ambient Air Quality Directive (2008/50/EC) (EC, 2008) aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants; it sets

legally binding concentration-based limit values, as well as target values. There are also information and alert thresholds for reporting purposes. These are to be achieved for the main air pollutants: particulate matter (PM₁₀ and PM_{2.5}), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), carbon monoxide (CO), lead (Pb) and benzene. This Directive replaced most of the previous EU air quality legislation and in Wales was transposed into domestic law by the Air Quality Standards (Wales) Regulations 2010 (WG, 2010), which in addition incorporates the 4th Air Quality Daughter Directive (2004/107/EC) that sets targets for ambient air concentrations of certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). Member states must comply with the limit values (which are legally binding on the Secretary of State) and the Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

UK Air Quality Strategy

- 9.7 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 (Defra, 2007). The Strategy sets UK air quality standards and objectives for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives.
- 9.8 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and putting in place Air Quality Action Plans to improve air quality. These plans also contribute, at local level, to the achievement of EU limit values.
- 9.9 For the purposes of this assessment, the limit values set out in the Air Quality Standards Regulations 2010 and the objective levels specified under the current UK AQS have been used.
- 9.10 The limit values and objectives relevant to this assessment are summarised in Table 9.1.

Table 9.1: Summary of Relevant Air Quality Limit Values and Objectives

Pollutant	Averaging Period	Objectives/Limit Values	Not to Exceeded More Than	Be Target Date
Nitrogen Dioxide (NO ₂)	1 hour	200 µg.m ⁻³	18 times per calendar year	-
	Annual	40 µg.m ⁻³	-	-
Particulate Matter (PM ₁₀)	24 Hour	50 µg.m ⁻³	35 times per calendar year	-
	Annual	40 µg.m ⁻³	-	-
Particulate Matter (PM _{2.5})	Annual	Target of 15% reduction in concentrations at urban background locations	-	Between 2010 and 2020 (a)
		Variable target of up to 20% reduction in concentrations at urban background locations	-	Between 2010 and 2020 (b)
		(c)		

Annual	25 µg.m ⁻³	-	01.01.2020 (a)
	25 µg.m ⁻³	-	01.01.2015 (b)

(a) Target date set in UK Air Quality Strategy 2007

(b) Target date set in Air Quality Standards (Wales) Regulations 2010

(c) Aim to not exceed 18 µg.m⁻³ by 2020

- 9.11 In July 2017, Defra published the 'UK plan for tackling roadside nitrogen dioxide concentrations'. This describes the Government's plan for bringing roads with NO₂ concentrations above the EU Limit Value back into compliance within the shortest possible time.

Relevant Guidance

- 9.12 The assessment approach is consistent with the following guidance documents:

- Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction (IAQM, 2014);
- Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) Land-Use Planning & Development Control: Planning for Air Quality (EPUK & IAQM, 2017);
- Where relevant, Defra's Local Air Quality Management Technical Guidance: LAQM.TG16 (Defra, 2016).

Study Area

- 9.13 The assessment study area differs between the construction and operational phases. The study areas in each case are described in detail within the methodology that follows, referencing the relevant guidance documents. An overview is provided below.
- 9.14 With respect to dust, the 2014 IAQM guidance on the assessment of dust from demolition and construction sets out 350 metres as the distance from the site boundary or 50 metres from the centre-line of the site traffic route(s) up to 500 metres from the entrance, within which there could potentially be nuisance dust and PM₁₀ effects on human receptors (IAQM, 2014). These distances are set to be deliberately conservative. For sensitive ecological receptors, the corresponding distances are 50 metres in both cases. The study area is shown on Figure 9.1.
- 9.15 With respect to emissions from operational traffic, the study area has been determined by the results of the transport assessment and encompasses the roads expected to be used by traffic generated by the Proposed Development. The study area is shown in Figure 9.2.

Baseline Methodology

- 9.16 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. The EPUK & IAQM (2017) guidance highlight published information from Defra and local monitoring studies as potential sources of information on background air quality. LAQM Technical Guidance 2016 (Defra, 2016) recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that:

'Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality'.

9.17 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:

- Defra maps (Defra, 2015), which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- Published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies.

Consultation

9.18 No issues were raised in relation to air quality within the Scoping Opinion. As such, no specific consultations were undertaken.

Assessment Criteria and Assignment of Significance

9.19 The UK AQS identifies the pollutants associated with road traffic emissions and local air quality impacts as nitrogen oxides (NOX) and particulate matter. Emissions of total NOX comprise nitric oxide (NO) and NO₂. NO oxidises in the atmosphere to form NO₂. Currently, AQMA's designated in the UK attributable to road traffic emissions are associated with high concentrations of NO₂ and PM₁₀. The impact from fine particulate matter, known as PM_{2.5} (a subset of PM₁₀) concentrations has also been considered.

9.20 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information.

9.21 The air quality impacts associated with traffic generated by the operation of the proposed development have been modelled using the ADMS Roads model.

9.22 Modelling has been undertaken for the following scenarios with and without operational traffic in 2020. The operational traffic flows generated by the development are not expected to change over time; however, emissions from the additional traffic movements are expected to reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. Therefore, modelling in the earliest year of operation is considered to be a conservative (i.e. towards worst case) approach.

9.23 The model used and the input data relevant to this assessment are described in Appendix 9.1.

Receptors for Assessment of Pollutant Concentrations

9.24 The principles for selecting sensitive receptors are described in Appendix 9.1. Sensitive receptors for this assessment have been selected at representative properties where pollutant concentrations

and/or changes in pollutant concentrations are anticipated to be greatest. These are set out in Table 9.2 and their locations are shown on Figure 9.2.

Table 9.2: Modelled Sensitive Receptors

ID	Description	X	Y
1	Hospital	195785	203498
2	Pembroke St 1	196320	203390
3	Melville St 1	196283	203363
4	Melville Terrace 1	196008	203436
5	Melville Terrace 2	195983	203433
6	Fort Road 1	195920	203473
7	Melville St 2	196096	203415
8	Commercial Way 1	196340	203447
9	Commercial Way 2	196360	203566
10	Western Way 1	196488	203681
11	Water St 1	196947	203629
12	Water St 2	196912	203476
13	Water St 3	196927	203630
14	Water St 4	196892	203471
15	Tremeyrick St 1	197043	203844
16	Front St 1	196520	203736
17	Tremeyrick St 2	197005	203821
18	Waterloo Road 1	197619	203630
19	London Road 1	197917	203467

- 9.25 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all the receptors identified.

Significance for Assessment of Pollutant Concentrations

- 9.26 The EPUK & IAQM Land-Use Planning & Development Control: Planning for Air Quality document (EPUK & IAQM, 2017) advises that:

‘The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation.’

- 9.27 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 9.3 provides the EPUK/IAQM approach for describing the air quality impacts at sensitive receptors.

Table 9.3: Impact Descriptors for Individual Sensitive Receptors

Long term average % change in concentration relative to Air Quality Assessment concentration at receptor in Level assessment year	1	2-5	6-10	>10
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 -94 % of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

Note: 1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

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

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

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

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

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

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

- 9.28 The impact descriptors above apply at individual receptors. The EPUK & IAQM guidance states that the impact descriptors 'are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances.'
- 9.29 Professional judgement by a competent, suitably qualified professional is required to establish the significance of effect arising as a consequence of the predicted impacts. This judgement has taken into account the extent of the population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process. In assigning significance levels to the likely effects, the following terms have been used:
- 9.30 Substantial: Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
- 9.31 Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.

- 9.32 Moderate: These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
- 9.33 Minor: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
- 9.34 Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
- 9.35 Effects assessed as moderate or above are considered within this assessment to be significant in terms of the EIA Regulations.

Limitations of the Assessment

- 9.36 An air quality model contains a set of mathematical equations that try to explain the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. Considering the turbulent nature of the atmosphere, the predictive ability of even the best model will be limited. The limitations in the predictive ability of the model further add to any errors associated with the limitations of the data inputs. The atmospheric dispersion models used for this assessment, ADMS Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas.
- 9.37 For road-related emissions, a site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values.
- 9.38 LAQM.TG16 requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their R&A duties. Model verification refers to “checks that are carried out on model performance at a local level”. Modelled concentrations are compared with the results of monitoring and, where there is a disparity between modelled and monitored concentrations, an adjustment may be established and applied. No adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.
- 9.39 For the verification and adjustment of NOX/NO₂ concentrations for R&A purposes, LAQM.TG16 recommends that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.
- 9.40 Local authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, local authorities are usually able to verify the models they use for R&A purposes; however, for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area. In this case, there is no roadside monitoring in the study area. While it has not been possible to verify the model, the limitations associated with each of the model inputs are discussed below.

9.41 Where assumptions have to be made, these assumptions have been made towards the upper end of the range informed by an analysis of relevant, available data. In particular:

- Traffic data – High growth assumptions have been used to develop the traffic data used for the air quality modelling.
- Road-related emission factors – The most recently published emission factors have been used within the modelling and these are based on the current and best understanding of the variation in emission factors in future years.
- Meteorological data – The model has been run for a full year of meteorological conditions. This means that the conditions in 8,760 hours have been considered in the assessment.
- Receptors – Receptor locations have been identified in locations where the impacts are expected to be greatest.
- Baseline conditions – Baseline conditions have been characterised by a review of all available data and reports. In general, the highest concentration has been used unless there is evidence to suggest that the highest concentration is not appropriate.

Baseline Environment

9.42 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. EPUK & IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LAQM.TG16 recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: *“Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality”*.

9.43 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:

- Defra maps (Defra, 2015), which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- Published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies.

Review and Assessment Process

9.44 The proposed development site is not located within an AQMA and existing air quality at the site and in the immediate surrounding area is very good. The site is approximately 3 km to the north-west of the nearest AQMA at Westgate Hill, designated by PCC due to high levels of NO₂ pollution from road traffic.

Local Urban Background Monitoring

- 9.45 Monitors at urban background locations measure concentrations away from the local influence of emission sources. There is no local urban background monitoring undertaken close to the development site. There is a monitoring station where rural concentrations are measured using continuous automatic instruments, but this is some considerable distance from the site. In the absence of urban background monitoring, the measurements at the rural site have been considered. The most recently measured annual-mean concentrations are presented in Table 9.4.

Table 9.4: Automatically Monitored Urban Background Annual-Mean Concentrations

Monitor Name	Approximate Distance from the Application Site (km)	Pollutant	Concentration ($\mu\text{g.m}^{-3}$)					
			2013	2014	2015	2016	2017	2018
Narberth	20	NO ₂	5.2	3.6	3	4	3	4
		PM ₁₀	16	14	12	12	11	12

- 9.46 Defra's total annual-mean NO₂ concentration estimates have been collected for the 1 km grid squares of the monitoring sites and the proposed development site and are summarised in Table 9.5.

Table 9.5: Defra Mapped Annual-Mean Background NO₂ Concentration Estimates

Monitor Name	Approximate Distance from the Application Site (km)	Concentrations ($\mu\text{g.m}^{-3}$)	
		Range of Monitored	Estimated Defra Mapped
Narberth	20	3 – 5.2	3.2
Proposed Development Site	-	-	9.9

- 9.47 Similarly, the Defra total annual-mean PM₁₀ concentration estimates have been collected for the grid square of the monitoring sites and the proposed development site and are summarised in Table 9.6.

Table 9.6: Defra Mapped Annual-Mean Background PM₁₀ Concentration Estimates

Monitor Name	Approximate Distance from the Application Site (km)	Concentrations ($\mu\text{g.m}^{-3}$)	
		Range of Monitored	Estimated Defra Mapped
Narberth	20	11 – 16	9.5
Proposed Development Site	-	-	13.1

Appropriate Background Concentrations for the Development Site

- 9.48 For NO₂, the Defra mapped background concentration estimate is towards the bottom of the range of the results from monitoring. This suggests that the use of the Defra mapped background concentration estimate would not be conservative. However, the Defra mapped background concentration estimate for the grid square of the proposed development site is above the highest measured concentration. To ensure the assessment is conservative, the background annual-mean

NO₂ concentration has been derived from the Defra mapped background concentration estimate of 9.9 µg.m⁻³ for the proposed development site.

- 9.49 For PM₁₀, the Defra mapped background concentration estimate is below the range of results from monitoring. The background annual-mean PM₁₀ concentration at the proposed development site has been derived from the highest measured concentration of 16 µg.m⁻³.
- 9.50 In the absence of PM_{2.5} monitoring at this site, the background annual-mean concentration at the proposed development site has been derived from the Defra mapped background concentration estimate.
- 9.51 Table 9.7 summarises the existing annual-mean background concentrations for NO₂, PM₁₀ and PM_{2.5}.

Table 9.7 Summary of Background Annual-Mean (Long-term) Concentrations used in the Assessment

Pollutant	Data Source	Concentration (µg.m ⁻³)
NO ₂	Defra mapped (2015)	9.9
PM ₁₀	Narberth 2013	16.0
PM _{2.5}	Defra mapped (2015)	8.8

Future Baseline Conditions

- 9.52 Historically the view has been that background traffic-related NO₂ concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. There is some evidence of a decrease at Narberth; however, the results of recent monitoring across the UK suggest that background annual-mean NO₂ concentrations have not decreased in line with expectations. To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years and Table 9.7 summarises the annual-mean background concentrations for NO₂, PM₁₀ and PM_{2.5} used in the modelled year of the assessment.

Mitigation Measures Adopted as Part of the Project

- 9.53 The emphasis of the IAQM dust risk assessment is to classify the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified. Appendix 9.2 sets out the assessment of construction dust risks.
- 9.54 The IAQM dust guidance lists mitigation measures for the site as a whole and for each of the four activities (demolition, earthworks, construction and trackout). Different mitigation measures are recommended depending on whether the risk is low, medium or high. In this case, the predicted dust impact risk for the development as a whole is classified as medium and the 'highly recommended' measures for medium risks are listed below along with the 'highly recommended' measures for demolition, construction and trackout.
- 9.55 There are no 'highly recommended' measures for medium earthworks. Furthermore, the 'highly recommended' measures for medium and high risk trackout are identical.
- 9.56 The measures listed below will be adopted as part of the project.

Communications

- 9.57 Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- 9.58 Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- 9.59 Display the contractor's head or regional office contact information.
- 9.60 Develop and implement a Dust Management Plan (DMP) (which may include measures to control other emissions), to be approved by PCC. The level of detail will depend on the risk and should include as a minimum the highly recommended measures set out in this chapter.

Site Management

- 9.61 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.
- 9.62 Make the complaints log available to PCC when asked.
- 9.63 Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

Monitoring

- 9.64 Carry out regular site inspections to monitor compliance with the DMP, record inspection results and make an inspection log available to PCC if requested.
- 9.65 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.
- 9.66 Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with PCC if necessary and agree baseline monitoring periods as necessary.

Preparing and Maintaining the Site

- 9.67 Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use screening intelligently where possible – e.g. locating site offices between potentially dusty activities and the receptors.
- 9.68 Erect solid screens or barriers around the site boundary.
- 9.69 Avoid site runoff of water or mud.
- 9.70 Keep site fencing, barriers and scaffolding clean.
- 9.71 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.
- 9.72 Depending on the duration that stockpiles will be present and their size - cover, seed, fence or water to prevent wind whipping.

Operating Vehicle/Machinery and Sustainable Travel

- 9.73 Ensure all vehicles switch off engines when stationary – no idling vehicles.
- 9.74 Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- 9.75 Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- 9.76 Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- 9.77 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.
- 9.78 Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible.
- 9.79 Use enclosed chutes, conveyors and covered skips, where practicable.
- 9.80 Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- 9.81 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

- 9.82 Avoid bonfires and burning of waste materials.

Medium Risk Measures Specific to Demolition

- 9.83 Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- 9.84 Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- 9.85 Bag and remove any biological debris or damp down such material before demolition.

Medium Risk Measures Specific to Construction

- 9.86 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.
- 9.87 Use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site. This may require the sweeper being continuously in use.

- 9.88 Avoid dry sweeping of large areas.
- 9.89 Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- 9.90 Record all inspections of haul routes and any subsequent action in a site log book.
- 9.91 Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowzers and regularly cleaned.

Medium Risk Measures Specific to Trackout

- 9.92 Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as practicable.
- 9.93 Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site).
- 9.94 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.
- 9.95 Access gates to be located at least 10m from receptors where possible.

Assessment of Construction Effects

- 9.96 Provided the mitigation measures adopted as part of the project are implemented, the residual construction dust effects are not considered significant. The IAQM dust guidance states that *“For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be ‘not significant’.”*

Further Mitigation

- 9.97 With the IAQM recommended dust controls in place, the effects are not considered significant and further mitigation is not required. However, the effectiveness of the controls will be checked through an inspection/monitoring programme detailed below.

Future Monitoring

- 9.98 The main influences on air quality arising from the construction of the development are likely to be dust generating activities, and recommended inspection/monitoring methods include:
 - Carry out regular site inspections to 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.

Accidents and/or Disasters

- 9.99 With the recommended mitigation measures in place, no significant adverse air quality effects to the environment arising from accidents during the construction phase are anticipated.

Assessment of Operational Effects

Nitrogen Dioxide (NO₂)

- 9.100 Table 9.8 presents the annual-mean NO₂ concentrations predicted at the façades of receptors in the earliest year of operation, 2020.

Table 9.8 Predicted Annual-mean NO₂ Concentrations in 2020

Receptor ID	Concentration (µg.m ⁻³)		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	10.0	10.0	0	Negligible
2	10.6	10.7	0	Negligible
3	10.8	10.9	0	Negligible
4	10.2	10.2	0	Negligible
5	10.2	10.3	0	Negligible
6	10.2	10.2	0	Negligible
7	10.3	10.3	0	Negligible
8	11.3	11.5	0	Negligible
9	11.1	11.3	0	Negligible
10	11.0	11.1	0	Negligible
11	11.4	11.4	0	Negligible
12	11.4	11.4	0	Negligible
13	10.9	10.9	0	Negligible
14	10.8	10.8	0	Negligible
15	11.0	11.1	0	Negligible
16	10.3	10.4	0	Negligible
17	11.1	11.2	0	Negligible
18	11.6	11.7	0	Negligible
19	12.2	12.3	0	Negligible
Maximum	12.2	12.3	0	-
Minimum	10.0	10.0	0	-

- 9.101 As set out above, a site-specific verification provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values. In this case, predicted annual-mean NO₂ concentrations in 2020 are well below the AQS objective for NO₂. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is 'negligible'.
- 9.102 As all predicted annual-mean NO₂ concentrations are below 60 µg.m⁻³, the hourly-mean objective for NO₂ is unlikely to be exceeded and is not considered further within this assessment.
- 9.103 Overall, the impact on the surrounding area from NO₂ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM₁₀)

- 9.104 Table 9.9 presents the annual-mean PM₁₀ concentrations predicted at the façades of receptors in 2020.

Table 9.9 Predicted Annual-mean PM₁₀ Concentrations in 2020

Receptor ID	Concentration (µg.m ⁻³)		With - Without Dev as of the AQS Objective	%Impact Descriptor
	Without Development	With Development		
1	16.0	16.0	0	Negligible
2	16.1	16.2	0	Negligible
3	16.2	16.2	0	Negligible
4	16.1	16.1	0	Negligible
5	16.1	16.1	0	Negligible
6	16.1	16.1	0	Negligible
7	16.1	16.1	0	Negligible
8	16.2	16.3	0	Negligible
9	16.2	16.3	0	Negligible
10	16.2	16.2	0	Negligible
11	16.3	16.3	0	Negligible
12	16.3	16.3	0	Negligible
13	16.2	16.2	0	Negligible
14	16.2	16.2	0	Negligible
15	16.2	16.2	0	Negligible
16	16.1	16.1	0	Negligible
17	16.2	16.2	0	Negligible
18	16.3	16.3	0	Negligible
19	16.5	16.5	0	Negligible
Maximum	16.5	16.5	0	-
Minimum	16.0	16.0	0	-

- 9.105 Predicted annual-mean PM₁₀ concentrations in the opening year at the façades of receptors are well below the AQS objective for PM₁₀. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.
- 9.106 As all predicted annual mean PM₁₀ concentrations are below 31.5 µg.m⁻³, the daily-mean PM₁₀ objective is expected to be met at all receptors and the short-term PM₁₀ impact is not considered further within this assessment.
- 9.107 Overall, the impact on the surrounding area from PM₁₀ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM_{2.5})

- 9.108 Table 9.10 presents the annual-mean PM_{2.5} concentrations predicted at the façades of receptors in 2020.

Table 9.10 Predicted Annual-mean PM_{2.5} Concentrations in 2020

Receptor ID	Concentration (µg.m ⁻³)		With - Without Dev as of the AQS Objective	%Impact Descriptor
	Without Development	With Development		
1	8.8	8.8	0	Negligible
2	8.9	8.9	0	Negligible
3	8.9	8.9	0	Negligible

4	8.8	8.8	0	Negligible
5	8.8	8.8	0	Negligible
6	8.8	8.8	0	Negligible
7	8.8	8.8	0	Negligible
8	8.9	9.0	0	Negligible
9	8.9	8.9	0	Negligible
10	8.9	8.9	0	Negligible
11	9.0	9.0	0	Negligible
12	9.0	9.0	0	Negligible
13	8.9	8.9	0	Negligible
14	8.9	8.9	0	Negligible
15	8.9	8.9	0	Negligible
16	8.8	8.8	0	Negligible
17	8.9	8.9	0	Negligible
18	9.0	9.0	0	Negligible
19	9.1	9.1	0	Negligible
Maximum	9.1	9.1	0	-
Minimum	8.8	8.8	0	-

- 9.109 Predicted annual-mean PM_{2.5} concentrations in the opening year at the façades of receptors are below the AQS objective for PM_{2.5} at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.
- 9.110 Overall, the impact on the surrounding area from PM_{2.5} is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Significance of Effect

- 9.111 The results of the modelling indicate that with the project, the predicted NO₂, PM₁₀ and PM_{2.5} concentrations at modelled receptors are below the relevant long and short term AQS objectives. When the magnitude of change in annual-mean NO₂, PM₁₀ and PM_{2.5} concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on receptors are categorised as 'negligible'. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area as a whole is considered to be 'negligible', using the descriptors adopted for this assessment.
- 9.112 Using professional judgement, the resulting air quality effect is considered to be 'negligible', which would not be significant in terms of the EIA Regulations.

Further Mitigation

- 9.113 The residual air quality effects during the operational phase are not considered significant and no further mitigation is required.

Future Monitoring

- 9.114 The residual air quality effects during the operational phase are not considered significant and no future monitoring is required.

Accidents/Disasters

- 9.115 No significant adverse air quality effects to the environment arising from accidents and/or disasters during the operational phase are anticipated.

Potential Changes to the Assessment as a Result of Climate Change

- 9.116 Based on current knowledge, the results of the assessment are not expected to be affected by climate change.

Assessment of Cumulative Effects

- 9.117 During the construction phase, cumulative dust effects may occur if there are other proposed and potential developments within 700m of the site. Meta Phase 1 and Martello Quays Marina are within 700 m whereas all other developments listed as being potentially cumulative in the Scoping Opinion are more than 700 m from the site. Assuming that mitigation and control measures that are proportionate to risk of a dust impact are identified and implemented at those sites, the cumulative effect should be not significant.
- 9.118 Similarly, during the operational phase, cumulative effects have been taken into account to the extent that the traffic from other developments has been included in the traffic data provided for this assessment. The other developments included within the traffic data provided are given in Chapter 11, Transportation. Emissions from other sources in the area are taken into account through the use of a conservative background concentration.

Inter-relationships

- 9.119 The data inputs for this assessment have been informed by the outputs of the assessment of traffic and transport (see Chapter 11, Transportation).

Summary of Effects

- 9.120 This assessment has considered dust effects during the construction phase and the air quality impacts during the operational phase of the Proposed Development.
- 9.121 Impacts during construction, such as dust generation and plant vehicle emissions, are predicted to be of short duration and only relevant during the construction phase. The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance, indicates that before the implementation of mitigation and controls, the risk of dust impacts will be medium. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance should reduce the residual dust effects to a level categorised as “not significant”.
- 9.122 For the operational phase, arrivals at and departures from the site may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are an important consideration during this phase of the development. Detailed atmospheric dispersion modelling has been undertaken for the first year in which the development is expected to be fully operational, 2020. Pollutant concentrations are predicted to be well within the relevant health-based

air quality objectives. Using the criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be 'not significant' overall and no mitigation is considered necessary.

- 9.123 Using professional judgement, taking into account the above data, modelling and assessments, the resulting air quality effect of the Proposed Development is considered to be 'not significant' overall.
- 9.124 The Proposed Development does not, in air quality terms, conflict with national or local policies. There are, therefore, no constraints to the Proposed Development in the context of air quality.

References

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Institute of Air Quality Management (IAQM) (2014) Guidance on the assessment of dust from demolition and construction v1.1.

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Welsh Government (WG) (2018) Planning Policy Wales Edition 10 (PPW).

Table 9.6: Summary of Likely Environmental Effects on Air Quality

Receptor	Sensitivity of receptor	Description of impact	Short / long term	medium / long term	Magnitude of impact	Significance of effect	Significant / Not significant	/ Notes
Construction phase								
Human-health receptors – residential properties, hospital	Medium to High	Dust deposition Increased concentrations of suspended particulate matter	Medium		Medium risk	Negligible	Not significant	The methodology requires the risk of dust impacts to be assessed, without mitigation. This allows appropriate mitigation to be identified. With the implementation of the recommended mitigation, the relevant guidance indicates that the effects are not significant.
Ecological receptors – Pembrokeshire Marine Special Area of Conservation (SAC) and the Milford Haven Waterway Site of Special Scientific Interest (SSSI)	Medium to High	Dust deposition Increased concentrations of suspended particulate matter	Medium		Medium risk	Negligible	Not significant	The methodology requires the risk of dust impacts to be assessed, without mitigation. This allows appropriate mitigation to be identified. With the implementation of the recommended mitigation, the relevant guidance indicates that the effects are not significant.
Operational phase								
Human-health receptors – residential properties, hospital	High	Increased concentrations of combustion-related pollutants.	Long		Negligible	Negligible	Not Significant	