Whitehaven Residential Development

Air Quality Assessment

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This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS OHSAS 18001:2007)

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Comments

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Executive Summary

Planning permission is sought for a residential development at the former Marchon site off High Road, Whitehaven.

With the implementation of a range of appropriate management practices to control dust, plant and vehicle emissions, effects associated with construction activities would be not significant.

The operational Development would generate vehicle trips, which could potentially change local air quality in terms of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) concentrations. However, on completion of the Development, and considering uncertainty in future reductions of nitrogen oxides (NO_x) and NO_2, the Development is predicted to not have a significant effect on NO_2, PM_{10} and $PM_{2.5}$ concentrations within, and surrounding the Site.

The overall effect of the Development on local air quality is not significant.

1. Introduction

1.1. Waterman Infrastructure & Environment Ltd (hereafter referred to as 'Waterman') was instructed by Persimmon Homes (the Applicant) to undertake an air quality assessment for the former Marchon site, High Road, Whitehaven (hereafter referred to as the 'Site').

1.2. The development of the Site would involve the construction of approximately 700 residential units (Class C3) and associated works (hereafter referred to as the 'Development'). The application would be in detail for the first 100 units and outline for the remaining units.

1.3. The Site is approximately 33.1 hectares in area within the administrative area of Copeland Borough Council (CBC) and is centred on National Grid Reference NX 96573 16066. The Site currently comprises greenfield and brownfield land. The site is bound to the east by High Road with the Woodhouse estate beyond it. The village of Kells lies to the north of the site, with the proposed site of the West Cumbria Mine to the immediate south of the site, with the village of Sandwith beyond this and St Bees further beyond this. West of the site lies open green space, the coastline and Saltom Bay which forms the Solway Firth. To the east and south-east of the site lies a currently under construction residential development undertaken by Story Homes, known as Edgehill Park.

1.4. The purpose of this air quality assessment is to provide a review of the existing air quality at and surrounding the Site, and to assess the potential effect of the Development on local air quality during construction and on completion. Consideration is given to the impact of emissions from construction activities and the completed and operational Development on existing sensitive receptors surrounding the Site and at the proposed residential receptors on the Site. The most significant pollutants associated with road traffic emissions, in relation to human health, are NO_2 and particulate matter (PM_{10} and $PM_{2.5}$), the assessment focuses on these pollutants.

1.5. Section 2 of this air quality assessment gives a summary of legislation, planning policy and guidance relevant to air quality. Section 3 provides details of the assessment methodology and Section 4 sets out the baseline conditions at and around the Site. The results of the assessments are presented in Section 5 and Section 6. Section 7 describes any required mitigation measures. A summary of the findings and conclusions of the assessment is given in Section 8. The air quality assessment accompanied by the following appendices:

- **Appendix A:** Consultation of Air Quality Scope with Copeland Borough Council; and
- **Appendix B:** Air Quality Assessment Detailed Methodology.

2. Air Quality Legislation, Planning Policy and Guidance

Legislation

EU Framework Directive 2008/50/EC, 2008

2.1. Air pollutants at high concentrations can have adverse effects on the health of humans and ecosystems. European Union (EU) legislation on air quality forms the basis for UK legislation and policy on air quality.

2.2. The EU Framework Directive 2008/50/EC[1] on ambient air quality assessment and management came into force in May 2008 and was implemented by Member States, including the UK, by June 2010. The Directive aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

Air Quality Standards Regulations, 2010

2.3. The Air Quality Standards Regulations[2] implement Limit Values prescribed by the EU Framework Directive 2008/50/EC. The Limit Values are legally binding and the Secretary of State, on behalf of the UK Government, is responsible for their implementation.

The UK Air Quality Strategy, 2007

2.4. The current UK Air Quality Strategy (UK AQS) was published in July 2007[3] sets out the objectives for Local Planning Authorities (LPA) in undertaking their Local Air Quality Management (LAQM) duties. The 2007 UK AQS introduced a national level policy framework for exposure reduction for fine particulate matter. Objectives in the UK AQS are in some cases more onerous than the Limit Values set out within the relevant EU Directives and the Air Quality Standards Regulations 2010[4]. In addition, objectives have been established for a wider range of pollutants.

2.5. The UK AQS objectives of air pollutants relevant to this assessment are summarised in **Table 1**.

Table 1: Summary of Relevant UK AQS Objectives

Pollutant	Objective		Date by which Objective to be Met
	Concentration	Measured as	
Nitrogen Dioxide (NO_2)	200µg/m^3	1 hour mean not to be exceeded more than 18 times per year	31/12/2005
	40µg/m^3	Annual Mean	31/12/2005
Particulate Matter (PM_{10}) [(a)]	50µg/m^3	24 hour mean not to be exceeded more than 35 times per year	31/12/2004
	40µg/m^3	Annual Mean	31/12/2004
Particulate Matter ($PM_{2.5}$) [(b)]	Target of 15% reduction in concentrations at urban background locations	Annual Mean	Between 2010 and 2020

1 Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe.
2 Defra, (2010) The Air Quality Standards (England) Regulations.
3 Department of the Environment, Food and Rural Affairs (Defra), (2007). 'The Air Quality Strategy for England, Scotland, Wales & Northern Ireland'.
6 Secretary of State, 2010. The Air Quality Standards Regulations 2010

Pollutant	Objective		Date by which Objective to be Met
	Concentration	Measured as	
	25µg/m^3	Annual Mean	01/01/2020

Note: (a) Particulate matter with a mean aerodynamic diameter less than 10 microns (or micrometres – µm)
(b) Particulate matter with a mean aerodynamic diameter less than 2.5 microns

The Environment Act, 1995

2.6. In a parallel process, the Environment Act 1995[5] required the preparation of a national air quality strategy setting health-based air quality objectives for specified pollutants and outlining measures to be taken by LPAs in relation to meeting these objectives (the LAQM system).

2.7. Part IV of the Environment Act 1995 provides a system of LAQM under which LPAs are required to review and assess the future quality of the air in their area by way of a staged process. Should this process suggest that any of the AQS objectives will not be met by the target dates, the LPA must consider the declaration of an Air Quality Management Area (AQMA) and the subsequent preparation of an Air Quality Action Plan (AQAP) to improve the air quality in that area in pursuit of the AQS objectives.

Planning Policy

National Planning Policy

National Planning Policy Framework, 2018

2.8. The National Planning Policy Framework (NPPF)[6], published in July 2018, sets out the Government's planning policies for England and how these should be applied, replacing the first NPPF published in March 2012[7].

2.9. Paragraph 170 (previously 109) states "… *Development should, wherever possible, help to improve local environmental conditions such as air and water quality* …"

2.10. Furthermore, Paragraph 180 (previously 124) states "…*Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement…"*.

Local Planning Policy

Copeland Local Plan 2013-2028 Core Strategy and Development Management Policies DPD

2.11. The Copeland Local Plan 2013-2028[8] contains the Core Strategy and the Development Management Policies Development Plan Documents (DPD). The Core Strategy sets out the setting out an over-arching vision, priority objectives, development principles and a series of high-level spatial policies. The Development Management Policies DPD concentrates on the Council's more detailed requirements for development proposals when considering planning applications.

2.12. Policy ST1 – Strategic Development Principles of the Core Strategy details the need to 'Protect, enhance and restore the Borough's valued assets' by ensuring development minimises air, ground and water pollution.

5 Office of the Deputy Prime Minister (ODPM), 1995, 'The Environment Act' 1995.
6 Department for Communities and Local Government, 2018, 'National Planning Policy Framework'. DCLG, London.
7 Department for Communities and Local Government, 2012, 'National Planning Policy Framework'. DCLG, London.
8 Copeland Local Plan 2013-2028 Core Strategy and Development Management Policies DPD

Guidance

Improving Air Quality in the UK: Tackling Nitrogen Dioxide in our Towns and Cities. UK Air Quality Plan for Tackling Nitrogen Dioxide,2017

2.13. The UK Government was required by the High Court to release an Air Quality Plan to meet the NO_2 Limit Value in the shortest timescale as possible. This document was adopted on 26th July 2017[9].

2.14. The plan focuses on reducing concentrations of NO_x and NO_2 around road vehicle emissions within the shortest possible time. With the principal aims to:

a. reduce emissions of NOx from the current road vehicle fleet in problem locations now; and

b. accelerate road vehicle fleet turnover to cleaner vehicles to ensure that the problem remains addressed and does not move to other locations.

2.15. The other aims include reducing background concentrations of NO_x from:

- Other forms of transport such as rail, aviation and shipping;
- Industry and non-road mobile machinery; and
- Buildings, both commercial and domestic, and other stationary sources.

2.16. The Document, provided additional measures to reduce NO_x and NO_2 concentrations in the UK, such measures include:

- Mandate local authorities to implement Clean Air Zones within the shortest possible time;
- Consultation on proposal for a Clean Air Zone Framework for Wales;
- Consultation on a draft National Low Emission Framework for Scotland;
- Commitment to establishing a Low Emission Zone for Scotland by 2018;
- Tackling air pollution on the English Road network;
- New real driving emissions requirement to address real world NO_x emissions;
- Additional funding to accelerate uptake of hydrogen vehicles and infrastructure;
- Additional funding to accelerate the uptake of electric taxis;
- Further investment in retrofitting alongside additional support of low emission buses and taxis;
- Regulatory changes to support the take up of alternatively fuelled light commercial vehicles;
- Exploring the appropriate tax treatment for diesel vehicles;
- Call for evidence on updating the existing HGV Road User Levy;
- Call for evidence on use of red diesel;
- Ensure wider environmental performance is apparent to consumers when purchasing cars;
- Updating Government procurement policy;
- New emissions standards for non-road mobile machinery;
- New measures to tackle NO_x emissions from Medium Combustion Plants; and
- New measures to tackle NO_x emissions from generators.

2.17. The above measures do not provide any actions which are relevant to the operation or design of the Development.

[9] Defra (2017) Improving Air Quality in the UK: Tackling nitrogen dioxide in our towns and cities. Draft UK Air Quality Plan for Tackling Nitrogen Dioxide (Consultation Document)

2.18. A High Court ruling[10] on 21st February 2018, stated the UK Governments air quality improvement plan adopted on 31st July 2017 was unlawful as '*it does not contain measures sufficient to ensure substantive compliance with the 2008 Directive and the English Regulations'*. The UK Government '*must ensure steps are taken to achieve compliance as soon as possible, by the quickest route possible and by a means that makes that outcome likely'*.

2.19. The judgement stated that the UK Government must produce a supplementary plan, setting out requirements for feasibility studies to be undertaken in the 33 Local Authority Areas. CBC is not considered within this judgement.

2.20. In May 2018, it was announced the European Union (EU) was going to take the UK to the European Commission over failure to meet the Limit Values for NO_2.

Environmental Protection UK & Institute of Air Quality Management Guidance; Land-Use Planning & Development Control: Planning for Air Quality, 2017

2.21. Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) provide guidance[11] for air quality considerations within the local development control processes, promoting a consistent approach to the treatment of air quality issues.

2.22. The EPUK and IAQM guidance explains how development proposals can adopt good design principles to reduce emissions and contribute to better air quality. The guidance also provides a method for screening the need for an air quality assessment and a consistent approach for describing the impacts at individual receptors. The EPUK and IAQM Guidance, advises that:

"In arriving at a decision about a specific proposed development the local planning authority is required to achieve a balance between economic, social and environmental considerations. For this reason, appropriate consideration of issues such as air quality, noise and visual amenity is necessary. In terms of air quality, particular attention should be paid to:

- *Compliance with national air quality objectives and of EU Limit Values;*
- *Whether the development will materially affect any air quality action plan or strategy;*
- *The overall degradation (or improvement) in local air quality; or*
- *Whether the development will introduce new public exposure into an area of existing poor air quality".*

Planning Practice Guidance, 2014

2.23. The Government's online Planning Practice Guidance[12] (PPG) states that air quality concerns are more likely to arise where development is proposed within an area of existing poor air quality, or where it would adversely impact upon the implementation of air quality strategies and / or action plans. The PPG notes that when deciding whether air quality is relevant to a planning application, considerations would include whether the development would lead to:

- Significant effects on traffic, such as volume, congestion, vehicle speed, or composition;
- The introduction of new point sources of air pollution, such as furnaces, centralised boilers and Combined Heat and Power (CHP) plant; and

[10] https://www.judiciary.gov.uk/judgments/the-queen-on-the-application-of-clientearth-no-3-claimant-v-secretary-of-state-for-environment-food-and-rural-affairs-and-othrs/

11 Environmental Protection UK & Institute of Air Quality Management (2017), 'Land-Use Planning & Development Control: Planning for Air Quality', EPUK & IAQM, London.

12 DCLG (2014), 'Planning Practice Guidance: Air Quality (ID 32)' (06 March 2014).

- Exposing occupants of any new developments to existing sources of air pollutants and areas with poor air quality.

Institute of Air Quality Management: Guidance on the Assessment of Dust from Demolition and Construction, 2014

2.24. The IAQM Construction Dust Guidance[13] provides guidance to consultants and Environmental Health Officers (EHOs) on how to assess air quality impacts from construction related activities. The guidance provides a risk based approach based on the potential dust emission magnitude of the site (small, medium or large) and the sensitivity of the area to dust impacts. The importance of professional judgement is noted throughout the guidance. The guidance recommends that once the risk class of the site has been identified, the appropriate level of mitigation measures are implemented to ensure that the construction activities have no significant impacts.

13 Institute of Air Quality Management, 2014, 'Guidance on the Assessment of dust from demolition and construction.

3. Assessment Methodology and Significance

Assessment Methodology Overview

3.1. This air quality assessment was undertaken using a variety of information and procedures as follows:

- consultation with the Scientific Officer at CBC to agree the methodology to be used within the assessment (see **Appendix A**);
- Review of CBC's air quality Review and Assessment statutory reports published as part of the LAQM regime to determine baseline conditions around the Site;
- Review of the local area, to identify potentially sensitive receptor locations that could be affected by changes in air quality arising from the construction works and the operation of the Development;
- Identification of air quality sensitive receptors within the Site, to determine air quality conditions that future users of the Site would be exposed too;
- Review and use of traffic flow data, provided by the transport consultants, CBO Transport Ltd;
- Dispersion modelling of pollutant emissions using the ADMS-Roads model[14] to predict the likely pollutant concentrations at the Site and the likely effect of the completed and operational Development on local air quality in terms of traffic emissions generated. The latest NO_2 from NO_x Calculator available from the LAQM Support website[15] has been applied to derive the road-related NO_2 concentrations from the modelled NO_x concentrations;
- Comparison of the predicted air pollutant concentrations with monitored concentrations from CBC's diffusion tube at Trinity Court, Scotch Street in Whitehaven (ID 22), and the adjustment of modelled results where necessary (model verification details are provided in **Appendix B**);
- Comparison of the predicted air pollutant concentrations with the UK AQS objectives;
- Determination of the likely significant effects of construction works and activities, and consideration of the environmental management controls likely to be employed during the works;
- Determination of the likely significant effects of the operational phase of the Development on air quality, based on the application of the EPUK/ IAQM Guidance significance criteria to the modelled results; and
- Identification of mitigation measures, where appropriate.

3.2. Emissions of total NO_x from motor vehicle exhausts comprise nitric oxide (NO) and nitrogen dioxide (NO_2). NO oxidises in the atmosphere to form NO_2.

3.3. The most significant pollutants associated with road traffic emissions, in relation to human health, are NO_2 and PM_{10}. This assessment therefore focuses on NO_2 and particulate matter (PM_{10} and $PM_{2.5}$).

14 Cambridge Environmental Research Consultants Ltd, ADMS-Roads, January 2018, Version 4.1.1.
15 AEA, NOx to NO2 Calculator, http://laqm1.defra.gov.uk/review/tools/monitoring/calculator.php Version 7.1, April 2019.

Construction Phase Assessment Methodology

Dust Emissions

3.4. The assessment of the construction activities in relation to dust has been based on the IAQM's Guidance on the Assessment of Dust from Demolition and Construction, 2014 and the following:

- Consideration of planned construction activities and their phasing; and
- A review of the sensitive uses in the area immediately surrounding the Site.

3.5. The IAQM guidance identifies receptors within 350m of the Site boundary, and within 50m of construction routes would be sensitive to emissions and nuisance dust from construction activities. **Figure 1** shows the area surrounding the Site, where sensitive receptors could be affected by nuisance dust, considering the IAQM guidance.

3.6. Following the IAQM guidance, construction activities can be divided into the following four distinct activities:

- Demolition – any activity involved in the removal of an existing building;
- Earthworks – the excavation, haulage, tipping and stockpiling of material, but may also involve levelling the site and landscaping;
- Construction – any activity involved with the provision of a new structure; and
- Trackout – the movement of vehicles from unpaved ground on a site, where they can accumulate mud and dirt, onto the public road network where dust might be deposited.

3.7. The IAQM guidance considers three separate dust effects, with the proximity of sensitive receptors being taken into consideration for:

- annoyance due to dust soiling;
- potential effects on human health due to significant increase in exposure to PM_{10}; and
- harm to ecological receptors.

3.8. A summary of the four-step process which has been undertaken for the dust assessment of construction activities as set out in the IAQM guidance is presented in **Table 2**.

Table 2: Summary of the IAQM Guidance for Undertaking a Construction Dust Assessment

Step		Description
1	Screen the Need for a Detailed Assessment	Simple distance-based criteria are used to determine the requirement for a detailed dust assessment. An assessment will normally be required where there are ‘human receptors’ within 350m of the boundary of the site and / or within 50m of the route(s) used by construction vehicles on public highway, up to 500m from the site entrance or ‘ecological receptors’ within 50m of the boundary of the site and/or within 50m of the route(s) used by construction vehicles on public highway, up to 500m from the site entrance.
2	Assess the Risk of Dust Effects	The risk of dust arising in sufficient quantities to cause annoyance and/or health or ecological effects should be determined using three risk categories: low, medium and high based on the following factors: • the scale and nature of the works, which determines the risk of dust arising (i.e. the magnitude of potential dust emissions) classed as small, medium or large; and • the sensitivity of the area to dust effects, considered separately for ecological and human receptors (i.e. the potential for effects) defined as low, medium or high.
3	Site Specific Mitigation	Determine the site-specific measures to be adopted at the site based on the risk categories determined in Step 2 for the four activities. For the cases where the risk is ‘insignificant’ no mitigation measures beyond those required by legislation are required. Where a local authority has issued guidance on measures to be adopted these should be taken into account.
4	Determine Significant Effects	Following Steps 2 and 3, the significance of the potential dust effects should be determined, using professional judgement, taking into account the factors that define the sensitivity of the surrounding area and the overall pattern of potential risks.

Construction Vehicle Exhaust Emissions

3.9. The IAQM guidance on assessing construction effects states that:

“*Experience of assessing the exhaust emissions from on-site plant and site traffic suggests that they are unlikely to make a significant effect on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed.*”

3.10. Given the size of the Site and the duration of the construction phase (Proposal due to be completed in approximately 2030), it was estimated the maximum number of Heavy Duty Vehicles (HDV) could exceed 50 outward movements trips per day. However, given the Site is not located within or adjacent to an AQMA, it was considered that a qualitative assessment of the exhaust emissions from construction traffic was acceptable.

Construction Plant Emissions

3.11. Given the size of the Site and the small contribution of emissions to local air quality, in accordance with the IAQM guidance, is considered that a quantitative assessment of the exhaust emissions from construction plant is not required, and a qualitative assessment is appropriate.

Operational Phase Assessment Methodology

ADMS-Roads Model

3.12. The likely effects on local air quality from traffic movements generated from the completed and operational Development have been assessed using the atmospheric dispersion model ADMS-Roads.

3.13. For the purposes of modelling, traffic data has been provided by the Applicant's transport consultant. Further details are provided in **Appendix B**. The baseline year of 2018 has been assessed together with the 'without Development' and 'with Development' scenarios for the year 2030, the anticipated year of completion of the Development.

3.14. The ADMS-Roads dispersion model predicts how emissions from roads and small-scale industrial sources combine with local background pollution levels, taking account of meteorological conditions, to affect local air quality. The model has been run for the completion year, using background data and vehicle emission rates for 2030 as inputs. For the verification assessment (referred to later in this Report), background data and vehicle emission rates for 2018 have been used, which would be higher than the 2030 data. Pollutant concentrations have been modelled at locations representative of nearby sensitive receptors.

3.15. Full details of the dispersion modelling study, including the road traffic used in the assessment, are presented within **Appendix B**.

Model Uncertainty

3.16. Analyses of historical monitoring data by Defra[16] have identified a disparity between actual measured NO_X and NO_2 concentrations and the expected decline associated with emission forecasts which form the basis of air quality modelling as described above. It has been found to be related to the on-road performance of certain vehicles compared to calculations based on Euro emission standards which inform emission forecasts. It is thought that there may be reduction in NO_X and NO_2 concentrations when the Euro 6 emission standards begin to take effect (assumed to be post 2015).

3.17. The note 'Projecting NO_2 Concentrations' published by Defra[17] and the Guidance Note from the IAQM[18] provides a number of alternative approaches that can be followed in air quality assessments, in relation to the modelling of future NO_2 concentrations, considering that future NO_X/NO_2 road-traffic emissions and background concentrations may not reduce as previously expected. This includes the use of revised background pollution maps, alternative projection factors and revised vehicle emission factors. However, the Defra and IAQM notes do not form part of statutory guidance and no prescriptive method is recommended for use in an air quality assessment.

[16] http://laqm.defra.gov.uk/faqs/faqs.html.
[17] Defra, 2012, Local Air Quality Management: Note on Projecting NO_2 Concentrations.
[18] https://iaqm.co.uk/text/position_statements/uncertainty_vehicle_NOx_emissions.pdf

3.18. This air quality assessment has been based on current guidance, i.e. using existing forecast emission rates and background concentrations to the completion year of 2030, which assumes a progressive reduction compared to the baseline year 2018. However, in addition, a sensitivity analysis has been undertaken based on no future NO_X and NO_2 reductions by 2030 (i.e. considering the likely significant effect of the Development against the baseline 2018 conditions, assuming no reduction in background concentrations or road-traffic emissions rates between 2018 and 2030).

3.19. The sensitivity approach presented in this air quality assessment is now typically agreed and accepted by local authorities as being robust, providing a clear method to account for the uncertainty in future NO_X and NO_2 concentrations in air quality assessments. The results of this sensitivity analysis, which represent a more conservative assessment scenario, are presented in the 'Operational Phase Effects' section below.

Background Pollutant Concentrations

3.20. To estimate the total concentrations due to the contribution of any other nearby sources of pollution, background pollutant concentrations need to be added to the modelled concentrations. Full details of the background pollution data used within the air quality assessment are included in **Appendix B**.

Model Verification

3.21. Model verification is the process of comparing monitored and modelled pollutant concentrations and, if necessary, adjusting the modelled results to reflect actual measured concentrations, to improve the accuracy of the modelling results. The model has been verified by comparing the predicted annual mean NO_2 concentrations for the baseline 2018, with the results from CBC's diffusion tube at Trinity Court, Scotch Street in Whitehaven (ID 22). Modelled concentrations have then been adjusted accordingly. The verification and adjustment process is described in detail in **Appendix B**.

Potentially Sensitive Receptors

3.22. The approach adopted by the UK AQS is to focus on areas at locations at, and close to, ground level where members of the public (in a non-workplace area) are likely to be exposed over the averaging time of the objective in question (i.e. over 1-hour, 24-hour or annual periods). Objective exceedances principally relate to annual mean NO_2 and PM_{10}, and 24-hour mean PM_{10} concentrations, so that associated potentially sensitive locations relate mainly to residential properties and other sensitive locations (such as hospitals and schools) where the public may be exposed for prolonged periods.

3.23. **Table 3** presents existing sensitive receptors selected due to their proximity to the road network likely to be affected by the Development. **Table 3** also presents future sensitive receptor locations which are representative of sensitive residential uses proposed within the Development itself. The future sensitive receptor locations represent areas of the Development that would likely be exposed to the worst-case air quality conditions, i.e. closest to road traffic. The location of the selected existing and future receptors assessed are presented in **Figure 2**.

Table 3: Selected Receptor Locations

ID	Receptor Location	Grid Reference		Height Above Ground (m)
1	Rivendale	297605	515034	0
2	10 Woodville Way	296834	516047	0
3	42 Snaefell Terrace	296777	516190	0
4	1 Taylors Way	296748	516502	0
5	1 Meadow View	297291	517241	0
6	Greenbank Avenue	297577	516011	0
7	1 Rose Cottage	297486	516836	0
8	4 Scotch Street	297453	517972	0
9	1 Suffolk Close	298596	516121	0
10	North Lodge	298581	515987	0
11	Cardewlee	298822	515508	0
12	**Proposed:** South-east of Site 1	296795	516052	0
13	**Proposed:** South-east of Site 2	296809	516008	0
14	**Proposed:** North of Site	296577	516373	0

Notes: Ground floor assumed to be 0m to represent worst-case assessment of exposure as it is the closest location of the receptor to the tailpipe vehicle emission

Limitations and Assumptions

3.24. For the purposes of the assessment of dust emissions during demolition and construction, it was assumed that site enabling and construction works would be carried out at the Site boundary to provide a worst-case assessment.

3.25. The air quality model cannot take account of the benefits a building or green planting can have in terms of restricting the dispersion of vehicle emissions by providing a physical barrier or, for planting, the ability to trap and filter airborne pollutants. As such the results from the air quality model are worst-case. In addition, the model cannot take account of individual behavioural changes associated with sustainable transport measures such as cycle routes and electric charging facilities.

Determining Significance of Effects

Construction

Dust Emissions

3.26. The potential effects of construction activities on local air quality were based on professional judgement and with reference to the criteria set out in IAQM's construction dust guidance. Appropriate mitigation that would be implemented to minimise any adverse effects on air quality were also considered. Details of the assessor's experience and competence to undertake the dust assessment is provided in **Appendix B**.

3.27. The assessment of the risk of dust effects arising from the likely construction activities, as identified by the IAQM's construction dust guidance, is based on the magnitude of potential dust emissions and the sensitivity of the area. The risk category matrix for construction activity types, taken from the IAQM guidance, is presented in **Table 4** to **Table 6**. There are no buildings on Site, demolition has therefore not been considered further.

Table 4: Risk Category from Earthworks Activities

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

Table 5: Risk Category from Construction Activities

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

Table 6: Risk Category from Trackout Activities

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

3.28. The risk category determined for each construction activity type was used to define the appropriate mitigation measures that should be applied. The IAQM's construction dust guidance recommends that significance is only assigned to the effect after considering mitigation and assumes that all actions to avoid or reduce the effects are inherent within the design of the development. In the case of construction mitigation, this would be secured through planning conditions, legal requirements or required by regulations. Therefore, in this assessment no significance is identified for the pre-mitigation effects of the construction activities.

Construction Vehicle Exhaust Emissions

3.29. The significance of the effects of construction vehicle exhaust emissions on air quality were based on professional judgement.

Construction Plant Emissions

3.30. The significance of the effects from construction plant emissions on air quality was also based on professional judgement.

Completed Development

3.31. The EPUK / IAQM guidance provides an approach to assigning the magnitude of changes as a result of a development as a proportion of a relevant assessment level, followed by examining this change in the context of the new total concentration and its relationship with the assessment criterion to provide a description of the impact at selected receptor locations.

3.32. **Table 7** presents the IAQM framework for describing the impacts (the change in concentration of an air pollutant) at individual receptors. The term Air Quality Assessment Level (AQAL) is used to include air quality objectives or limit values, where these exist.

Table 7: Impact Descriptors for Individual Receptors

Long term average Concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	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 of AQAL	Moderate	Substantial	Substantial	Substantial

Note: AQAL may be an air quality objective, EU limit value, or an Environment Agency ‘Environmental Assessment Level (EAL)’
The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers.
Changes of 0% (i.e. less than 0.5%) are described as Negligible.
The table is only to be used with annual mean concentrations

3.33. The approach set out in the EPUK / IAQM guidance provides a method for describing the impact magnitude at individual receptors only. The guidance outlines that this change may have an effect on the receptor depending on the severity of the impact and other factors that may need to be taken into account. The assessment framework for describing impacts can be used as a starting point to make a judgement on the significance of the effect. However, whilst there may be ‘slight’, ‘moderate’ or ‘substantial’ impacts described at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances.

3.34. Following the approach to assessing significance outlined in the EPUK / IAQM guidance, the significance of likely residual effects of the completed Development on air quality was established through professional judgement and the consideration of the following factors:

- the geographical extent (local, district or regional) of effects;
- their duration (temporary or long term);
- their reversibility (reversible or permanent);
- the magnitude of changes in pollution concentrations;

- the exceedance of standards (e.g. AQS objectives); and
- changes in pollutant exposure.

waterman

4. Baseline Conditions

Copeland Borough Council's Review and Assessment of Air Quality

4.1. As a result of work undertaken to date as part of their Review and Assessment of air quality process, the air quality is good within CBC. CBC has therefore not declared an AQMA[19].

Copeland Borough Council's Local Monitoring

4.2. CBC undertook NO_2 monitoring at 24 diffusion tubes in 2018. The results for the seven NO_2 diffusion tube locations located within Whitehaven are presented in **Table 8**.

Table 8: NO_2 Annual Mean Monitored Concentrations at the CBC's Whitehaven diffusion tubes

Site ID	Location	Classification	Distance to Site Centre	2014	2015	2016	2017	2018
22	Trinity Court, Scotch Street	Roadside	2.1km	11.8	11.9	13.9	12.2	15.6
6	Admiral House, Strand Street	Roadside	2.2km	15.9	18.3	19.6	16.6	21.4*
2	Police Station, Scotch Street	Roadside	2.2km	24.0	21.7	24.1	21.7	24.3
1	55/56 Lowther Street	Roadside	2.2km	15.0	14.6	16.3	14.7	16.2
24	37 New Lowther Street	Roadside	2.3km	16.8	15.0	15.2	14.4	17.4
11	Opposite Paul Jones Tavern, Strand Street	Roadside	2.3km	20.9	19.0	21.6	19.5	22.6
3	Fire Station, Main St, Hensingham	Background	2.7km	8.7	7.9	9.0	8.2	8.6

Notes: Data obtained directly from Thomas Greer at CBC
*Unusually high reading for the Admiral House monitoring point (ID6) in July 2018, caused by the diffusion tube being accidently left up over 2 monitoring periods

4.3. The monitoring results in **Table 9** indicate that the annual mean NO_2 objective of $40\mu g/m^3$ was met at the seven diffusion tube monitoring locations in Whitehaven between 2014 and 2018. The local air quality conditions at the Site are therefore considered to be good.

[19] Copeland Borough Council. 2018. 2017 Air Quality Annual Status Report (ASR), January 2018

5. Construction Phase Effects

5.1. Construction activities in relation to the Development have the potential to affect local air quality through Earthworks, Construction and Trackout activities, as described above. There are no buildings on Site and therefore no demolition works would be required.

5.2. The nearest high sensitivity human receptors include residential properties bordering the north east of the Site boundary off Waters Edge Close and within 20m to the east of the Site on the opposite side of High Road. The nearest ecological receptor is St Bees Head, an area of Special Scientific Interest (SSSI), located 120m to the west of the Site at its closest point. The location of the Site and Construction Phase Assessment Bands are presented in **Figure 1**.

5.3. As there are existing receptors within 350m of the boundary of the Site and within 50m of the routes that would be used by construction vehicles on the public highway, it is considered a detailed assessment is required to determine the likely dust effects, as recommended by the IAQM guidance on construction dust. Results of this assessment are provided for each main activity (Earthworks, Construction and Trackout) below.

Dust Emissions

Earthworks

5.4. The area of the Site is approximately 33.1ha, or 331,000m^2. Based on this and considering the criteria in Step 2A of the IAQM guidance, the potential dust emissions during earthworks activities would be of **large** magnitude.

Construction

5.5. The estimate for the total volume of buildings to be constructed could exceed 100,000m^3. Based on this, and considering the criteria in Step 2A of the IAQM guidance, the potential dust emissions during construction activities would be of **large** magnitude.

Trackout

5.6. It is estimated that the number of construction HDV trips would be between 10 and 50 outward HDV trips per day (Monday to Saturday). Based on this and considering the criteria in Step 2A of the IAQM guidance, the potential for dust emissions due to trackout activities would be of **medium** magnitude.

Sensitivity of the area

5.7. The sensitivity of the area to each main activity has been assessed based on the number and distance of the nearest sensitive receptors to the activity, and the sensitivity of these receptors to dust soiling and human health.

Sensitivities of People to Dust Soiling Effects

5.8. There were estimated to be 10 -100 high sensitive human receptors within 50m of the Site. On this basis (as set out in Table 2 of the IAQM Guidance) the sensitivity of the area to dust soiling was considered to be **medium**.

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

5.9. The Defra background PM_{10} concentration for the Site ranges from 7.7µg/m^3 to 8.1µg/m^3 for 2018 (see **Appendix B: Air Quality Assessment Detailed Methodology**). On this basis (as set out in Table 3 of the IAQM guidance) the sensitivity of the area to human health was **low**.

Sensitivities of Receptors to Ecological Effects

5.10. St Bees Head is designated as an SSSI and using Box 8 of the IAQM Guidance, the sensitivity of the area to ecological impacts was **medium**.

Dust Risk Summary

5.11. The dust risk categories, based on the potential magnitude of dust emissions and the sensitivity of the area to dust, are presented in **Table 9.**

Table 9: Summary of Risk

Potential Effect	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Medium Risk	Medium Risk
Human Health	Low Risk	Low Risk	Low Risk
Ecological	Medium Risk	Medium Risk	Medium Risk

5.12. The Site is considered **medium risk** to dust soiling and ecological impacts. Consequently, mitigation would be required to ensure that this medium risk adverse impact be minimised, reduced and, where possible, eliminated.

Construction Vehicle Emissions

5.13. Construction related vehicles entering and egressing the Site from / to the local road network would have the potential to increase local air pollutant concentrations, particularly in respect of NO_2 and particulate matter (both PM_{10} and $PM_{2.5}$).

5.14. Based on the size of the Site, it is estimated that number of HDVs would be between 10 and 50 outward HDV trips per day (Monday to Saturday). Emissions from construction traffic would be relatively small compared to road traffic emissions on Rotherhithe New Road (3,559 daily vehicles including 1% HDVs) in 2018. Further details on traffic flows is contained within **Appendix B**.

5.15. However, as the Site is in a residential area, in the worst case, it was considered the effect of the construction vehicles could be **temporary**, **local** and of **minor adverse** significance.

Construction Plant Emissions

5.16. Any emissions from plant operating on the Site would be small in comparison to current traffic emissions and existing background concentrations. The likely effect of emissions from construction plant would be **not significant**.

6. Operational Phase Effects

6.1. Effects on local air quality associated with the completed and operational Development would likely result from changes to traffic flows associated with the Development.

6.2. The results of the ADMS-Roads air quality modelling of operational traffic (based on current guidance, i.e. with reduced emission rates and background concentration to the completion year of 2030) are presented in **Table 10** and **Table 11**. Full details are provided within **Appendix B**.

6.3. **Table 10** and **Table 11** presents the predicted concentrations at relevant existing receptors and receptors introduced as part of the Development nearest to road traffic. These locations represent the worst-case air quality conditions that would likely result.

Nitrogen Dioxide (NO_2)

Table 10: Results of the ADMS Modelling at Sensitive Receptors (NO_2)

ID	Receptor Location	NO_2 Annual Mean (µg/m³)			
		2018 Baseline	2030 Without Development	2030 With Development	2030 Change
1	Rivendale	9.1	5.9	5.9	0.0
2	10 Woodville Way	9.4	6.4	6.7	0.3
3	42 Snaefell Terrace	10.5	6.9	7.4	0.5
4	1 Taylors Way	9.4	6.4	6.6	0.2
5	1 Meadow View	11.5	6.8	7.1	0.3
6	Greenbank Avenue	9.4	6.0	6.1	0.1
7	1 Rose Cottage	10.0	6.3	6.4	0.1
8	4 Scotch Street	11.6	6.8	7.0	0.2
9	1 Suffolk Close	13.9	7.9	8.0	0.1
10	North Lodge	12.2	7.1	7.1	0.0
11	Cardewlee	14.3	8.1	8.2	0.1
12	**Proposed:** South-east of Site 1	-	-	6.5	-
13	**Proposed:** South-east of Site 2	-	-	6.5	-
14	**Proposed:** North of Site	-	-	6.1	-

Note: For accuracy, the changes arising from the Development have been calculated using the exact output from the ADMS-Road model rather than the rounded numbers within Table 10.

6.4. The results in **Table 10** indicate that for 2018 the annual mean NO_2 objective is met at all 11 existing receptor locations. The highest predicted concentration is 14.3µg/m^3 at Receptor 11.

6.5. As discussed in **Appendix B: Air Quality Assessment Detailed Methodology**, the 1-hour mean AQS objective for NO_2 is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60µg/m^3. As shown in **Table 10**, the predicted NO_2 annual mean concentrations in 2018 were below 60µg/m^3 at all the existing locations and as such it is likely that the 1-hour mean objective is met at these locations.

6.6. In 2030, both 'without' and 'with' the Development, all existing receptors are predicted to be below the NO_2 annual mean objective. Therefore, the 1-hour mean objective is also predicted to be met at all existing receptor locations.

6.7. Using the impact descriptors outlined in **Table 7**, the Development is predicted to result in a 'negligible' impact at all 24 existing receptors. Using professional judgement, based on the severity of the impact and the concentrations predicted at the sensitive receptors it is considered that the effect of the Development on NO_2 concentrations would be **not significant**.

Particulate Matter (PM_{10} and $PM_{2.5}$)

Table 11: Results of the ADMS Modelling at Sensitive Receptors (PM_{10} and $PM_{2.5}$)

ID	PM_{10} Annual Mean (µg/m^3)				PM_{10} - Number of Days >50µg/m^3				$PM_{2.5}$ Annual Mean (µg/m^3)			
	2018 Baseline	2030 Without Development	2030 With Development	2030 Change	2018 Baseline	2030 Without Development	2030 With Development	2030 Change	2018 Baseline	2030 Without Development	2030 With Development	2030 Change
1	9.0	8.3	8.3	0.0	5	7	7	0	5.3	4.8	4.8	0.0
2	8.4	7.8	7.9	0.1	6	8	8	0	5.2	4.6	4.7	0.1
3	8.5	8.0	8.2	0.2	6	8	8	0	5.3	4.8	4.9	0.1
4	8.4	7.7	7.8	0.1	7	8	8	0	5.2	4.6	4.7	0.1
5	9.7	9.0	9.1	0.1	4	5	5	0	5.7	5.2	5.2	0.0
6	10.6	10.0	10.0	0.0	2	3	3	0	5.7	5.1	5.1	0.0
7	10.8	10.1	10.1	0.0	2	3	3	0	5.7	5.2	5.2	0.0
8	9.6	9.0	9.1	0.1	4	5	5	0	5.7	5.2	5.2	0.0
9	10.6	9.9	10.0	0.1	2	3	3	0	6.2	5.6	5.6	0.0
10	9.8	9.2	9.3	0.1	3	4	4	0	5.8	5.3	5.3	0.0
11	10.3	9.8	9.8	0.0	3	3	3	0	6.1	5.6	5.6	0.0
12	-	-	7.8	-	-	-	8	-	-	-	4.7	-
13	-	-	7.8	-	-	-	8	-	-	-	4.7	-

ID	PM$_{10}$ Annual Mean (µg/m^3)				PM$_{10}$ - Number of Days >50µg/m^3				PM$_{2.5}$ Annual Mean (µg/m^3)			
	2018 Baseline	2030 Without Development	2030 With Development	2030 Change	2018 Baseline	2030 Without Development	2030 With Development	2030 Change	2018 Baseline	2030 Without Development	2030 With Development	2030 Change
4	-	-	7.6	-	-	-	9	-	-	-	4.6	-

Note: For accuracy, the changes arising from the Development have been calculated using the exact output from the ADMS-Road model rather than the rounded numbers within Table 11.

6.8. As shown in **Table 11**, the annual mean concentrations of PM$_{10}$ are predicted to be below the objective of 40µg/m^3 in 2018 and in 2030 both 'without' and 'with' the Development at all the existing receptor locations considered. The maximum predicted concentration in all scenarios tested is 10.8µg/m^3 at Receptor 7 in 2018. Using the impact descriptors outlined in **Table 7**, the Development is predicted to result in a 'negligible' impact at all existing receptors.

6.9. The results in **Table 11** indicate that in 2018 and in 2030 both 'without' and 'with' the Development, all existing receptor locations are predicted to be below the 24-hour mean PM$_{10}$ objective value of 35 days exceeding 50µg/m^3. The highest number of days exceeding 50µg/m^3 was eight days in 2030 both 'without' and 'with' the Development.

6.10. The results in **Table 11** indicate that in 2018 and in 2030 both 'without' and 'with' the Development, all existing receptor locations are predicted to be below the annual mean PM$_{2.5}$ objective value of 25µg/m^3. The maximum predicted concentration in all scenarios is 6.2µg/m^3 at Receptor 9 in 2018. Using the impact descriptors outlined in **Table 7**, the Development is predicted to result in a 'negligible' impact at all existing receptors.

6.11. Using professional judgement, based on the severity of the impact and the concentrations predicted at the sensitive receptors it is considered that the effect of the Development on PM$_{10}$ and PM$_{2.5}$ concentrations would be **not significant**.

Conditions within the Development

6.12. As shown by the results in **Tables 10 and 11**, the predicted NO_2, PM$_{10}$ and PM$_{2.5}$ concentrations for locations within the Development itself are below the relevant objectives in 2030. As such, it is considered that the effect of introducing educational uses to the Site is **not significant**.

Nitrogen Dioxide Sensitivity Analysis Results

6.13. The results of the sensitivity analysis in relation to NO_2 (i.e. considering the potential impact of the Development against the current baseline, 2018, conditions) are presented in **Table 12**.

Table 12: Results of ADMS-Roads Assessment for 2030 Assuming no Improvement in NO_x or NO_2

ID	Receptor Location	Without Development	With Development	$\mu g/m^3$ Change
1	Rivendale	9.3	9.3	0.0
2	10 Woodville Way	9.8	10.6	0.8
3	42 Snaefell Terrace	11.2	12.6	1.4
4	1 Taylors Way	9.7	10.3	0.6
5	1 Meadow View	12.1	12.8	0.7
6	Greenbank Avenue	9.5	9.6	0.1
7	1 Rose Cottage	10.3	10.5	0.2
8	4 Scotch Street	12.1	12.6	0.5
9	1 Suffolk Close	15.0	15.2	0.2
10	North Lodge	12.9	13.1	0.2
11	Cardewlee	15.5	15.9	0.4
12	**Proposed:** South-east of Site 1	-	10.1	-
13	**Proposed:** South-east of Site 2	-	10.2	-
14	**Proposed:** North of Site	-	8.9	-

6.14. The overall predicted concentrations in **Table 12** are higher than those presented in **Table 10** for 2030 due to higher background concentrations and vehicle emissions rates in 2018 than 2030. The results in **Table 13** show that the NO_2 annual mean concentrations are predicted to be meet the objective value of 40µg/m^3, 'without' and 'with' the Development, at all 11 of the existing sensitive receptors modelled, when assuming no improvements to NOx and NO_2.

6.15. The predicted annual mean NO_2 concentrations are below 60µg/m^3 at all receptor locations both 'without' and 'with' the Development when assuming no improvement to NO_x and NO_2, and as such the 1-hour mean objective is also likely to be met at these locations.

6.16. Using the impact descriptors outlined in **Table 7**, the Development is predicted to result in a 'negligible' impact at all 11 existing receptors. Using professional judgement, based on the severity of the impact, the existing concentrations at the sensitive receptors, it is considered that the effect of the Development on NO_2 concentrations, when assuming no improvements in future NOx and NO_2 concentrations, would be **not significant**.

Conditions within the Development

6.17. As shown by the results in **Table 12**, assuming no improvement in future NO_x and NO_2, predicted NO_2 concentrations are below the annual mean AQS objective of 40µg/m^3 for locations within the Development itself. As such, it is considered that the effect of introducing residential uses to the Site is **not significant**.

7. Mitigation Measures and Residual Effects

Construction

Dust Emissions

7.1. The Site is a medium-risk site in relation to nuisance dust emissions (referred to earlier in this Report), and therefore a range of environmental management controls would be developed with reference to the IAQM guidance for high-risk sites. The management controls would prevent the release of dust entering the atmosphere and / or being deposited on nearby receptors and would be included within a Construction Environmental Management Plan. The management controls would include:

- appropriate site management including implementation of a stakeholder communications plan, a dust management plan, and regular site inspections to monitor dust control procedures
- provision of appropriate hoarding and / or fencing to reduce dust dispersion and restrict public access;
- avoid site runoff of water and mud;
- maintenance of Site fencing, barriers and scaffolding clean using wet methods;
- removal of materials that have potential to produce dust, where possible
- avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment, where possible;
- fitting equipment (particularly cutting, grinding or sawing) with dust control measures such as water sprays, wherever possible;
- enclosing chutes, conveyors and covered skips;
- restricting drop heights onto lorries and other equipment;
- no fires would be allowed on the Site;
- control of cutting or grinding of materials on the Site and avoidance of scabbling;
- ensuring sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process and other control measures are in place;
- ensuring that a road sweeper is available to clean mud and other debris from hard-standing, roads and footpaths;
- ensuring vehicles entering and leaving the sites are securely covered; and
- using a wheel wash system (with rumble grids).

7.2. Such measures are routinely and successfully applied to construction projects throughout the UK and are proven to significantly reduce the potential for adverse nuisance dust effects associated with the various stages of the construction work. Therefore, it is considered that residual effects due to fugitive emissions would be **not significant**.

Construction Vehicle Exhaust Emissions

7.3. All construction traffic logistics would be agreed with CBC. Consideration would also be given to the avoidance, or limited use, of traffic routes in proximity to sensitive uses (i.e. residential roads etc.) and the avoidance, or limited use, of roads during peak hours, where practicable. The likely residual effect of construction vehicles entering and egressing the Site to air quality would be **not significant**.

Construction Plant Emissions

7.4. Even in the absence of mitigation, the likely effect of any emissions from plant operation on the Site would be **not significant.** This would therefore remain the likely residual effect.

Operational Development

7.5. As identified earlier in this report, the Development is predicted to have a **not significant** effect on local air quality. Accordingly, mitigation measures would not be required so **residual effects** would be **not significant**.

7.6. The Development would however, incorporate measures likely to benefit local air quality. Measures would include:

- Provision of ‘No-Idling” signage within the Development; and
- Planting of trees and plants appropriate for a coastal location.

8. Summary and Conclusions

8.1. The main likely effects on local air quality during construction relate to dust. A range of measures to minimise or prevent dust would be implemented and it is considered that following mitigation, the effects from nuisance dust emissions would be **not significant.**

8.2. It is anticipated that after management measures have been implemented, the effect of construction vehicles entering and egressing the Site during the construction phase would be **not significant**.

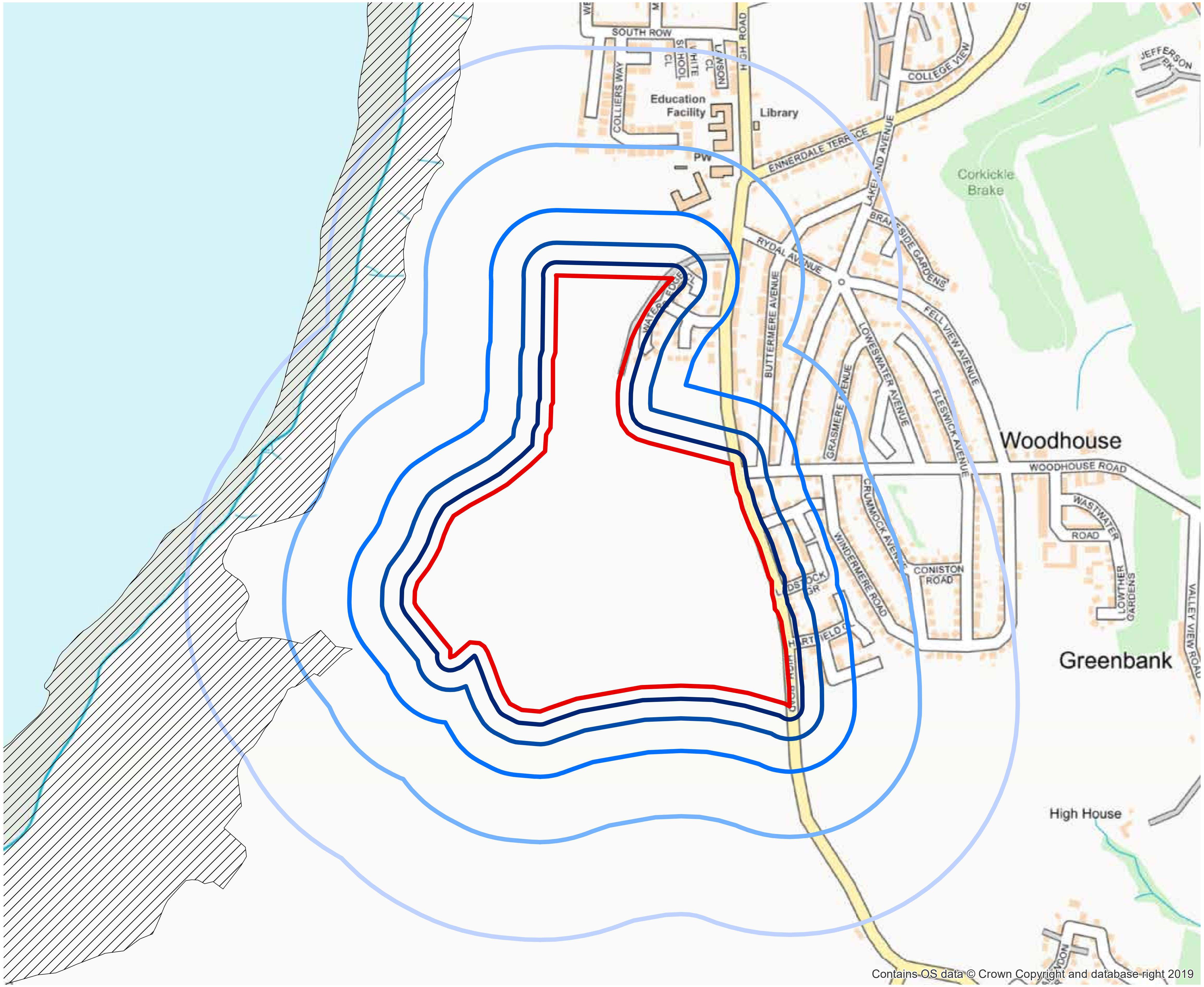
8.3. Emissions from construction vehicles would be small in comparison to emissions from vehicles travelling on roads in the surrounding area of the Site and would not significantly affect air quality. Therefore, it is anticipated that the effect of construction plant would be **not significant**.

8.4. Following completion of the Development, even considering uncertainty in future NO_X and NO_2 reductions, the Development is predicted to have a negligible impact on NO_2, PM_{10} and $PM_{2.5}$ concentrations, at all existing receptors considered. As such, the overall effect of the Development on air quality is **not significant**.

8.5. With regards to predicted concentrations at the Site, when considering the uncertainty in NO_x and NO_2, it is considered air quality conditions at the Ste for all pollutants considered are **not significant**.

FIGURES

Figure 1: Construction Phase Assessment Bands



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- Site Boundary
- 20m from Site Boundary
- 50m from Site Boundary
- 100m from Site Boundary
- 200m from Site Boundary
- 350m from Site Boundary
- St. Bees Head SSSI

N

Project Details	WIE15084-100 : Whitehaven Residential Development
Figure Title	Figure 1: Construction Phase Assessment Bands
Figure Ref	WIE15084-100_GR_AQ_1A
Date	August 2019
File Location	\\s-lncs\wiel\projects\wie15084\100\graphics\aq\issued figures

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Figure 2: Site Plan and Receptor Locations

Site Boundary

Proposed Receptor Locations

Existing Receptor Locations

Project Details	WIE15084-100 : Whitehaven Residential Development
Figure Title	Figure 2: Site Plan and Receptor Locations
Figure Ref	WIE15084-100_GR_AQ_2A
Date	August 2019
File Location	\\s-lncs\wiel\projects\wie15084\100\graphics\aq\issued figures

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APPENDICES

Appendix A Consultation of Air Quality Scope with Copeland Borough Council

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Appendix A: Consultation of Air Quality Scope with Copeland Borough Council

From: Thomas Greer <Thomas.Greer@copeland.gov.uk>
Sent: 06 March 2019 09:08
To: Andrew Fowler <andrew.fowler@watermangroup.com>
Subject: RE: AQ information - Copeland Borough Council

Hi Andy,
Apologies for the delay in getting back to you.
Your proposed scope and methodology for the AQ assessment seems to be reasonable.
For information the diffusion tube at Trinity Court (ID 22) is on a part of the Whitehaven one way system, but is relatively free flowing and typically shows the lowest NO_2 levels in the town centre. The tube at the Police Station (ID 2) is on the same one way system but is by the main junction and is affected by standing traffic, hence the higher NO_2 levels.
If you need anything else please let me know.
Kind regards
Thom

From: Andrew Fowler <andrew.fowler@watermangroup.com>
Sent: 26 February 2019 11:39
To: Thomas Greer <Thomas.Greer@copeland.gov.uk>
Subject: RE: AQ information - Copeland Borough Council
Importance: High

Hi Thom,
Many thanks for sending this through, I really appreciate it.
I would like to agree with you the scope and methodology for an air quality assessment for a hybrid planning application for the redevelopment of land adjacent to High Road, Whitehaven for up to 700 residential units.
In terms of our approach we propose to use the detailed dispersion models ADMS roads to model the traffic emissions, and ADMS 5 to model any point source emissions if applicable. We would model the existing baseline, future without development and future with development scenarios at sensitive receptors in proximity to the Site and within the roads modelled. The model will also consider the future concentrations future users of the Site would be exposed too. To take into account the trend that NO_x and NO_2 concentrations are not declining as expected, the results will include an uncertainty section which will assess the future traffic on the basis of no future reductions (i.e. considering the potential effect of the Development against the current baseline conditions and assuming no improvements in vehicle emissions).
As traffic flows follow a diurnal variation throughout the day and week, the AMDS-Roads model will therefore include the DfT traffic profile for all roads nationally.
To ensure the performance of the model, a comparison between monitored and modelled concentrations (model verification) would be undertaken. Waterman propose to use the roadside diffusion tube at Trinity Court, Scotch Street, Whitehaven (ID 22).

Further to the operational assessment, a qualitative assessment of the potential impacts of the development on local air quality during construction would be undertaken. This would use the IAQM best practice guidance to assess dust nuisance and construction plant/ vehicles, detailing any mitigation measures required.
I welcome your thoughts on the above scope and would appreciate any recommendations.
Kind regards
Andy

Andy Fowler
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P Please consider the environment before printing this e-mail. Thank you!

From: Thomas Greer <Thomas.Greer@copeland.gov.uk>
Sent: 26 February 2019 09:18
To: Andrew Fowler <andrew.fowler@watermangroup.com>
Subject: AQ information - Copeland Borough Council

Hi Andrew,
Further to your phone call please find attached Copeland's ASR from 2017. As discussed I have also included a spreadsheet of the NO_2 diffusion tube data covering the period 2011-2017.
I hope this information helps. If you have any other queries please let me know.
Kind regards
Thom

Thomas Greer
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Appendix B: Air Quality Assessment Detailed Methodology

Appendix B: Air Quality Assessment Detailed Methodology

1.1 This appendix presents the technical information and data upon which the air quality assessment is based.

Completed Development Assessment

Model

1.2 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; which requires a range of input data, which can include pollutant emissions rates, meteorological data and local topographical information.

1.3 The effect of the Development on local air quality was assessed using the advanced atmospheric dispersion model ADMS-Roads, considering the contribution of emissions from forecast road-traffic on the local road network by the completion year. The use of the ADMS-Roads model was agreed with the Scientific Officer at Copeland Borough Council (CBC). Details of this consultation are provided in **Appendix A**.

1.4 At this stage a centralised heating or energy plant (such as a Combined Heat and Power Plant) is not proposed and it is envisaged the residential properties would utilise individual small-scale domestic boilers. Therefore, the air quality assessment does not consider further any emissions to air from any centralised heating or power plant. Notwithstanding this, it is considered a carefully worded planning condition would be attached to any granting of planning permission by the CBC, to ensure that, should a centralised combustion plant be included, such plant does not impact local air quality.

ADMS-Roads

1.5 The ADMS-Roads model is a comprehensive tool for investigating air pollution in relation to road networks. On review of the Site, and its surroundings, ADMS-Roads was considered appropriate for the assessment of the long and short-term effects of the proposals on air quality. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions of air pollutant concentrations. It can predict long-term and short-term concentrations, including percentile concentrations.

1.6 ADMS-Roads model is a formally validated model, developed in the United Kingdom (UK) by CERC (Cambridge Environmental Research Consultants). This includes comparisons with data from the UK's air quality Automatic Urban and Rural Network (AURN) and specific verification exercises using standard field, laboratory and numerical data sets. CERC is also involved in European programmes on model harmonisation, and their models were compared favourably against other EU and U.S. EPA systems. Further information in relation to this is available from the CERC web site at www.cerc.co.uk.

Model Scenarios

1.7 To assess the effect of the Development on local air quality, future ‘without Development’ and ‘with Development’ scenarios were assessed. The Development is anticipated to be complete in 2030 and therefore this is the year in which these future scenarios were modelled.

1.8 The year 2018 was modelled to establish the existing baseline situation, as it is the latest full year of air quality monitoring data, against which the air quality model is verified (discussed further below). 2018 base year traffic data and 2018 meteorological data were also used to be consistent with the verification year.

1.9 Considering recent analyses by Defra[1] showing that historical nitrogen oxide (NO_x) and nitrogen dioxide (NO_2) concentrations are not declining in line with emission forecasts, as outlined in main chapter, a sensitivity analysis has been undertaken based on no future reductions in NO_x/NO_2 concentrations (i.e. considering the potential effects of the Development against the current baseline 2018 conditions by applying the 2030 road traffic data to 2018 background concentrations and road traffic emission rates). The results for this sensitivity analysis are presented in the main report.

Traffic Data

1.10 Traffic flow data comprising Annual Average Daily Traffic (AADT) flows, traffic composition (% Heavy-Duty Vehicles (HDVs)) used in the model were provided by CBO Transport Ltd. **Table A1** presents the traffic data used within the Air Quality Assessment.

1.11 The methodology for calculating the expected change in vehicle trips because of the Development, once completed and operational, is set out in detail within the Transport Assessment (submitted separately with the planning application) and covers all the proposed land uses.

Table A1: 24-hour AADT Data Used within the Assessment

Link Name	Speed (kph)	Base 2018		Without 2030		With 2030	
		AADT	%HDV	AADT	%HDV	AADT	%HDV
B5345 St. Bees Road	48	3388	1	4025	1	4025	1
Wilson Pit Road	48	3498	1	6382	1	7979	1
High Road	48	3559	1	5218	1	6884	1
High Road North of Site Access (South)	48	3559	1	5218	1	8391	1
High Road North of Woodhouse Road	48	3740	2	5388	2	8350	2
High Road North of Site Access (North)	48	3740	2	5388	2	8714	2
Gins to Kells Road	48	5429	2	7217	2	10403	2
B5345 St. Bees Road	48	3388	1	4025	1	4025	1
Mirehouse Road	20	6419	1	9203	1	10840	1
B5345 St. Bees Road south of Woodhouse Road	48	3729	1	4495	1	4881	1
Woodhouse Road	20	1469	3	1651	3	2407	3
B5345 St. Bees Road north of Woodhouse Road	48	3454	2	4191	2	4419	2

1 http://laqm.defra.gov.uk/faqs/faqs.html: Measured nitrogen oxides (NOx) and/or nitrogen dioxide (NO_2) concentrations in my local authority area do not appear to be declining in line with national forecasts.

Link Name	Speed (kph)	Base 2018		Without 2030		With 2030	
		AADT	%HDV	AADT	%HDV	AADT	%HDV
B5345 Meadow View	48	5874	2	6869	2	7097	2
Coach Road	48	4422	1	5261	1	5759	1
B5345 Preston Street	48	10302	2	12612	2	15155	2
Irish Street	48	6644	2	7693	2	8965	2
Swingpump Lane	48	4340	3	5674	3	6946	3
Mirehouse Road	48	6419	1	9203	1	10840	1
Meadow Road	48	5055	1	5865	1	6588	1
A595 Egremont Road south of Mirehouse Road	64	18392	3	22347	3	23121	3
A595 Egremont Road south of Meadow Road	64	18599	3	23271	3	23271	3
A595 Egremont Road north of Meadow Road	64	21984	3	27282	3	28005	3
A595 Hensingham Bypass	64	17028	3	19732	4	19732	4
Homewood Road	48	6490	1	7386	1	7693	1
B5295 Egremont Road	48	4785	2	7159	2	7575	2

Vehicle Speeds

1.12 To take into account the presence of slow-moving traffic near junctions and at roundabouts, the speed at each junction was reduced to 20kph. This follows the criteria recommended within LAQM.TG(16) [2], which recommends traffic on the carriageway approaching the lights when red is reduced to 5-20 kph, depending on the time of day and how congested the junction is.

1.13 The speed was also reduced to 32kph along Scotch Street to account for slower moving vehicles along the narrow road.

Diurnal Profile

1.14 The ADMS-Roads model uses an hourly traffic flow based on the daily (AADT) flows. Traffic flows follow a diurnal variation throughout the day and week. Therefore, a diurnal profile was used in the model to replicate how the average hourly traffic flow would vary throughout the day and the week. This was based on data (the latest available at the time of the assessment) collated by Waterman from the Department for Transport (DfT) statistics Table TRA0307: 'Traffic Distribution by Time of Day on all roads in Great Britain', 2018[3], which is the latest data available at the time of undertaking the air quality assessment. **Figure A1** presents the diurnal variation in traffic flows which has been used within the model.

2 Defra, 2016, Local Air Quality Management Technical Guidance LAQM.TG(16)

3 Department for Transport (DfT) Statistics, www.dft.gov.uk/statistics/series/traffic

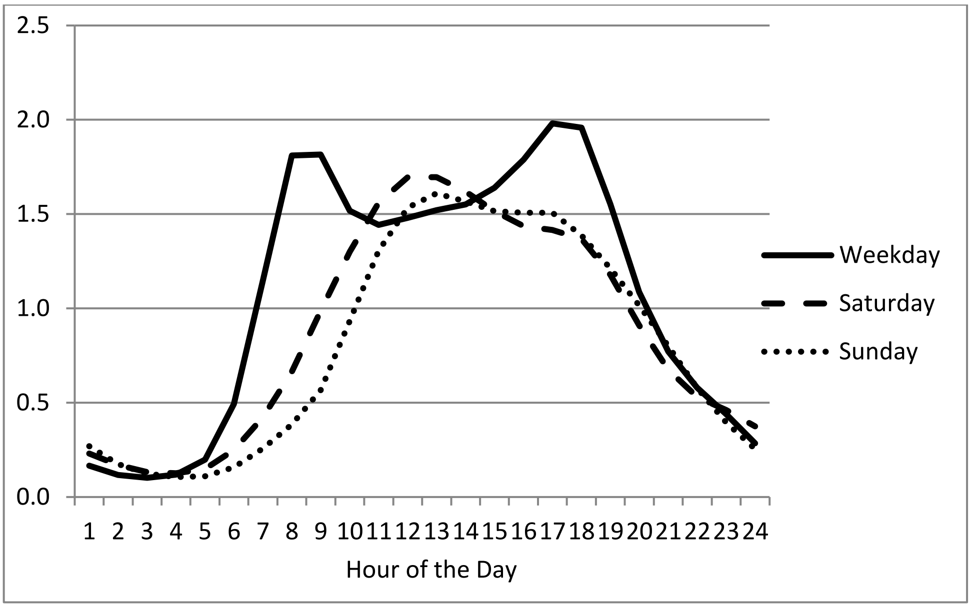

Figure A1: Department for Transport Diurnal Traffic Variation

Street Canyon Effect

1.15 Narrow streets with tall buildings on either side have the potential to create a confined space, which can interfere with the dispersion of traffic pollutants and may result in pollutant emissions accumulating in these streets. In an air quality model these narrow streets are described as street canyons.

1.16 ADMS-Roads includes a street canyon model to take account of the additional turbulent flow patterns occurring inside such a narrow street with relatively tall buildings on both sides. LAQM.TG(16) identifies a street canyon *"as narrow streets where the height of buildings on both sides of the road is greater than the road width."*

1.17 Initially the model was run without the street canyon and showed that when comparing against monitored results, further improvements to the model were required (discussed further under Model Verification). Following a review of the road network to be included within the model, the street canyon option was included for Scotch Street. Reasonable judgement was applied to try and replicate the height of the buildings along Scotch Street, and a height of 10m was used to represent a three-storey terraced house.

Road Traffic Emission Factors

1.18 The latest version of the ADMS-Roads model (version 4.1.1) was used for the assessment. The model includes the latest vehicle emission factors available at the time of the assessment, as published by Defra in the Emission Factors Toolkit (EFT) (version 9.0).

1.19 The EFT uses several parameters (traffic flow, percentage of HDV, speed and road type) to calculate road traffic emissions for the selected pollutants.

Background Pollutant Concentrations

1.20 Background pollutant concentration data (i.e. concentrations due to the contribution of pollution sources not directly considered in the dispersion modelling) have been added to contributions from the modelled pollution sources, for each year of assessment.

1.21 Background pollution monitoring is undertaken within CBC at nine diffusion tubes. One urban background diffusion tube is located in Whitehaven, at the Fire Station, on Main Street, approximately 2.7km east of the Site **Table A2** shows the concentrations measured at the Fire Station background diffusion tube from 2014 to 2018.

Table A2: Annual Mean Concentrations at CBC's Fire Station Urban Background Monitor

ID	Monitor	AQS Objective	2014	2015	2016	2017	2018
3	Fire Station, Main St, Hensingham, Whitehaven	Annual Mean (40µg/m^3)	8.7	7.9	9.0	8.2	8.6

Notes: Data obtained from London Borough of Ealing Air Quality Annual Status Report for 2017, May 2018

1.22 **Table A2** indicates the annual mean NO_2 concentrations at the Fire Station, Main Street are below the objective from 2014 to 2018.

1.23 **Table A2** shows that the monitored annual mean NO_2 concentrations were met in all years at the Fire Station diffusion tube monitor.

1.24 In addition to the monitoring data, background concentrations of NO_2, PM_{10} and $PM_{2.5}$ are available from the Defra LAQM Support website[4] for 1x1km grid squares for assessment years between 2017 and 2030. **Table A3** presents the Defra background concentrations for the years 2018 and 2030, for the grid squares the Site is located within (296500, 515500 and 296500, 516500).

Table A3: Defra Background Maps in 2018 and 2030 for the Grid Square at the Site

Pollutant	Annual Mean Concentration (µg/m^3)			
	Grid Square 296500, 515500		Grid Square 296500, 516500	
	2018	2030	2021	2030
NO_X	4.2	3.1	4.8	3.4
NO_2	3.4	2.4	3.8	2.7
PM_{10}	7.7	7.1	8.1	7.6
$PM_{2.5}$	4.8	4.3	5.0	4.5

1.25 The NO_2 urban background concentrations for NO_2 at the Fire Station diffusion tube are higher than the Defra Background Maps. The Fire Station diffusion tube has therefore been used in the assessment for a more conservative approach.

1.26 As no data was available for PM_{10} and $PM_{2.5}$, Defra background maps were used. The background concentrations data used within the assessment are presented in **Table A4**.

[4] http://laqm.defra.gov.uk/

Table A4: Background Concentrations used in the Assessment (µg/m^3)

Pollutant	Annual Mean Concentration (µg/m^3)	
	2018	2030
Grid Square 297500, 515500; Receptor 1		
NO_2	8.6	5.6
PM_{10}	8.8	8.2
$PM_{2.5}$	5.2	4.7
Grid Square 296500, 516500; Receptors 2, 3, 4, 12, 13, and 14		
NO_2	8.6	6.0
PM_{10}	8.1	7.6
$PM_{2.5}$	5.0	4.5
Grid Square 297500, 517500; Receptors 5 and 8		
NO_2	8.6	5.5
PM_{10}	9.1	8.5
$PM_{2.5}$	5.4	4.9
Grid Square 297500, 516500; Receptors 6 and 7		
NO_2	8.6	5.7
PM_{10}	10.4	9.8
$PM_{2.5}$	5.5	5.0
Grid Square 298500, 516500; Receptor 9		
NO_2	8.6	5.6
PM_{10}	9.7	9.1
$PM_{2.5}$	5.4	5.1
Grid Square 298500, 515500; Receptors 10 and 11		
NO_2	8.6	5.5
PM_{10}	9.1	8.5
$PM_{2.5}$	5.4	4.9

Note: The following adjustment factors were obtained from Defra Maps to calculate 2030 NO_2 concentrations; 0.6916 for Grid Square 297500, 515500; 0.7233 for Grid Square 296500, 516500; 0.6764 for Grid Square 297500, 517500; 0.6828 for Grid Square 298500, 516500; and 0.6690 for Grid Square 298500, 515500

Meteorological Data

1.27 Local meteorological conditions strongly influence the dispersal of pollutants. Key meteorological data for dispersion modelling include hourly sequential data including wind direction, wind speed, temperature, precipitation and the extent of cloud cover for each hour of a given year. As a minimum ADMS-Roads requires wind speed, wind direction, and cloud cover.

1.28 Meteorological data to input into the model were obtained from the St. Bees Head Meteorological Station, which is the closest to the Site and considered to be the most representative. The 2018 data were used to be consistent with the base traffic year and model verification year. It was also used for the 2030 scenario for the air quality assessment. **Figure A2** presents the wind-rose for the meteorological data.

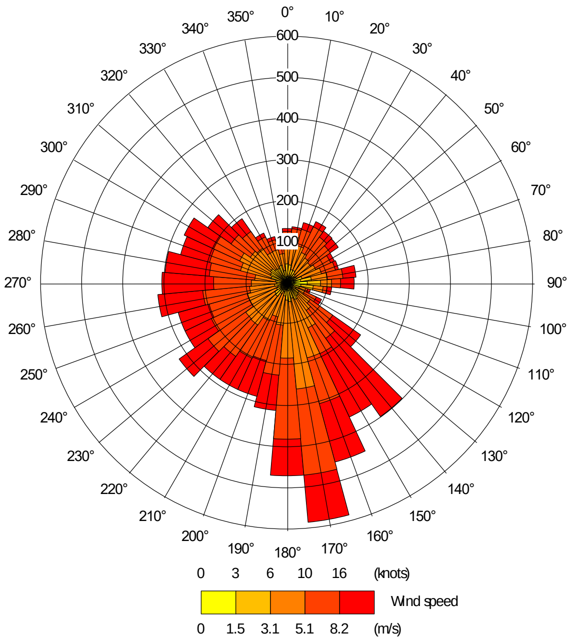

Figure A2: 2018 Wind Rose for the St. Bees Head Meteorological Station

1.29 Most dispersion models do not use meteorological data if they relate to calm winds conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS-Roads and ADMS 5 treats calm wind conditions by setting the minimum wind speed to 0.75 m/s. It is recommended in LAQM.TG(16) that the meteorological data file be tested within 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. LAQM.TG(16) recommends that meteorological data should only be used if the percentage of usable hours is greater than 85%. 2018 meteorological data from St. Bees Head Meteorological Site includes 8,549 lines of usable hourly data out of the total 8,760 for the year, i.e. 97.6% of usable data. This is above the 85% threshold, and is therefore adequate for the dispersion modelling.

1.30 A value of 0.2 was used for the St. Bees Head Meteorological Station, which is representative of agricultural areas and is considered appropriate following a review of the local area surrounding the Meteorological Station.

Model Data Processing

1.31 The modelling results were processed to calculate the averaging periods required for comparison with the AQS Objectives.

1.32 NO_X emissions from combustion sources (including vehicle exhausts) comprise principally nitric oxide (NO) and NO_2. The emitted NO reacts with oxidants in the air (mainly ozone) to form more NO_2. Since only NO_2 is associated with impacts on human health, the air quality standards for the protection of human health are based on NO_2 and not total NO_X or NO.

1.33 The ADMS-Roads model was run without the Chemistry Reaction option to allow verification (see below). Therefore, a suitable NO_X:NO_2 conversion was applied to the modelled NO_X concentrations. There are a variety of different approaches to dealing with NO_X:NO_2 relationships, a number of which are widely recognised as being acceptable. However, the current approach was developed for roadside sites, and is detailed within the Technical Guidance LAQM.TG(16).

1.34 The LAQM Support website provides a spreadsheet calculator[5] to allow the calculation of NO_2 from NO_X concentrations, accounting for the difference between primary emissions of NO_X and background NO_X, the concentration of O_3, and the different proportions of primary NO_2 emissions, in different years. This approach is only applicable to annual mean concentrations.

1.35 Research[6] undertaken on behalf of Defra has indicated that the hourly mean limit value and objective for NO_2 is unlikely to be exceeded at a roadside location where the annual-mean NO_2 concentration is less than 60µg/m^3, LAQM.TG(16) confirms that this assumption is still valid. The hourly objective is, therefore, not considered further within this assessment where the annual-mean NO_2 concentration is predicted to be less than 60µg/m^3.

1.36 To calculate the number of daily exceedances of 50µg/m^3 PM_{10}, the relationship between the number of 24-hour exceedances of 50µg/m^3 and the annual mean PM_{10} concentration from LAQM.TG (16) was applied as follows:

Number of Exceedances = -18.5+0.00145 x annual mean^3 + (206/annual mean)

Other Model Parameters

1.37 There are a number of other parameters that are used within the ADMS-Roads model which are described for completeness and transparency:

- The model requires a surface roughness value to be inputted.
  - A value of 0.5 was used for the Site, which is representative of parkland and open suburbia; and
  - A value of 0.2 was used for the St. Bees Head Meteorological Station, which is representative of agricultural areas;
- The model requires the Monin-Obukhov length (a measure of the stability of the atmosphere) to be inputted. A value of 10m (representative of small towns) was used for the modelling; and
- The model requires the Road Type to be inputted. *'England [Urban]'* was selected and used for the modelling of the road links.

Model Verification

1.38 Model verification is the process of comparing monitored and modelled pollutant concentrations for the same year, at the same locations, and adjusting modelled concentrations if necessary to be consistent with monitoring data. This increases the robustness of modelling results.

1.39 Discrepancies between modelled and measured concentrations can arise for a number of reasons, for example:

- Traffic data uncertainties;
- Background concentration estimates;
- Meteorological data uncertainties;
- Sources not explicitly included within the model (e.g. car parks and bus stops);

[5] AEA, NOX to NO2 Calculator, http://laqm1.defra.gov.uk/review/tools/monitoring/calculator.php Version 4.1, 19 June 2014

[6] Defra (2016), 'Local Air Quality Management Policy guidance PG(16)', DEFRA, London

- Overall model limitations (e.g. treatment of roughness and meteorological data, treatment of speeds); and
- Uncertainty in monitoring data, particularly diffusion tubes.

1.40 Verification is the process by which uncertainties such as those described above are investigated and minimised. Disparities between modelling and monitoring results are likely to arise as result of a combination of all of these aspects.

1.41 Box 7.15 of LAQM.TG(16) provides guidance on approaching model verification and adjustment. This requires the roadside NO_x contribution to be calculated. In addition, monitored NO_x concentrations are required, which have been calculated from the annual mean NO_2 concentration at the diffusion tube sites using the NO_x to NO_2 spreadsheet calculator as described above. The verification process applied here, has been based on Box 7.15.

Nitrogen Dioxide

1.42 The dispersion model was run to predict annual mean NO_x concentrations using the diffusion tube on Trinity Court, Scotch Street, Whitehaven (DT N22). This monitoring location is classified as being roadside and considered appropriate for the model verification.

1.43 The NO_2 concentrations are a function of NO_x concentrations. Therefore, the roadside NO_x concentration predicted by the model was converted to NO_2 using the NO_x to NO_2 calculator provided by Defra on the LAQM Support website. The background data for 2018 as presented in **Table A4** were used. The following tables present the adjusted model results using these input values.

Table A5: 2018 Annual Mean NO_2 Modelled and Monitored Concentrations (µg/m^3)

Site ID	Monitored Annual Mean NO_2 (µg/m^3)	Modelled Total Annual Mean NO_2 (µg/m^3)	% Difference (modelled – monitored)
DT N22	15.6	14.4	-7.9

1.44 **Table A5** indicates that the model under predicts at DT N22. Technical Guidance LAQM.TG(16) suggests that where there is a disparity of less than 10% between modelled and monitored results, adjustment of the modelling results is not necessary. However, for a comprehensive assessment, adjustment has been undertaken. The steps involved in the adjustment process are presented in **Table A6**.

Table A6: Model Verification Result for Adjustment NOx Emissions (µg/m^3)

Site ID	Monitored NO_2	Monitored Road NO_x	Modelled Road NO_x	Ratio of Monitored Road Contribution NO_x/Modelled Road Contribution NO_x
DT N22	15.6	13.1	10.8	1.22

1.45 In **Table A7** the adjustment factor (1.22) obtained from **Table A6** was applied to the relevant modelled NO_x Roadside concentrations before being converted to annual mean NO_2 using the NO_x:NO_2 spreadsheet calculator.

Table A7: Model Verification Result for Adjustment NOx Emissions (µg/m^3)

Site ID	Adjusted Modelled Road NO_x	Modelled Total NO_2	Monitored Total NO_2	% Difference
DT N22	13.1	15.6	15.6	0

1.46 The data from the adjusted/verified model in **Table A7** indicates a more conservative agreement between monitored and modelled annual mean NO_2 results compared to the unadjusted model in **Table A5**.

1.47 The NO_X adjustment process was therefore applied to the roadside NOx modelling for 2018 and 2030 ‘without’ and ‘with’ the Development in place.

Particulate Matter (PM_{10} and $PM_{2.5}$)

1.48 PM_{10} and $PM_{2.5}$ monitoring data is not available for the Site area. Therefore, similarly to NOx, the adjustment factor of 1.22 was applied to the roadside PM_{10} and $PM_{2.5}$ modelling results.

Verification Summary

1.49 Any atmospheric dispersion model study will always have a degree of inaccuracy due to a variety of factors. These include uncertainties in traffic emissions data, the differences between available meteorological data and the specific microclimate at each receptor location, and simplifications made in the model algorithms that describe the atmospheric dispersion and chemical processes. There will also be uncertainty in the comparison of predicted concentrations with monitored data, given the potential for errors and uncertainty in sampling methodology (technique, location, handling, and analysis) as well as processing of any monitoring data.

1.50 Model uncertainties arise because of limited scientific knowledge, limited ability to assess the uncertainty of model inputs, for example, emissions from vehicles, poor understanding of the interaction between model and / or emissions inventory parameters, sampling and measurement error associated with monitoring sites and whether the model itself completely describes all the necessary atmospheric processes.

1.51 Overall, it is concluded the ADMS-Roads model is performing well and modelled results are considered to be suitable to determine the potential effects of the Development on local air quality.

Assessor Experience

Name: Andy Fowler

Years of Experience: 9

Qualifications:

- CEnv
- BSc (Hons)
- Full Member of the IAQM
- AIEMA (Associate Member of the Institute of Environmental Management and Assessment)
- Full Member of the Institution of Environmental Sciences (IES)

Andy has been responsible for the technical delivery of a wide range of air quality projects for a variety of clients in both the public and private sector. These projects include consideration of emissions from both transportation and industrial sources, through both monitoring and modelling, and therefore he has an in depth understanding of the regulatory requirements for these sources and the published technical guidance for their assessment.

Waterman

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