

Havant Thicket Reservoir Project

Environmental Statement Volume 2 - Main Report Chapter 7 Air Quality

Portsmouth Water Ltd.

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7. Air Quality

Competent expert evidence

- 7.1. This chapter of the ES Volume 2, Chapter 7 Air Quality, has been undertaken by the following individuals who have used their knowledge and professional judgement to undertake this assessment:
- a Senior Air Quality Consultant (BSc, MSc, full professional membership with the Institution of Environmental Sciences (IES) and Institute of Air Quality Management (IAQM)) with over 5 years of knowledge and experience in air quality assessment and have used their knowledge and professional judgement to undertake this assessment.
 - an Associate Environmental Scientist (BSc, CSci, full professional membership with IES and IAQM) with over 20 years of knowledge and experience in air quality assessment.

Legislative and policy framework

UK air quality legislation

- 7.2. There are two types of air quality regulations that apply in England:
- Regulations implementing mandatory European Union Directive limit values: The Air Quality Standards Regulations 2010 (Statutory Instrument (SI) 2010 No. 1001)¹; and
 - Regulations implementing national air quality objectives: Air Quality (England) Regulations 2000 (SI 2000 No. 928) and Air Quality (England) (Amendment) Regulations 2002 (SI 2002 No. 3043)^{2,3}.

EU limit values

- 7.3. In April 2008, the European Commission adopted the Directive on ambient air quality and cleaner air for Europe (2008/50/EC). This Directive merged the previous Air Quality Framework Directive and the first three daughter directives and introduced new objectives for PM_{2.5}. UK regulations (SI 2010 No. 1001) implement the EU Directive. The relevant EU limit values in the context of this assessment for the protection of human health are presented in Table 7-1. Statutory responsibility for achieving EU limit values rests with the Secretary of State.

National air quality strategy

- 7.4. The 2007 Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland⁴ (UK AQS) sets out the national air quality standards and objectives for a number of local air pollutants. The standards are set by expert organisations with regard to scientific and medical evidence on the effects of the particular pollutant on health, and defines the level of pollution below which health effects are expected to be minimum or low risk even for the most sensitive members of the population. The objectives are targets for air pollution levels to be achieved by a specified timescale, and take account of the costs and benefits of achieving the standard, either without exception or, for certain short term averaging period standards, with a permitted number of exceedances. Local authorities have a responsibility (under Part IV of the Environment Act 1995, see below) to review and assess local pollution levels against these objectives. These criteria are defined in Regulations SI 2000 No. 928 and SI 2002 No. 3043.
- 7.5. It should be noted that the UK AQS objectives only apply in locations likely to have 'relevant exposure' i.e. where members of the public are exposed for periods equal to or exceeding the averaging periods set for the standards. For this assessment, locations of relevant exposure include building façades of residential premises, schools, public buildings and medical facilities;

¹ The Air Quality Standards Regulations 2010: <http://www.legislation.gov.uk/uksi/2010/1001/contents/made>

² The Air Quality (England) Regulations 2000: <http://www.legislation.gov.uk/uksi/2000/928/contents/made>

³ The Air Quality (England) (Amendment) Regulations 2002: <http://www.legislation.gov.uk/uksi/2002/3043/contents/made>

⁴ Department for Environment, Food and Rural Affairs (Defra), 2007. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. <http://archive.defra.gov.uk/environment/quality/air/airquality/strategy/documents/air-qualitystrategy-vol1.pdf>

places of work (other than certain community facilities) are excluded, as the AQS objectives do not apply to places of work.

- 7.6. In January 2019, the UK Government published a Clean Air Strategy⁵, which sets out actions to improve air quality by reducing pollution from a wide range of sources. Within the strategy, the Government proposes an ambitious target to reduce the population exposed to concentrations of PM_{2.5} above 10 µg/m³ by 2025.

Local air quality management

- 7.7. Under Part IV of the Environment Act 1995 all local authorities are responsible for Local Air Quality Management (LAQM), the mechanism by which the Government's AQS objectives are to be achieved. As part of this LAQM role, local authorities are required to periodically review air quality in their area and to assess air quality against the objectives defined in the Regulations. Where an objective is breached within their area, they must designate an Air Quality Management Area (AQMA) and develop an action plan to improve pollution levels and work towards achieving the AQS objectives. Under the current LAQM regime, a local authority is responsible for regular review and assessment of local air quality, reports on which are published following public consultation and review by the Department for Environment, Food and Rural Affairs (DEFRA).
- 7.8. Statutory responsibility for achieving EU limit values rests with the Secretary of State and local authorities have no responsibility for achieving the national air quality criteria, although they should contribute to this through local action plans designed to reduce pollution levels in AQMAs.
- 7.9. The relevant air quality criteria for the protection of human health are outlined in Table 7-1 and for vegetation and ecosystems in Table 7-2.

Table 7-1 - Relevant air quality criteria for the protection of human health

Pollutant	Objective
NO ₂	Hourly mean concentration should not exceed 200 µg/m ³ more than 18 times a year Annual mean concentration should not exceed 40 µg/m ³
PM ₁₀	24-hour mean concentration should not exceed 50 µg/m ³ more than 35 times a year Annual mean concentration should not exceed 40 µg/m ³
PM _{2.5}	UK (Except Scotland) annual mean concentration should not exceed 25 µg/m ³ † Exposure reduction^ (UK urban areas): target of 15% reduction in concentrations at urban background between 2010 and 2020*

† UK AQS objective is 25 µg/m³ to be met by 2020. EU limit value is 25 µg/m³ to be met by 2015, with a requirement in urban areas to bring exposure down to below 20 µg/m³ by 2020.

^ EU limit value exposure reduction target of 20% reduction between 2010 and 2020.

* 25 µg/m³ is a cap to be seen in conjunction with 15% reduction.

Table 7-2 - Relevant air quality criteria for the protection of vegetation and ecosystems

Pollutant	Objective
NO _x	Annual mean concentration should not exceed 30 µg/m ³

Dust

- 7.10. There is no legislation, national standards or guidelines for dust deposition currently set in the UK, or by any international organisation. This is mainly due to the fact that any standard set would need to relate to dust being a perceptual problem, rather than being specifically related to health effects. A threshold of a dust deposition rate of 200 mg/m²/day is recommended as a level for action in line with the 2018 IAQM "Guidance on Monitoring in the Vicinity of Demolition and Construction Sites"⁶.

⁵ Defra 2019, Clean Air Strategy.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf

⁶ Institute of Air Quality Management, "Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (version 1.1)", October 2018. Available: http://iaqm.co.uk/text/guidance/guidance_monitoring_dust_2018.pdf. [Accessed February 2019].

National planning policy

National planning policy framework

- 7.11. The Government's planning guidance of relevance to air quality is found within the National Planning Policy Framework (NPPF)⁷. It provides guidance for local authorities on incorporating air quality considerations into planning decisions and aims to protect the environment and to promote sustainable growth.
- 7.12. Paragraph 103 refers to sustainable transport:
- "The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making."*
- 7.13. Paragraph 181 considers impacts on local air quality:
- "Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

Planning practice guidance

- 7.14. Planning practice guidance for air quality⁸ is intended to support the NPPF and provide further detail to its policies. Paragraph 005 of this guidance provides information relating to air quality that could be important to decision makers, and when there are concerns about air quality, the local planning authority may want to know about:
- "the 'baseline' local air quality;
 - whether the proposed development could significantly change air quality during the construction and operational phases; and
 - whether occupiers or users of the development could experience poor living conditions or health due to poor air quality".
- 7.15. Paragraph 005 of this guidance also provides information on early engagement with the local planning and environmental health departments to establish the scope of any assessment. Guidance is also given on the level of detail required in an air quality assessment, and measures which could be employed to mitigate adverse effects.

Local planning policy

- 7.16. The Scheme lies within the administrative boundaries of Havant Borough Council and East Hampshire District Council; the local planning policy and actions related to air quality issues for both these councils are presented below.

Havant Borough Council Core Strategy 2011⁹

- 7.17. The Havant Borough Core Strategy is the principal document within Havant Borough Local Development Framework (HBLDF), which sets out the broad detail and direction of development in the borough until 2026. It contains strategic policies supplemented by detailed development management (DM) policies.

⁷ Ministry of Housing, Communities & Local Government, National Planning Policy Framework (NPPF), February 2019, from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

⁸ National Planning Portal, guidance for air quality available at <https://www.gov.uk/guidance/air-quality--3>

⁹ Havant Borough Council (2011) Core Strategy, from: <https://www.havant.gov.uk/sites/default/files/documents/ADOPTED%20CORE%20STRATEGY%20.pdf> Accessed May 2020

7.18. In relation to air quality, Policy “DM10 Pollution” states:

“Development that may cause pollution of water, air or soil or pollution through noise, smell, smoke, fumes, gases, steam, dust, vibration, light, heat, electromagnetic radiation and other pollutants will only be permitted where all of the following relevant criteria can be met:

1. *The health and safety of existing and future users of the site, or nearby occupiers and residents is not put at risk.*
2. *National air quality standards or objectives would not be breached.*
3. *The water environment would not be detrimentally affected.*
4. *It would not lead to an unacceptable deterioration in the quality or potential yield of coastal, surface and ground water resources.*
5. *External lighting is of the minimum level of illumination and duration required for security and operational purposes.*
6. *External lighting would not interfere with safe navigation in either Chichester or Langstone Harbours and other coastal locations.”*

East Hampshire District Local Plan: Joint Core Strategy¹⁰

7.19. The Joint Core Strategy (JCS) was adopted by EHDC in 2014. In relation to air quality, Policy CP27 “POLLUTION” states:

- *“Development must not result in pollution which prejudices the health and safety of communities and their environments.*
- *Developments that may cause pollution, and developments sensitive to pollution, will only be permitted if they are appropriately separated and designed to remove the risk of unacceptable impacts. Engineering or administrative controls may be required to provide sufficient protection to focus on reducing pollution at source.*
- *Development which includes a lighting scheme will not be permitted unless the minimum amount of lighting necessary to achieve its purpose is proposed. Glare and light spillage from the site must be minimised. In determining an application, consideration will be given to the aesthetic effect of the light produced and to its effect on local residents, vehicle users, pedestrians and the visibility and appreciation of the night sky.*
- *Development will not be permitted if it would have an unacceptable effect on the amenity of the occupiers of neighbouring properties through loss of privacy or through excessive overshadowing.*
- *Any development which is likely to lead to a significant effect on an internationally designated site is required to undertake an appropriate assessment under the Habitats Regulations. As part of any mitigation/avoidance package any impacts on air quality will require a regime for continued air quality monitoring to be set up before the introduction of any mitigation measures, and thereafter maintained.”*

Study area

7.20. The Scheme is not within a designated Air Quality Management Area (AQMA).

7.21. The air quality study area for assessing the potential effects of construction dust during the construction phase is defined as the area within 350 m of the red line boundary, as set out in the IAQM Dust Guidance¹¹.

7.22. The air quality study area for assessment of traffic emissions during both the construction and operational phases is determined in accordance with traffic change criteria set out in guidance published by Environmental Protection UK (EPUK) and the IAQM entitled “Land-Use Planning and

¹⁰ East Hampshire District Council and South Downs National Park Authority (2014) Local Plan: Joint Core Strategy, from: <https://www.easthants.gov.uk/sites/default/files/documents/DP01%20East%20Hampshire%20District%20Local%20Plan%20Joint%20Core%20Strategy%20COMPLETE.pdf> Accessed May 2020

¹¹ Institute of Air Quality Management (IAQM) (2014). Guidance on the assessment of dust from demolition and construction. <http://iaqm.co.uk/text/guidance/construction-dust-2014.pdf>

development control: Planning for air quality”¹² (IAQM Planning Guidance). Sensitive receptors within 200 m of the affected roads are included in the assessment.

- 7.23. The study area considering the construction dust assessment is shown in Figure 7.2 Air Quality Construction Dust Assessment. Sensitive receptors included within the construction traffic assessment are shown in Figure 7.3 Air Quality Construction Traffic Assessment.

Assessment methodology

Construction phase

- 7.24. The IAQM Dust Guidance provides a framework for a risk-based approach to the assessment of dust emissions from demolition and construction and proposes good practice control measures that are “highly recommended” or “desirable” for dust control for the various dust risk categories.
- 7.25. The assessment of dust emissions during construction is considered in the context of the overall scale and nature of the development under consideration and the potential sensitivity of neighbouring land uses. The quantity and distribution of dust emissions varies according to type, duration and location of activity, weather conditions and the effectiveness of suppression (mitigation) measures.

Construction dust risk assessment

- 7.26. Assessment of the potential impact of the construction phase of the Scheme on air quality with regards dust and PM₁₀ emissions has been carried out with reference to the four step process described in the IAQM Dust Guidance¹¹. These steps are summarised below:
- Step 1 (screening) – Identification of the number of human receptors within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway up to 500 m from the site entrance. Ecological receptors should also be identified within 50 m of either the boundary of the site and/or of the route(s) used by construction vehicles on the public highway up to 500 m from the Site entrance. No further assessment is required if there are no receptors.
 - ‘Human’ receptors include residential dwellings and other premises that may have a particular sensitivity to dust deposition or to the health effects of PM₁₀ e.g. vehicle showrooms, museums, long term car parks, hospitals, schools and residential care homes.
 - ‘Ecological’ receptors include sites with statutory designations e.g. Ramsar sites, Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI), as well as non-statutory sites such as local wildlife sites and/or locations with very specific ecological sensitivities e.g. horticultural operations.
 - Step 2 – Assessment of the risk of dust effects by considering the area around the site in the context of potential dust impacts and distances to nearby receptors in relation to activities in terms of demolition, earthworks, construction, and trackout. Trackout can be defined as the deposition of dust and dirt from a construction site onto a public road network where it may then be re-suspended in the air by vehicles using the road network.
 - Dust emission magnitude classes of ‘large’, ‘medium’ and ‘small’ are used to define the level of risk arising from each activity depending on the nature and scale of operation.
 - The sensitivity of the area is defined as ‘high’, ‘medium’ or ‘low’ for dust soiling effects, human health impacts, and ecological impacts separately, taking into account the sensitivity of receptors, distance and number of receptors from dust generating activities, and other site specific factors (defined in the IAQM Dust Guidance). In addition, for the effect on human health, background PM₁₀ concentrations are taken into account. The definitions are provided in Tables 2, 3 and 4 of the IAQM Dust Guidance.
 - Step 3 – Site specific mitigation in terms of the identified risks is identified.
 - Step 4 – Assessment of the significance of the residual dust risk, after the application of the site specific mitigation.

¹² Environmental Protection UK and Institute of Air Quality Management, ‘Land-Use Planning & Development Control: Planning for Air Quality’, January 2017. Available online: <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>.

7.27. Tables 6 to 9 of the IAQM Dust Guidance are used to define the risk of impact based on the dust emission magnitude and sensitivity of area. These are reproduced in Table 7-3 to Table 7-5 below.

Table 7-3 - Air quality: risk of dust impacts - demolition

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible

Table 7-4 - Air quality: risk of dust impacts – earthworks and construction

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Table 7-5 - Air quality: risk of dust impacts - trackout

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low risk	Negligible

Construction traffic emissions

- 7.28. The need for an assessment of construction traffic impacts associated with the Scheme was determined based on the screening criteria given in the guidance published by Environmental Protection UK (EPUK) and the IAQM Planning Guidance. These screening criteria indicate an air quality assessment is required if the development comprises:
- ten or more residential units or a site area of more than 0.5 ha; or
 - More than 1,000 m² of floor space for all other uses or a site area greater than 1 ha; and either:
 - More than ten parking spaces; or
 - A centralised energy facility or other centralised combustion process.
- 7.29. Given that the Scheme (both the reservoir site (including access roads) and the pipeline corridor) comprises a site area of more than 0.5 ha, further screening was undertaken using the indicative traffic change criteria in the IAQM Planning Guidance. The relevant traffic change criteria are:
- a change of light duty vehicles (LDV, which includes cars and light vans) of more than 500 Annual Average Daily Traffic (AADT; or more than 100 AADT within or adjacent to an AQMA); or
 - a change of heavy duty vehicles (HDV, which includes trucks, buses and coaches) of more than 100 AADT (or more than 25 AADT within or adjacent to an AQMA).
- 7.30. Road links that exceed the criteria for assessment given in the IAQM Planning Guidance are defined as requiring an air quality assessment. Traffic data presented in Chapter 13 Traffic and Transport in ES Volume 2 shows that the maximum change in HDV associated with the reservoir site in the maximum construction traffic year is 230 per day, consequently the criteria for an air quality assessment is met and a quantitative assessment is required for the reservoir site.
- 7.31. The construction period for the reservoir is expected to take up to eight years and although any effect on air quality from construction traffic is likely to be temporary, as the daily HDV flows are

expected to exceed 100 for a period of approximately nine months during the construction works, a detailed air quality assessment has been undertaken in accordance with the applicable guidance documents.

- 7.32. An assessment of the effects of construction traffic associated only with the pipeline corridor is not considered necessary as the number of HDV movements does not meet the criteria for assessment (less than 100 HDV movements per day to and from the reservoir site). However, the traffic associated with constructing the pipeline corridor has been included within the assessment of construction traffic for the reservoir site.
- 7.33. The effect on human health receptors from changes in road traffic flows once the Scheme is constructed was assessed with reference to published guidance including the IAQM Planning Guidance and using air quality assessment tools from Defra's Technical Guidance LAQM.TG(16)¹³. The effect on ecological receptors was additionally assessed with reference to guidance published by IAQM "A guide to the assessment of air quality impacts on designated nature conservation sites" (IAQM Air Quality Impacts on Nature Sites Guidance)¹⁴. Receptors are provided in Appendix A7.1 in ES Volume 4, shown on Figure 7.3 Air Quality Construction Traffic Assessment, in ES Volume 3 and discussed in the baseline conditions section paragraphs 7.56 to 7.67.

Assessment scenarios

- 7.34. As there is no requirement for an air quality assessment of operational phase traffic, only the construction phase traffic has been assessed. Traffic data presented in Chapter 13 Traffic and Transport in ES Volume 2 and used in the assessment include the following scenarios:
- Base year (2019);
 - Maximum construction traffic year (2023) without the Scheme;
 - Maximum construction traffic year (2023) with the Scheme.

- 7.35. The traffic flows used in this assessment are reported in .

Emission factors

- 7.36. Vehicle exhaust emissions of NO_x, PM₁₀ and PM_{2.5} for each road link in each modelled scenario were calculated using DEFRA's Emissions Factors Toolkit (EFT, version 9.0, May 2019) for the 2019 and 2023 (without the Scheme and with the Scheme) scenarios. The emission calculations assumed a road type of "Urban – not London" for the majority of modelled roads based on the defined classes in the EFT User Guide, whilst "Motorway – not London" was used for the A3(M).

Background concentrations

- 7.37. The output from the dispersion model provides the contribution from road traffic emissions to annual mean concentrations of NO_x, PM₁₀ and PM_{2.5} at discrete receptor points. These incremental concentrations are combined with estimates of background concentrations, to account for other sources of air pollution, to derive total annual mean concentrations. Background concentrations have been derived from Defra's background maps for a 2017 reference year (Table 7-8). No adjustment has been applied to the DEFRA background mapped concentrations used in this assessment.

Meteorological data

- 7.38. Hourly sequential meteorological data for a suitable meteorological station, in this case that based in Southampton, were used in the model for the year 2019 (to match the traffic model base year). The meteorological station is approximately 26 kilometres west of the Scheme and is considered representative of conditions in the study area given the absence of major topographical features between the two locations. The basic data include: date, hour, direction that the wind is blowing from, wind speed, how many eighths ('oktas') of the sky are covered by cloud, and surface air temperature.

¹³ Department for Environment, Food and Rural Affairs (2018) Local Air Quality Management Technical Guidance (TG16). Available online: <https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf>

¹⁴ Institute of Air Quality Management, 'A guide to the assessment of air quality impacts on designated nature conservation sites', May 2020, available at <https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf>

Nitrogen dioxide

- 7.39. To derive total NO₂ concentrations from modelled road NO_x concentrations, and allow comparison with air quality criteria, the method described in DEFRA's Technical Guidance LAQM.TG(16) has been used. Total annual mean NO₂ concentrations have been calculated from modelled road NO_x and background NO₂ concentrations, using the latest version of the 'NO_x to NO₂ conversion spreadsheet' (version 7.1) available from the DEFRA UK-AIR website¹⁵.
- 7.40. In addition to the modelled road NO_x and background NO₂ data, DEFRA's NO_x to NO₂ conversion spreadsheet requires a local authority area to be specified to determine regional oxidant concentrations, and a traffic mix to determine the proportion of primary NO₂. The local authority selected in the conversion tool was "Havant" based on the location of the relevant receptors; the traffic mix selected was "All other urban UK traffic" for all modelled roads.
- 7.41. Since only annual mean concentrations have been generated using the dispersion model, commentary on potential exceedances of the hourly mean NO₂ standard has been made through reference to DEFRA's Technical Guidance LAQM.TG(16). The guidance suggests that if annual mean concentrations of NO₂ do not exceed 60 µg/m³ then it is unlikely that hourly mean concentrations would exceed the relevant objective, which allows for 18 exceedances of the hourly standard in a calendar year.

Particulate matter

- 7.42. To determine total annual mean concentrations of PM₁₀ and PM_{2.5} at human health receptors, the modelled road contribution has been added to the background concentration to give the total concentration for comparison with the annual mean assessment criterion.
- 7.43. Annual mean PM₁₀ concentrations are used to derive the number of exceedances of the 24-hour mean PM₁₀ criterion, of which 35 are allowed in a calendar year. The method described in LAQM.TG(16) was applied. This method is based on the relationship between the number of 24-hour exceedances of 50 µg/m³ and the annual mean concentration derived from UK Automatic Network Sites. This is described in the calculation of PM₁₀ 24-hour mean exceedances calculation below:
- Number of exceedances of 24-hour mean of 50 µg/m³ = $-18.5 + 0.00145 * a^3 + (206/a)$
 - Where 'a' = total annual mean PM₁₀ concentration.
- 7.44. It is noted that there is a known limitation of the equation when the annual mean PM₁₀ concentrations are below 14.8 µg/m³. It can be considered that when annual mean PM₁₀ concentrations are below 14.8 µg/m³ there would not be a risk of the 24-hour mean PM₁₀ objective being exceeded.

Assessment of significance

Human health receptors

- 7.45. A matrix for describing the impact of a change in concentration at individual receptors is set out in the IAQM Planning Guidance, reproduced in Table 7-6. These descriptors are used in the assessment of changes to annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} with the Scheme, and range from negligible to slight, moderate or substantial.
- 7.46. The impact description depends upon:
- the larger value of the total concentration without the Scheme or with the Scheme, as a percentage of the relevant Air Quality Assessment Level (AQAL i.e. AQS objective); and
 - the change in concentration, classified according to the percentage change relative to the AQAL of interest. The percentage change is then rounded to the nearest whole number before application of the impact descriptor. Changes of less than 0.5% are described as negligible.

¹⁵ Department for Environment, Food and Rural Affairs (2019) NO_x to NO₂ Calculator. Available online: <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>

Table 7-6 - IAQM impact descriptors for annual mean pollutant concentrations

Long Term Average Concentration at Receptor	Percentage Change in Concentration Relative to 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

7.47. The overall determination of significance of effect requires the professional judgement of a suitably qualified air quality professional. This judgement must take into account such factors as:

- the existing and future air quality in the absence of the scheme or development;
- the extent of current and future population exposure to the impacts (i.e. extrapolating the findings from the individual modelled receptors); and
- the influence and validity of any assumptions adopted when modelling the impacts.

Ecological assessment

7.48. Assessment of the potential effects on NO_x concentrations and nitrogen deposition rates has been undertaken at identified sensitive ecological designations, in accordance with IAQM Air Quality Impacts on Nature Sites Guidance. Nitrogen deposition rates have been calculated in line with the Highways England's Design Manual for Roads and Bridges (DMRB) air quality guidance (LA105)¹⁶ for assessing nitrogen deposition from road traffic sources.

7.49. The modelled road NO_x contribution has been added to the background NO_x concentration to give the total NO_x concentration for comparison with the annual mean assessment criterion.

7.50. Nitrogen deposition rates have been calculated from the road NO₂ concentration using a deposition velocity based on the Air Quality Technical Advisory Group (AQTAG) value for forest sites [1 µg/m³ of NO₂ = 0.29 kg N/ha/yr], a conservative assumption for sites which are not forested such as grassland sites. The background nitrogen deposition rate was taken from the Air Pollution Information System (APIS) website¹⁷ for 2017 using the location of the receptors within the study area, and reduced by 0.33 kgN/ha/yr each year for 2019 and 2023 in line with trends in nitrogen deposition rates at Catherington Down SSSI, located within 5 km of the Scheme. The total nitrogen deposition rates were compared with a critical load of 10 kg N/ha/yr, which is the critical load for forested areas, to ensure a conservative assessment.

7.51. IAQM Air Quality Impacts on Nature Sites Guidance does not provide air quality impact descriptors to characterise the impact on ecological sites of a change in concentrations as a result of the Scheme (such as those for human health described above in Table 7.6). As such no consideration of the significance of the change in NO_x concentrations is provided and only consideration of the total concentration for comparison with the annual mean assessment criterion has been considered in this chapter.

7.52. The IAQM asserts that "Whilst an air quality specialist may be able to conclude that there are no likely significant effects using established thresholds, they will not generally be able to assess the effects of the air pollution on the integrity of the designated site. This is the job of an ecologist.". Consequently nitrogen deposition rates have been calculated at relevant sites and provided to project ecologists to determine their significance. This consideration of significance of changes in nitrogen deposition is presented in the Chapter 9 Biodiversity in ES Volume 2. Operational phase

7.53. The effect on sensitive receptors from changes in road traffic flows with the Scheme in the opening year was assessed with reference to assessment criteria in the IAQM Planning Guidance¹¹.

¹⁶ Highways England (2019) Design Manual for Roads and Bridges LA 105 Air Quality available at: <https://standardsforhighways.co.uk/dmr/b/search/10191621-07df-44a3-892e-c1d5c7a28d90>

¹⁷ Air Pollution Information System (APIS) available at <http://www.apis.ac.uk/>

- 7.54. Road links that exceed the criteria for assessment given in the IAQM Planning Guidance are defined as requiring an air quality assessment. Should the criteria not be met, the IAQM states the impacts can be considered negligible. Traffic data provided in Chapter 13 Traffic and Transport in ES Volume 2 shows that the largest change in LDV in the opening year is less than 500 per day with no change in HDV vehicles, consequently the criteria for an air quality assessment are not met and a quantitative assessment is not required.
- 7.55. Nonetheless, emissions of NO_x and PM₁₀ have been calculated to provide information to the local planning authority under HBC's Draft Policy E23⁹. CO₂ emissions have also been calculated for reference in Chapter 16 Effect on Climate in ES Volume 2. The calculations were undertaken as described for the construction traffic assessment above, using DEFRA's EFT, traffic data and link lengths for all roads in the traffic model. Assessment assumptions and limitations

Model inputs and assumptions

- 7.56. The reservoir site and pipeline corridor have been assessed independently for their construction dust impact due to their differing locations and associated construction activities.
- 7.57. Construction traffic emissions for the reservoir site and pipeline corridor have been assessed together to ensure a reasonable worst case scenario (for the year during the construction phase with the highest traffic flows).
- 7.58. The air dispersion modelling scenarios have been based on the following key inputs and assumptions:
- Ordnance Survey maps used to define the modelled road geometry and receptor locations;
 - Road widths manually determined from Google Earth Pro aerial photography;
 - Traffic data in 24 hour AADT format for the 2019 base year and 2023 maximum construction traffic year without and with Scheme scenarios;
 - Surface roughness defined as 0.5 metres for the modelled area (representative of parkland and open suburbia) and as 0.5 metres for the meteorological station (parkland and open suburbia);
 - Model default values used for surface albedo and Priestly-Taylor parameter; and
 - The Monin-Obukhov length for both the modelled area and the meteorological station have been set at 10 metres to represent small towns <50,000.

Model uncertainty

- 7.59. Any dispersion modelling exercise has inherent areas of uncertainty, including:
- input data (traffic data, emissions data);
 - simplifications in model algorithms and empirical relationships that are used to simulate complex physical and chemical processes in the atmosphere;
 - background concentrations; and
 - meteorological data.
- 7.60. Uncertainty associated with vehicle emissions data has been minimised by using the widely applied ADMS-Roads modelling software (version 5.0) (the most recent model available at the time of the assessment) and DEFRA's emission factors toolkit (EFT v9.0).
- 7.61. Uncertainty associated with model algorithms and empirical relationships have been minimised by using algorithms and relationships within a dispersion model (ADMS-Roads) that has been independently validated and judged as fit for purpose.
- 7.62. Hourly sequential meteorological data have been provided by an approved supplier and have been subject to robust quality checks. The key limiting assumption in estimating future concentrations is that conditions in the future will be the same as in the past; however, in reality no two years are the same. To address some of this uncertainty, the meteorological data used in the model was for the same year as the air quality monitoring data and traffic data used in the base year verification.
- 7.63. Given the above, the approach taken to this assessment is considered to be robust and is in line with good practice.

Model verification

- 7.64. Model verification is the process of determining the performance of the model by undertaking a comparison of the base year model with measured data. The verification step involves, where possible, the comparison of modelled pollutant concentrations at suitable monitoring sites with monitored values that are representative of the base year (in this case 2019). Verification has been undertaken in accordance with DEFRA's Technical Guidance LAQM.TG(16).
- 7.65. Where there is a disparity between modelled and measured concentrations, and where further improvements to input data are not possible, then if required, an appropriate adjustment factor can be determined to correct systematic bias. This adjustment is applied to the base year and future year model output. Information on model verification and adjustment is provided in Appendix 7.2 Air Quality Model Verification in ES Volume 4. In summary, the model tended to over predict monitored NO₂ concentrations in the study area by 19%. In accordance with DEFRA's Technical Guidance LAQM.TG(16), adjustment to the model is not required for differences within 25%. As such, no adjustment factor was applied to the modelled NO_x concentrations; this also ensures the estimated results are conservative.
- 7.66. In the absence of PM₁₀ and PM_{2.5} monitoring data in the study area against which modelled concentrations could be verified, no model adjustment factor was applied to modelled PM₁₀ and PM_{2.5} concentrations in line with the assessment for NO_x concentrations. This approach is suggested within LAQM.TG(16), which states that "*In the absence of any PM₁₀ data for verification, it may be appropriate to apply the road-NO_x adjustment to the modelled road-PM₁₀*", and is considered likely to provide a conservative estimate of the contribution of modelled roads to ambient PM₁₀ concentrations.

Baseline conditions including value/sensitivity of resources and receptors

Local air quality management

- 7.67. There are no AQMAs within the areas administered by HBC¹⁸ or EHDC¹⁹.

Air quality monitoring

- 7.68. Air quality monitoring is undertaken by national and local authorities and is a key component of local air quality management. Measurements of pollutant concentrations can be made by analytical instruments that measure continuously, and passive sampling devices such as diffusion tubes which give longer period results (typically monthly, to calculate an annual mean concentration).

Continuous monitoring data

- 7.69. No Continuous Monitoring Sites (CMS) are operated by HBC or EHDC and nor are there any CMS operated by DEFRA's Automatic Urban and Rural Network (AURN) within the local authority areas.

Passive monitoring data

- 7.70. HBC undertook non-automatic (passive) monitoring of nitrogen dioxide (NO₂) at 25 locations during 2019 and EHDC at 14 sites during 2019. There are seven monitoring sites within 350 m of the Scheme (both reservoir site and pipeline corridor) or within 200 m of a road affected by construction traffic, including five monitoring sites operated by HBC and two monitoring sites operated by EHDC, to the north of the reservoir site. In addition, an eighth site (site 10) was selected due to its use in the verification of the air quality modelling.
- 7.71. These sites are shown in Table 7-7 and Figure 7-1 Air Quality Constraints. Measured concentrations between 2015 and 2019 were below the AQS objective at all these sites.

¹⁸ Havant Borough Council, 2019, 2019 Air Quality Annual Status Report:

https://www.havant.gov.uk/sites/default/files/documents/HBC_ASR1903v2%20Rpt.%20Main%20%5BAmend%20inc.%20Apx%5D.pdf
Accessed April 2020.

¹⁹ East Hampshire District Council, 2019, 2019 Air Quality Annual Status Report:

<https://www.easthants.gov.uk/sites/default/files/documents/EHDC%20Air%20Quality%20Annual%20Status%20Report%20-%202019.pdf>
Accessed April 2020

Table 7-7 - NO₂ diffusion tube monitoring results (µg/m³) within 350 m of the Scheme or within 200 m of an affected road

LA	Site ID	Site name	Site type	X	Y	2015	2016	2017	2018	2019
HBC	10	Ramblers Way	Suburban	470032	110043	19.6	22.9	20.1	21.4	20.8
HBC	15	Front Lawn Junior, Broadmere Av.	Urban Background	471894	108403	13.5	14.7	14.1	-*	-
HBC	T1	Dunsbury Way	Urban Centre	471411	107933	-	-	-	22.5	-
HBC	S1	Trosnant (Field)	Urban Background	471473	107193	-	-	-	22.0	-
HBC	S2	Trosnant (Entrance)	Suburban	471363	107227	-	-	-	23.9	-
HBC	S8	Barncroft (Woodland)	Urban Background	470608	107457	-	-	-	19.6	-
EHD C	HR 1	London Road	Roadside	470554	113582	33.3	31.6	36.8	33.8	32.2
EHD C	HR 7	Gales Brewery	Roadside	470655	113259	25.9	23.5	32.8	30.3	29.8

LPA - Local Planning Authority

*Monitoring discontinued at this location in 2019

DEFRA mapped concentrations

- 7.72. Estimates of background pollutant concentrations in the UK are available on the DEFRA UK-Air website²⁰. The background estimates, which are a combination of measured and modelled data, are available for each 1 km grid square throughout the UK for the years 2017 to 2030. The estimated annual average background concentrations in the area covering the study area for the base year (2019) and the maximum construction traffic year (2023) are presented in Table 7-8 for the pollutants NO_x, NO₂, PM₁₀ and PM_{2.5}. Background concentrations of these pollutants are shown to be well below²¹ relevant AQS objectives in both 2019 and 2023.

²⁰ <https://iaqm.DEFRA.gov.uk/review-and-assessment/tools/background-maps.html> Accessed April 2020

²¹ EPUK/IAQM Planning guidance advises that at exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. See Footnote 6 to Table 6.3: <https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf> Accessed April 2020

Table 7-8 - DEFRA mapped background concentrations, 2019 and 2023 ($\mu\text{g}/\text{m}^3$)

Grid square (x,y)	2019 Background concentration ($\mu\text{g}/\text{m}^3$)				2023 Background concentration ($\mu\text{g}/\text{m}^3$)			
	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}
470500, 113500	22.4	15.8	14.4	9.9	18.6	13.4	13.8	9.4
470500, 112500	22.7	16.0	14.4	10.0	18.9	13.6	13.8	9.5
471500, 111500	17.7	12.8	13.2	9.2	15.1	11.1	12.6	8.8
470500, 110500	21.6	15.3	14.3	10.0	18.0	13.0	13.7	9.5

Compliance with EU limit values

- 7.73. DEFRA's Pollution Climate Mapping (PCM) model²² provides estimates of roadside concentrations of pollutants, including annual mean NO₂ and PM₁₀, which are used in annual reporting regarding national compliance with EU Limit Values.
- 7.74. There are a number of PCM model links in the latest update of the PCM modelling (2018 reference year) within 5 km of the Scheme, which exceeded the NO₂ annual mean Limit Value in 2018. These include the links on A27 to the south of the Scheme. The PCM model links on the A27 are projected to be compliant by either 2021 (PCM Census ID 802036296), or 2023 (Census ID 802099631, controlled by Highways England). This means that all links within 5 km of the Scheme achieve compliance with the EU Limit Value for annual mean NO₂ concentrations in 2029 (opening year) according to the latest projections. In the UK plan for tackling roadside nitrogen dioxide concentrations²³ HBC are not required to conduct a feasibility study, this is reaffirmed in the Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations²⁴.

Summary of existing conditions

- 7.75. Air quality in the area of the Scheme can be considered relatively good. There are no AQMAs within the HBC or EHDC administrative boundaries.
- 7.76. Monitoring data from the local authority diffusion tube surveys have shown that the annual mean NO₂ AQS objective was not exceeded at any relevant locations of exposure in 2018 or 2019 based on available data.
- 7.77. The latest update of the DEFRA PCM modelling indicates that the EU Limit Value is exceeded along the A27 (in 2018) but should comply with the EU Limit Value by 2023, by the year of assessment for the construction phase and before the opening year of the Scheme (2029).
- 7.78. DEFRA mapped background concentrations for 2018 and 2023, are well below the relevant AQS objectives for all pollutants.
- 7.79. Existing air pollutant concentrations in the vicinity of the Scheme are, therefore, expected to be below the AQS objectives for annual mean NO_x, NO₂, PM₁₀ and PM_{2.5}.

Sensitive receptors

- 7.80. The sensitive receptors included in the assessment comprised 20 locations representative of five existing human health receptors and 15 ecological sites within 200 metres of the roads meeting the criteria for air quality assessment. These receptors were chosen to represent the closest receptors to the roads to ensure the highest pollutant concentrations and/or the largest changes in pollutant concentrations would be estimated with and without the construction traffic (Figure 7-3 Air Quality Construction Traffic Assessment).
- 7.81. The ecological receptors included in the assessment are summarised below:
- Redcroft Row Site of Important Nature Conservation (SINC)

²² DEFRA (2018) 2020 NO₂ projections data (2018 reference year). <https://uk-air.defra.gov.uk/library/no2ten/2020-no2-pm-projections-from-2018-data> Accessed June 2020

²³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/633270/air-quality-plan-detail.pdf Accessed April 2020

²⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746100/air-quality-no2-plan-supplement.pdf Accessed April 2020

- Idsworth Common SINC
- The Holt SINC
- Hazelton Common Local Nature Reserve (LNR)
- Havant Thicket SINC
- Pyle Farm Meadow South SINC
- Havant Road Woodland Strip SINC
- Forest of Bere ancient woodland
- Havant Road Woodland Strip SINC
- Other unnamed parcels of ancient woodland

Potential impacts

Construction phase

Construction dust assessment for reservoir site (including access roads)

- 7.82. In accordance with IAQM Dust Guidance, an initial screening assessment was carried out using Ordnance Survey²⁵ base mapping and DEFRA's mapping website "Magic"²⁶ to determine the location and number of sensitive receptors within relevant distances of the Scheme. Given the presence of sensitive receptors, an assessment was undertaken.
- 7.83. These receptors include local wildlife sites: Sites of Importance for Nature Conservation (SINCs) including Havant Thicket, Bells Copse, Cabbagefield Row, Middle Clearing, Thicket Bottom and Thicket Bottom Woods and Lake), and parcels of ancient woodland.
- 7.84. Table 7-9 shows the assumed dust emission magnitude for each construction activity. Although there are not expected to be any dust-raising demolition activities, as a conservative assumption, it was assumed that demolition activities would be classed as "small". The area of earthworks involving earthworks borrow pits, topsoil stripping and haul route levelling is greater than 10,000 m², classifying the site as 'large'. Construction activities are categorised as "large" due an estimated total building volume of between 25,000 to 100,000 m³. Estimates of vehicle movements for the construction of the Scheme are greater than 50 HGV outward movements per day, so a "large" emission magnitude for trackout has been assigned.

Table 7-9 - Reservoir construction dust emission magnitude

Activity	Dust emission magnitude
Demolition	Small
Earthworks	Large
Construction	Large
Trackout	Large

- 7.85. There are between 11 to 100 high sensitivity receptors within 20 metres of the site boundary, and consequently the sensitivity of the surrounding area from demolition, earthworks and construction activities to dust soiling is classed as high. As annual mean PM₁₀ concentrations are below 24 µg/m³, the sensitivity of the surrounding area to human health impacts from demolition, earthworks and construction activities is classed as low.
- 7.86. No sensitive human health receptors were identified within 50 m of the northern access trackout road within 500 m from the site exit, although there are more than 10 sensitive receptors within 20 m of the southern access trackout road within 500 m from the site exit, indicating a high sensitivity area for trackout on the southern access road.

²⁵ <https://www.ordnancesurvey.co.uk/opendatadownload/products.html>

²⁶ <https://magic.defra.gov.uk/>

- 7.87. Locally designated ecological sites are classified as low sensitivity receptors for the purposes of dust assessment in accordance with IAQM Dust Guidance. As such, and despite their presence within the site boundary, the sensitivity to ecological impacts is classed as low.
- 7.88. The potential risk of dust soiling, human health and ecological impacts, given the dust emissions magnitudes and sensitivities described above, are summarised in Table 7-10. The distance buffers are presented in Figure 7.2 Air Quality Construction Dust Assessment. Without mitigation, the reservoir site can be classed as a high risk site.

Table 7-10 - Summary of reservoir expected dust risk

Sensitivity of surrounding area		Summary of dust risk			
		Demolition	Earthworks	Construction	Trackout
Dust Soiling	High Risk	Medium Risk	High Risk	High Risk	High Risk
Human Health	Low Risk	Medium Risk	Low Risk	Low Risk	Low Risk
Ecological	Low Risk	Medium Risk	Low Risk	Low Risk	Low Risk

Construction dust assessment for pipeline corridor

- 7.89. The approach to the dust assessment for the pipeline corridor is the same as that for the reservoir site described in the previous section above.
- 7.90. The pipeline corridor is approximately 4 km in length extending south from the reservoir site to the Bedhampton site. Vehicles will be required to transport excavated material, the new pipeline components, and material to backfill the excavation between the main reservoir site and the pipeline workforce.
- 7.91. The pipeline route has been split into thirds for the purposes of the assessment. The northern third adjacent to the reservoir site will be accessed via the Southern Site Access to the reservoir site through Swanmore Road. The middle and southern thirds will be accessed via the A3(M) Huilbert Road and A3(M) Bedhampton Road respectively, with construction traffic leaving/returning to the reservoir site via the Northern Site Access.
- 7.92. Table 7-11 shows the assumed magnitude of dust emissions for each construction activity. No demolition works are associated with the pipeline. The combined area of earthworks required for excavation of the pipeline trenches, and the haul roads would be no greater than 2,500 m² at any one time, classifying the site as 'small', based on working at a maximum of 8 m length per day. Construction activities are categorised as "small" due to an estimated total building volume of no greater than 25,000 m³ (approximately 4 km of pipeline to be laid but no significant associated infrastructure works). Estimates of vehicle movements for the construction of the Scheme are greater than 15 HGV outward movements per day, so a "medium" emission magnitude for trackout has been assigned.

Table 7-11 - Pipeline construction dust emission magnitude

Activity	Dust emission magnitude
Demolition	N/A
Earthworks	Small
Construction	Small
Trackout	Medium

- 7.93. There are approximately 11 to 100 high sensitivity receptors within 20 m along the pipeline routes including High Lawn Way, Dunsbury Way, Ellisfield Road, Highclere Avenue, Purbrook Way, Barncroft Way, Stockheath Lane and Bedhampton Road. There were also 10 to 100 high sensitivity receptors identified within 20 m of likely trackout route, 200 m from the pipeline site entrance, including the traffic routes on Bedhampton Road, Purbrook Way, Dunsbury Way, and Middle Park Way and consequently the sensitivity of the surrounding area to dust soiling is high.
- 7.94. As annual mean PM₁₀ concentrations are below 24 µg/m³ the sensitivity of the surrounding area to human health impacts is classed as low.

- 7.95. Given the presence of locally designated ecological sites located within 50 m of the corridor of the pipeline boundary, the sensitivity of the surrounding area to ecological impacts is classed as low.
- 7.96. The potential risk of dust soiling resulting in human health and ecological impacts, given the dust emissions magnitudes and sensitivities described above, are summarised in Table 7-12. The construction dust risk buffers are presented in Figure 7-2 Air Quality Construction Dust Assessment. Without mitigation, the pipeline site can be classed as a medium risk site.

Table 7-12 - Summary of pipeline expected dust risk

Sensitivity of surrounding area		Summary of dust risk			
		Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	N/A	Low Risk	Low Risk	Medium Risk
Human Health	Low	N/A	Negligible	Negligible	Low Risk
Ecological	Low	N/A	Negligible	Negligible	Low Risk

Assessment of construction traffic for reservoir site (including access roads)

Human health receptors

Nitrogen dioxide

- 7.97. Total annual mean NO₂ concentrations and changes in concentrations of NO₂ at the modelled receptors in 2023 are presented in Table 7-13; results indicate that concentrations are well below the AQS objective of 40 µg/m³ at all receptors, either without or with the construction traffic.
- 7.98. The highest modelled annual mean NO₂ concentration in 2023 is 24.4 µg/m³ at R3 (residential receptor on The Yews), with the construction traffic. The change at this receptor is 0.1 µg/m³ and can be described as negligible, in accordance with IAQM Planning Guidance.
- 7.99. The largest modelled change at any receptor is 0.1 µg/m³ and can be described as negligible as the modelled annual concentration is less than 75% of the annual mean NO₂ AQS objective.

Table 7-13 - Annual mean NO₂ concentrations (µg/m³) and impact

Receptor ID	2019	2023 without construction	2023 with construction	Change	Impact of change
R1	20.2	16.8	16.8	<0.1	Negligible
R2	20.8	17.2	17.3	+0.1	Negligible
R3	30.0	24.3	24.4	+0.1	Negligible
R4	27.6	22.4	22.5	+0.1	Negligible
R5	20.5	17.0	17.0	<0.1	Negligible

Particulate matter (PM₁₀)

- 7.100. The total annual mean PM₁₀ concentrations, number of exceedances of the daily mean standard and changes in concentrations of PM₁₀ for the modelled receptors are presented in Table 7-14.
- 7.101. These results indicate that total annual mean concentrations are well below the AQS objective of 40 µg/m³ at all receptors, with or without the construction traffic. The estimated number of exceedances of the daily mean standard, presented in brackets in Table 7-14, is zero, well below the AQS objective of 35 permitted exceedances. There is expected to be a negligible change in annual mean PM₁₀ concentrations at all modelled receptor locations resulting from the construction traffic.

Table 7-14 - Annual mean PM₁₀ concentrations (µg/m³) and impact

Receptor ID	2023 without construction	2023 with construction	Change	Impact of change
R1	14.4 (0)	14.5(0)	+0.1 (0)	Negligible
R2	14.6 (0)	14.6 (0)	<0.1 (0)	Negligible
R3	14.9 (0)	15.0 (0)	+0.1 (0)	Negligible
R4	14.7 (0)	14.8 (0)	+0.1 (0)	Negligible
R5	14.5 (0)	14.5 (0)	<0.1 (0)	Negligible

Particulate matter (PM_{2.5})

- 7.102. Total annual mean PM_{2.5} concentrations and changes in concentrations of PM_{2.5} for the modelled receptors are presented in Table 7-15. The results indicate that total annual mean concentrations of PM_{2.5} are estimated to be well below the AQS objective of 25 µg/m³ at all modelled receptors, with or without the construction traffic. Furthermore, the changes in annual mean PM_{2.5} concentrations as a result of the construction traffic can be described as negligible at all receptor locations.

Table 7-15 - Annual mean PM_{2.5} concentrations (µg/m³) and impact

Receptor ID	2023 without construction	2023 with construction	Change	Impact of change
R1	9.9	9.9	<0.1	Negligible
R2	9.9	10.0	+0.1	Negligible
R3	10.2	10.2	<0.1	Negligible
R4	10.0	10.0	<0.1	Negligible
R5	9.9	9.9	<0.1	Negligible

Ecological receptors

Oxides of nitrogen (NO_x)

- 7.103. Total annual mean NO_x concentrations and changes in concentrations of NO_x for the ecological receptors are presented in Table 7-16. The results indicate that in 2023, total annual mean NO_x concentrations are estimated to be below the critical level of 30 µg/m³ at all modelled ecological receptors with the exception of Eco 1 (Ancient Woodland, located at the west side of the A3(M) north of junction 2) and Eco 13 (Havant Thicket Woodland Strip SINC, located at the east side of the A3(M) north of junction 2). Concentrations are anticipated to exceed 30 µg/m³ both with and without the construction traffic in 2023 at these locations, and are considered to be raised due to the proximity of these sites to the A3(M). However, the change at both of these locations is 0.1 µg/m³, and any effect will be temporary, for the duration of the construction period.

Table 7-16 - Annual mean NO_x concentrations (µg/m³)

Receptor ID	2019	2023 without construction	2023 with construction	Change
Eco1	43.2	34.0	34.1	+0.1
Eco2	34.9	27.9	28.1	+0.3
Eco3	34.6	27.6	27.9	+0.3
Eco4	21.3	17.4	18.0	+0.5
Eco5	19.3	15.9	16.9	+0.9
Eco6	19.2	15.9	16.6	+0.7
Eco7	32.2	25.7	26.4	+0.8
Eco8	35.4	28.1	28.2	+0.1
Eco9	18.5	15.4	16.4	+1.0
Eco10	18.4	15.3	16.4	+1.0
Eco11	15.2	12.8	13.8	+1.0
Eco12	32.4	25.7	26.3	+0.6
Eco13	44.0	34.7	34.8	+0.1
Eco14	23.4	19.1	19.5	+0.4
Eco15	15.2	12.8	13.9	+1.1

Bold text indicates concentrations >30 µg/m³

Nitrogen deposition rates

- 7.104. Nitrogen deposition rates are provided in Table 7-17. The maximum change as a percentage of critical load is 1.6% for Eco 10, Eco 11 and Eco 15, located on the Northern Site Access within Havant Thicket SIN. However it should be noted that any effect will be temporary. Further discussion of these results is presented in the Chapter 6 Biodiversity in ES Volume 2.

Table 7-17 - Nitrogen deposition rates (kg/N/yr)

Receptor ID	Base 2019	2023 without construction	2023 with construction	Change	Change as a percentage of critical load
Eco1	25.65	23.43	23.44	0.01	0.1%
Eco2	24.50	22.53	22.57	0.04	0.4%
Eco3	24.44	22.49	22.53	0.04	0.4%
Eco4	23.02	21.39	21.47	0.08	0.8%
Eco5	22.72	21.17	21.31	0.14	1.4%
Eco6	22.71	21.16	21.27	0.11	1.1%
Eco7	24.59	22.61	22.72	0.11	1.1%
Eco8	24.56	22.57	22.58	0.01	0.1%
Eco9	22.23	20.79	20.93	0.15	1.5%
Eco10	22.21	20.77	20.93	0.16	1.6%
Eco11	22.10	20.69	20.85	0.16	1.6%
Eco12	24.62	22.62	22.70	0.08	0.8%
Eco13	25.73	23.50	23.51	0.01	0.1%
Eco14	23.33	21.64	21.70	0.06	0.6%
Eco15	22.11	20.69	20.85	0.16	1.6%

Carbon dioxide emissions

- 7.105. Emissions of CO₂ from construction traffic were calculated for reference in Chapter 16 Effect on Climate in ES Volume 2. There is expected to be a change of 686 tonnes per year during the construction period with the greatest change in traffic flows. This is an increase of 1.5% compared with the without construction scenario (Table 7-18 - Annual emissions of CO₂ as a result of construction traffic (2023)Table 7-18).

Table 7-18 - Annual emissions of CO₂ as a result of construction traffic (2023)

Scenario	CO ₂ (t/yr)
Without Construction	45,597
With Construction	46,283
Change	+ 686
% Change from Without Construction	1.5%

Operational phase

The effects on local air quality once the Scheme is operational are considered to be negligible.

7.106. Table 7-19 presents changes in emissions of CO₂, NO_x and PM₁₀, arising from operational road traffic which are less than 0.5%, compared to the Do Minimum Scenario.

Table 7-19 - Annual emissions of CO₂, NO_x and PM₁₀ as a result of operational road transport (2029)

Scenario	CO ₂ (t/yr)	NO _x (kg/yr)	PM ₁₀ (kg/yr)
Do Minimum (DM)	47,865	59,029	6,936
Operational Scenario (DS)	48,016	59,233	6,963
Change with Operational Scenario Flows (DS)	151	205	27
% Change from DM	0.3%	0.3%	0.4%

Design, mitigation and enhancement measures

Construction phase

Reservoir site and pipeline corridor construction dust management and mitigation

- 7.107. Construction works associated with the Scheme (at both the reservoir site and along the pipeline corridor) have the potential to generate dust emissions. These will be controlled through measures outlined in the Construction Environmental Management Plan (CEMP).
- 7.108. Selected mitigation measures given in the IAQM Dust Guidance which are applicable to both medium and high risk construction sites are described below. With appropriate mitigation measures in place, any adverse effects resulting from the construction works will be minimised such that there would not be any significant residual effect on receptors. Mitigation measures to control dust are included in the Register of Environmental Actions and Commitments (REAC) in the Outline Environmental Management Plan (OEMP) in Appendix A2.1 in ES Volume 4. The appointed contractor will include these measures within the CEMP.
- 7.109. Mitigation measures will include:
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
 - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
 - Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
 - Keep site fencing, barriers and scaffolding clean using wet methods;
 - Ensure all vehicles switch off engines when stationary – no idling vehicles;
 - Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
 - Impose and signpost a maximum speed limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas;
 - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
 - Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
 - Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
 - Use water-assisted dust sweepers on the access and local roads, to remove any material tracked out of the site;
 - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;

- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsters and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable); and
- Access gates to be located at least 10 m from receptors where possible.

7.110. Stakeholder communication including community engagement will be undertaken both before and during work on site and contact details for those responsible for dust issues on site will be clearly displayed. Any complaints and exceptional incidents will be logged along with the appropriate measures taken to reduce emissions.

7.111. Daily site management of emission control measures will be undertaken, with visual inspections of activities and control measures carried out especially during dry conditions. This will include recording of activities, controls, weather (wind direction, precipitation) and ground conditions, and observations of surface dust deposits at and beyond the site boundary near sensitive receptors.

Reservoir site and pipeline corridor construction traffic emissions management and mitigation

7.112. Specific mitigation measures for emissions from construction traffic are unlikely to be required, given that any effect is likely to be temporary and unlikely to be significant. A construction traffic management plan will be included in the CEMP by the appointed contractor.

Operational phase

7.113. Given that any effect would be negligible and not significant, no mitigation measures will be required. However, in line with best practice, it is recommended that consideration is given to including electric vehicle charging points within the car parks.

Assessment of effects

Construction phase

Reservoir site construction dust

7.114. No significant adverse effect with appropriate mitigation measures secured within the CEMP by the appointed contractor.

Pipeline corridor construction dust

7.115. No significant adverse effect with appropriate mitigation measures secured within a CEMP by the appointed contractor.

Reservoir site and pipeline corridor construction traffic emissions

7.116. The results of the local air quality assessment indicate that concentrations of NO₂, PM₁₀ and PM_{2.5} are unlikely to exceed AQS objectives at any modelled human health receptor, either with or without the construction traffic associated with the Scheme in 2023. Furthermore, the impacts of the Scheme on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations at all modelled receptors can be described as negligible, and the effect can be considered not significant.

7.117. Modelled annual mean NO_x concentrations at the majority of ecological receptors are also shown to be below critical level AQS objective (30 µg/m³).

Operational phase

7.118. Any effect on air quality would be negligible and can be considered not significant.

Cumulative effects

Construction phase

Reservoir site construction dust

- 7.119. There are other committed developments which could potentially affect receptors within the air quality study area for construction dust. These include the plots documented in Chapter 19 Cumulative and In-combination Effects in ES Volume 2, numbered 6, 8, 22, 24, 26, 27, 30 and 31. However, with appropriate mitigation measures in place for these developments as secured in a CEMP, any adverse effects resulting from construction dust would be minimised such that there would not be a significant residual effect on the receptors affected by these proposals. Submission of a CEMP for approval by the local planning authority is expected as a condition of planning consent.

Pipeline corridor construction dust

- 7.120. There are other committed developments which could potentially affect receptors within the air quality study area for construction dust. These include the plots documented in the Chapter 19 Cumulative and In-combination Effects in ES Volume 2, numbered 1, 3, 4, 7, 9, 10, 13, 17, 22, 23 and 24. However, with appropriate mitigation measures in place as secured in a CEMP, any adverse effects resulting from construction dust would be minimised such that there would not be a significant residual effect on the receptors affected by these proposals. Submission of a CEMP for approval by the local planning authority is expected as a condition of planning consent.

Reservoir site and pipeline corridor construction traffic emissions

- 7.121. During the construction period, there could be an overlap with construction traffic for the other committed developments in the area where the construction periods occur over the same timeframe, and the traffic uses the same road links. This is particularly the case with construction traffic using the B2149 to access plots 26, 30, 31, 32 and 34, given that the change in traffic on this road met the criteria for assessment, a change of more than 100 HDV trips per day, shown in traffic data presented in Chapter 13 Traffic and Transport in ES Volume 2. However, as the air quality assessment for the combined reservoir site and pipeline corridor components, using conservative assumptions did not show a significant adverse effect on air quality, it is also considered that the cumulative effect of any additional traffic during construction is highly unlikely to be significant. Nonetheless a construction traffic management plan will be drawn up in consultation with the local planning authority to ensure any effects are minimised.

Operational phase

- 7.122. The traffic data includes additional traffic from other committed developments. Given that the effect on air quality during operation is expected to be negligible and not significant, the cumulative effect is also not expected to be significant.

Monitoring

Construction phase

Reservoir site Construction Dust

- 7.123. Measures to monitor dust will be included in the CEMP prepared by the appointed contractor and will be agreed with the local planning authority.

Pipeline corridor Construction Dust

- 7.124. Measures to monitor dust will be included in the CEMP by the appointed contractor and will be agreed with the local planning authority.

Construction traffic emissions

- 7.125. Given that there is not expected to be a significant adverse effect on human health receptors with the Scheme, no monitoring of local air quality is required.

Operational phase

- 7.126. Given that there is not expected to be a significant adverse effect on air quality with the Scheme, no monitoring is required.

Summary

- 7.127. This air quality assessment includes a review of existing air quality conditions, a detailed assessment of construction dust impacts, and a quantitative assessment of the effects of construction traffic arising due to the Scheme.

Baseline conditions

- 7.128. Air quality in the vicinity of the reservoir site and pipeline corridor is considered to be relatively good, with measured pollutant concentrations below relevant air quality criteria.

Reservoir site construction dust assessment

- 7.129. The construction phase of the Scheme has the potential to generate dust and PM₁₀ emissions. With appropriate mitigation measures in place however, these works should not result in a significant residual effect at these receptors. The measures will be secured within the CEMP by the appointed contractor.

Pipeline corridor construction dust assessment

- 7.130. The construction phase of the Scheme has the potential to generate dust and PM₁₀ emissions. With appropriate mitigation measures in place however, these works should not result in a significant residual effect at these receptors. The measures will be secured within the CEMP by the appointed contractor.

Reservoir site construction traffic assessment

- 7.131. The air quality assessment for the construction of the Scheme was carried out using detailed dispersion modelling.
- 7.132. In the year of assessment, 2023, annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were shown to be below relevant AQS objectives at all human health receptors, in all scenarios. The impact of the changes was estimated to be negligible at all receptors, and the effect of the construction traffic considered not to be significant.
- 7.133. Annual mean NO_x concentrations at the selected ecological receptors were also shown to be below the critical level AQS objective (30 µg/m³), both with or without the construction traffic, in the assessed year of 2023, with the exception of two sites near the A3(M), north of junction 2.

Pipeline construction traffic assessment

- 7.134. The effect on air quality from the construction traffic for the pipeline corridor alone was not considered to be significant, but was included within the assessment of construction traffic associated with the reservoir site.

Operational traffic assessment

- 7.135. There is not expected to be a significant effect on air quality during operation, given that the traffic did not meet the relevant criteria for assessment.



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