Cambridge Waste Water Treatment Plant Relocation Project
Anglian Water Services Limited

Environmental Statement Chapter 7: Air Quality

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Summary

Introduction

This chapter of the Environmental Statement (ES) presents the potential impacts of the Proposed Development on air quality during its construction, operational and decommissioning phases.

The air quality assessment has taken account of national legislation, national and local planning policy, including the requirements of the National Policy Statement for Waste Water, and legislation pertaining to statutory nuisance.

Summary of relevant mitigation

In developing the Proposed Development through an iterative process, including consultation and engagement with consultees, and via the Environmental Impact Assessment (EIA) process, the Applicant has identified and incorporated suitable measures and mitigation for potentially significant adverse effects, as well as maximising beneficial effects where possible.

Some measures are 'embedded' in the design of the Proposed Development for which consent is included in Schedule 1 to the Development Consent Order (DCO) and the accompanying Works Plans. These are considered primary mitigation. For example, adjustment of Order Limits to avoid sensitive features, amending the sizing and location of temporary access routes and compounds.

Secondary measures may be detailed activities for example construction dust control measures contained within the Code of Construction Practice (CoCP) and the preparation and delivery of an Air Quality Management Plan (AQMP) that is secured through the CoCP. These secondary measures are differentiated from the good practice measures.

Tertiary measures comprise good practice measures (such as measures within Considerate Contractors Scheme) and measures integrated into legal requirements secured through environmental permits and consents, such as the Industrial Emissions Directive (IED) and Medium Combustion Plant Directive (MCPD) permits required by the Environment Agency.

Assessment approach

The assessment of air quality impacts has been assessed qualitatively for construction dust, construction plant and the emergency use of vents, known as 'Whessoe Valves' during operation, and quantitively for on road construction vehicle movements, on road operational vehicle movements and operational energy plant.

Both the quantitative and qualitative approaches considered the maximum design envelope parameters and primary, secondary and tertiary mitigation measures adopted as part of the Proposed Development.

The assessment for construction dust risk applies the assessment criteria outlined within the IAQM construction dust guidance which identifies the magnitude of an impact and the sensitivity of receptors. Overall sensitivity of receptors is based on receptor type, the number of receptors located within various distances from the dust source and in the case of particulates (PM_{10}) the existing ambient concentrations of PM_{10} are also used to determine the impacts on health.

Guidance from the IAQM (Moorcroft and Barrowcliffe et al., 2017) notes that effects from construction plant exhaust emissions would likely not be significant. Generally, effects of construction plant emissions on local air quality are considered of negligible significance relative to the surrounding road traffic contributions on the local road network. However, given the scale of the construction works, the number of site plant operating during working hours and their locations have been qualitatively reviewed in relation to baseline conditions and their distance to nearby receptors to confirm significant effects are unlikely to occur based upon professional judgement.

During operation, Whessoe Valves may open in an emergency situation and vent biogas, containing part methane, part carbon dioxide and other trace gases, directly to air from the highest point of a pressurised tank or container. The methane component of the biogas is much less dense than air and would rise and disperse quickly. Methane and carbon dioxide exist in low levels in the natural environment and are generally considered non-toxic gases at the levels of exposure that could possibly occur from the operation of a Whessoe valve. Whessoe valves are not expected to cause a new significant effect and are an intrinsic part of the proposed WWTP's operational safety.

The quantitative assessment has been undertaken using best practice methods to assess the impact of the Proposed Development on air quality during construction and operation. The quantitative approach uses the atmospheric dispersion model ADMS 5 to model emissions from energy plant and ADMS-Roads 5 to model emissions from traffic sources. It includes an assessment of:

- The change in emissions of pollutants associated with traffic on the local road network where there is an increase of 100 heavy duty vehicles and/or 500 light duty vehicles per day (as an annual average daily total), during the construction and operational phases of the Proposed Development.
- Emissions of pollutants associated with the operation of the energy plant at the proposed WWTP in isolation.
- The combined impacts and effects of the operational phase emissions from traffic on the local road network and the energy plant.

Summary of construction effects

Air quality impacts from construction dust during the construction of the Proposed Development will be temporary and of short duration. The dust risk assessment aids the identification of secondary mitigation measures which are included within the CoCP Part A

and Part B. Following effective implementation of the CoCP, the residual effects from construction activities generating dust are negligible and not significant.

Construction of the Proposed Development would require the use of different equipment such as excavators, cranes and on-site generators. All construction plant has an energy demand; with some plant resulting in direct emissions to air from exhausts. Emissions from construction plant would quickly disperse and would be localised to the source. The sensitivity of human health receptors to changes in air quality is 'very low' as pollutant concentrations are less than 75% of the relevant long term air quality assessment levels (AQAL) at the closest human health receptor. Overall, the use of construction plant has a negligible effect on air quality. The CoCP Part A and Part B provides secondary mitigation measures to further reduce the effect and the residual effect is negligible and not significant.

During construction of the Proposed Development there will be additional vehicle movements on the public highway network. Where additional vehicle movements are more than 100 heavy duty vehicles and/or 500 light duty vehicles per day for more than six months, the Base, Do-Minimum (no Proposed Development) and Do-Construction (with construction of the Proposed Development) traffic scenarios have been modelled at relevant worst case receptor locations using ADMS-Roads 5 to predict concentrations of nitrogen dioxide (NO_2), PM_{10} and fine particulates ($PM_{2.5}$) at human health receptors and nitrogen oxide (NO_x) concentrations, nitrogen deposition and acid deposition at ecological designations. Overall, the Proposed Development's effect on air quality from construction vehicle movements on the public highway network is concluded to be not significant and no secondary mitigation or enhancement measures are required.

Summary of operation effects

During operation of the Proposed Development there will be additional vehicle movements on the public highway network. Where additional vehicle movements are more than 100 heavy duty vehicles and/or 500 light duty vehicles per day for more than six months, the Base, Do-Minimum (no Proposed Development) and Do-Something (with Proposed Development) traffic scenarios have been modelled at relevant worst case receptor locations using ADMS-Roads 5 to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at human health receptors and NO_x concentrations, nitrogen deposition and acid deposition at ecological designations. Overall, the Proposed Development's effect on air quality from operational vehicle movements on the public highway network is concluded to be not significant and no secondary mitigation or enhancement measures are required.

The operation of the proposed WWTP will produce biogas. Biogas would be combusted within one of two boilers (one duty and one standby) to generate heat for the process. Additional biogas will either be exported to the national gas network following appropriate treatment, this is the preferred option, or combusted within a Combined Heat and Power (CHP) plant if exporting to the national gas network becomes infeasible. There are no combustion emissions to air from exporting the biogas to the national gas network and therefore this option has not been considered further in this chapter. This assessment has

therefore conservatively considered emissions from the combined operation of boilers and CHPs.

Overall, the Proposed Development's effect on air quality from the operational energy plant at the proposed WWTP is concluded to be not significant and no secondary mitigation or enhancement measures are required.

Both energy plant and road traffic will have operational impacts on air quality. Therefore, the impact of both sources has been combined to demonstrate the predicted inter-related effect on air quality at modelled receptor locations. The outputs of the ADMS 5 and ADMS Roads models at sensitive receptors were combined to demonstrate the overall combined effects. The combined operation of energy plant and road vehicles during operation has a 'negligible' effect on air quality is therefore not significant and no secondary mitigation or enhancement measures are required.

Summary decommissioning effects

Decommissioning works are not anticipated to result in additional emissions to air, and that although changes to vehicle movements can be expected due to these activities, traffic flows to and from the existing Cambridge WWTP during decommissioning will be broadly similar to existing flows accessing the existing Cambridge WWTP whilst it is operational. The assessment in relation to decommissioning of the existing Cambridge WWTP is included within the assessment of vehicle traffic which includes movements associated with decommissioning.

Closing

Overall, the effect of the Proposed Development on air quality during the construction, operational and decommissioning phases are not significant, and the Proposed Development does not conflict with national or local policies in relation to air quality.

1 Introduction

1.1 Purpose of this chapter

1.1.1 This chapter of the Environmental Statement (ES) presents the findings of Environmental Impact Assessment (EIA) completed in relation to the potential impacts of the Proposed Development on Air Quality.

1.1.2 The ES has been prepared as part of the application to the Planning Inspectorate (PINS) for development consent. This chapter considers the potential air quality impacts of the Proposed Development during its construction (including commissioning), operation and maintenance, and decommissioning phases, with reference to:

- nuisance, loss of amenity and health impacts caused by construction dust and construction plant emissions;
- air quality impacts caused by increased traffic generation or re-routing of traffic during construction and operation of the Proposed Development;
- air quality impacts caused by emissions from energy plant (boilers, combined heat and power plants (CHPs) and flare) at the proposed Waste Water Treatment Plant (WWTP); and
- emergency emissions from the proposed WWTP.

1.1.3 Potential impacts of the Proposed Development on Biodiversity are assessed in Chapter 8: Biodiversity (Application Document Reference 5.2.8) and potential impacts of the Proposed Development on human health are assessed in Chapter 12: Health (Application Document Reference: 5.2.12).

1.2 Competency statement

1.2.1 Summaries of the qualifications and experience of the chapter authors are set out in Table 1-1.

Table 1-1: Competent experts

Author	Qualification / Professional Membership	Years of experience	Project experience summary
[redacted]	MSc Air Pollution Management and Control, University of Birmingham, 2011 BSc (Hons) Environmental Studies, University of Manchester, 2010 Member of Institution of Environmental Sciences	11 years	Worked on many projects requiring the application of quantitative and qualitative assessment methodologies from the Institute of Air Quality Management (IAQM), Environment Agency, Defra and National Highways and for other international practices. He has worked on projects

Author	Qualification / Professional Membership	Years of experience	Project experience summary
	Member of Institute of Air Quality Management		across a range of sectors including water, transportation, power, and infrastructure both domestically and internationally.
[redacted]	MSc Air Pollution Management and Control, University of Birmingham, 2007 BSc (Hons) Environmental Science, University of Birmingham, 2006 Member of the Institute of Environmental Sciences Member of the Institute of Air Quality Management	15 years	Air quality practice leader and oversees air quality assessments across the Mott MacDonald Group. Technical lead for many air quality assessments across a range of sectors including water, power, oil and gas, petrochemicals, transportation and buildings. Oversees planning and Environmental Permit applications and leads on the environment aspects of due diligence and Lenders' Technical Advisor work. Managed a variety of projects from small-scale mixed-use developments in the UK to large international environmental and social impact assessments (ESIA) to a range of international standards. Recently been an Expert Witness for three transport projects in the UK on behalf of National Highways.

1.3 Planning policy context

National Policy Statement (NPS) requirements

1.3.1 Planning policy on waste water Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to air quality, is contained in the National Policy Statement (NPS) for Waste Water (Department of Environment, Food and Rural Affairs, 2012).

1.3.2 Table 1-2 sets out how the scope proposed in this chapter complies with the NPS for Waste Water.

Table 1-2: Scope and NPS compliance

NPS requirement	Compliance of ES scope with NPS requirements
Paragraph 4.11.3	Air quality is considered within the ES and assessed in line with best-practice guidance and local policy.

NPS requirement	Compliance of ES scope with NPS requirements
The ES should describe any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project.	Any significant effects from the project have been described within the ES in section 4. No significant effects have been identified; however, where required further mitigation measures, beyond those presented in section 2.8, have been recommended in section 4 to further minimise air quality impacts. In the case of dust, mitigation measures as recommended within the Institute of Air Quality Management (IAQM) guidance will be applied and are included within the CoCP.
Paragraph 4.11.3 The ES should describe the predicted absolute emission levels from the proposed project, after mitigation methods have been applied.	The ES describes the impacts on and effects from air quality from the Proposed Development, in section 4. Assessment has taken into account mitigation at described in section 2.8. No additional mitigation is proposed.
Paragraph 4.11.3 The ES should describe existing air quality levels and the relative change in air quality from existing levels.	A baseline assessment has been undertaken and presented within the ES in section 3 to provide a summary of existing air quality conditions. The future year baseline is also presented to provide predicted future air quality conditions without the Proposed Development in place. The changes in modelled concentrations are reported in section 4 in line with relevant guidance.

National planning policy

1.3.3 National planning policy of relevance to air quality, and pertinent to the Proposed Development are listed below.

UK Air Quality Strategy

1.3.4 The Environment Act requires the UK Government to produce a national Air Quality Strategy (AQS). The AQS establishes the UK framework for air quality improvements. The measures agreed at the national and international level are the foundations on which the strategy is based. The first AQS was adopted in 1997 (Defra, 1997) and its subsequent iterations, have now been superseded as of the 14 January 2019 with the Clean Air Strategy 2019 (CAS) (Defra, 2019).

1.3.5 The CAS does not set legally binding objectives, the CAS instead has targets for reducing total UK emissions of NO_x and fine particulate matter ($PM_{2.5}$[1]) from sectors such as road transport, domestic sources and construction plant (non-road mobile machinery or NRMM).

1.3.6 Air quality impacts have been considered against the air quality objectives and limit values summarised in Table 1-3**.**

1.3.7 Table 1-3 provides details of where the respective objectives should and should not apply and therefore the types of receptors that are relevant to the assessment of air quality.

[1] Particulate matter with an aerodynamic diameter of less than 2.5 microns.

Table 1-3: Relevant air quality objectives and limit values

Pollutant	Averaging period	Concentration	Allowance	Attainment date	
				Air quality objectives	Limit values
Nitrogen dioxide (NO_2)	Annual	40 µg/m^3	-	31 December 2005[a]	1 January 2010[c]
	1 Hour	200 µg/m^3	18	31 December 2005[a]	1 January 2010[c]
Sulphur dioxide (SO_2)	15-minute	266 µg/m^3	35	31 December 2005[a]	-
	1-hour	350 µg/m^3	24	31 December 2005[a]	1 January 2005[c]
	24-hour	125 µg/m^3	3	31 December 2005[a]	1 January 2005[c]
Particulates (PM_{10})	Annual	40 µg/m^3	-	31 December 2004[a]	1 January 2005[c]
	24 Hour	50 µg/m^3	35	31 December 2004[a]	1 January 2005[c]
$PM_{2.5}$[e]	Annual	20 µg/m^3	-	-	1 January 2020[c]
	Annual	25 µg/m^3	-	2020[b]	-
NO_x[d]	Annual	30 µg/m^3	-	31 December 2000[a]	19 July 2001[c]
SO_2	Annual	20 µg/m^3	-	31 December 2000[a]	19 July 2001[c]
SO_2 where bryophytes and lichens are present	Annual	10 µg/m^3	-	31 December 2000[a]	19 July 2001[c]

Notes: *[a] Air Quality (England) Regulations 2000 as amended*

[b] Air Quality Strategy 2007

[c] EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe, as transposed into UK Law

[d] Designated for the protection of vegetation and ecosystems and also referred to as the 'critical level' for NO_x. The policy of the UK statutory nature conservation agencies is to apply the annual mean NO_x criterion in internationally designated conservation sites and Site of Special Scientific Interest (SSSI) on a precautionary basis, as the limit value applies only to locations more than 20km from towns with more than 250,000 inhabitants or more than 5km from other built-up areas, industrial installations or motorways.

[e] As the Air Quality Strategy 2007 and EU Directive 2008/50/EC have a different numerical standard for $PM_{2.5}$, the more stringent standard of 20µg/m^3 has been adopted for this assessment.

Table 1-4: Locations where the air quality objectives apply

Averaging period	Objectives should apply at:	Objectives should not apply at:
Annual	All locations where members of the public might be regularly exposed.	Building façades of offices or other places of work where members of the public do not have regular access.

Averaging period	Objectives should apply at:	Objectives should not apply at:
	Building façades of residential properties, schools, hospitals, care homes, etc.	Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations a building façade), or any other location w public exposure is expected to be short-
24-Hour	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1-Hour	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations, etc., which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-Minute	All location where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

Source: Defra TG22 (Defra and Devolved Administrations, 2022).

National Planning Policy Framework

1.3.8 National planning policy of relevance to air quality and pertinent to the Proposed Development are:

- The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021) with particular reference to Section 15: Conserving and enhancing the natural environment, paragraph 174 and 186 Local planning policy.

Local planning policy

1.3.9 Local planning policy of relevance to the Proposed Development includes the:

- South Cambridgeshire District Council (SCDC) Local Plan 2018 (SCDC, 2018), with particular reference to Policy SC/12: Air Quality and Policy SC/14 Odour and Other Fugitive Emissions to Air.
- Cambridge City Council (CCC) Local Plan 2018 (CCC, 2018) with particular reference to Policy 36: Air quality, odour and dust.

1.4 Legislation

1.4.1 The principal legislative and planning context in relation to the assessment of the effects of the Proposed Development on air quality is presented below.

National Legislation

1.4.2 The Air Quality Standards Regulations 2010 (Gov.uk, 2010), Air Quality Standards (amendment) Regulations 2016 (Gov.uk, 2016), Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 (Gov.uk, 2019) and Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (Gov.uk, 2020) implement Directive 2008/50/EC on ambient air quality (European Union, 2008).

1.4.3 These define limit values and times by which they are to be achieved for the purpose of protecting human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants. The limit values apply everywhere, except for:

- any locations situated within areas where members of the public do not have access and there is no fixed habitation;
- in accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply;
- on the carriageway of roads; and
- on the central reservations of roads except where there is normally pedestrian access to the central reservation.

1.4.4 The Department for Environment Food and Rural Affairs (Defra) assesses and reports on compliance with the limit values for 43 regional quality assessment zones and agglomerations across the UK[2]. Zones and/or agglomerations achieve compliance when everywhere within the zone and/or agglomeration (excepting locations provided in the Directive) does not exceed the relevant limit value.

1.4.5 Part IV of the Environment Act 1995 (Defra, 2003) (as amended in Schedule 11 of the Environment Act 2021) (Gov.uk, 2021) requires that every local authority shall

[2] The UK is divided into zones for air quality assessment – 28 agglomeration zones (large urban areas) and 15 non-agglomeration zones.

periodically carry out a review of air quality within its area, including predictions of likely future air quality. The air quality objectives specifically for use by local authorities in carrying out their air quality management duties are set out in the Air Quality (England) Regulations 2000 (Gov.uk, 2000) and the Air Quality (England) (Amendment) Regulations 2002 (Gov.uk, 2002). In most cases, the air quality objectives are set at the same pollutant concentrations as the limit values transposed into UK law although compliance dates differ.

1.4.6 As part of the review of air quality, the local authority must assess whether air quality objectives are being achieved, or likely to be achieved within the relevant periods. Any part of a local authority's area where the objectives are not being achieved or are not likely to be achieved within the relevant period must be identified and declared as an Air Quality Management Area (AQMA). Once such a declaration has been made, local authorities are under a duty to prepare an action Plan which sets out measures to pursue the achievement of the air quality objectives within the AQMA.

Statutory nuisance

1.4.7 Section 79(1)(d) of the Environmental Protection Act 1990 (Parliament of the United Kingdom, 1990) defines one type of 'statutory nuisance' as 'any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance'. Where a local authority is satisfied that a statutory nuisance exists, or is likely to occur or recur, it must serve an abatement notice. Failure to comply with an abatement notice is an offence. Best practicable means is a widely used- defense by operators, if employed to prevent or to counteract the effects of the nuisance.

1.5 Consultation

Scoping

1.5.1 Table 1-5 provides a summary of key points raised during scoping.

Table 1-5: Key points raised during scoping

ID	Consultee	Points raised	Response
3.2.1	PINS	The ES should consider construction site plant emissions with reference to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur.	Construction plant is qualitatively assessed in section 4.3.
3.2.4	PINS	The ES should assess any likely significant effects on air quality sensitive designated sites associated with anaerobic digestion (including safety valve emissions).	Assessment of anaerobic digestion emissions has been undertaken in section 4.3.
3.2.5	PINS	The ES should adopt a worst-case approach when scoping in receptors and contains a robust justification to support the selected study area's relevant to impacts from emissions to air on people and designated ecological sites, with reference to the extent of the likely impacts and agreement with relevant consultation bodies. Ecological receptor selection for air quality modelling and assessment should be undertaken in conjunction with the biodiversity assessment.	The location of the maximum impacts will be shown through contours produced from the results. These will be used to confirm that the extent of the study area is appropriate, and if, not the study area will be expanded accordingly. Ecological receptors have been chosen in consultation with the project ecologist.
3.2.6	PINS	A description of the methods and assumptions used for determining the number, placement, height and diameter of stack should be included within the ES, including any sensitivity testing which has been undertaken to assess variations in these parameters. The Applicant should ensure these parameters are reflected in the DCO such that the Proposed Development is representative of the worst-case operational scenario assessed in the ES.	All modelling assumptions and inputs are provided in the ES. The assumptions used in the assessment represent the worst-case operational scenario.
n/a	SCDC	Consideration of road traffic during decommissioning works and incorporation of mitigation measures in a Construction Management Plan.	Road traffic during decommissioning works has been considered in the ES and appropriate mitigation measures have been included in the Decommissioning Plan.

Technical Working Groups

1.5.2 Table 1-6 provides a summary of key points raised during engagement with Technical Working Groups.

Table 1-6: Key points raised during engagement with Technical Work Groups

Date	Consultee	Points raised	How and where addressed
10/05/2021	South Cambridgeshire District Council	Agreed method of assessment as detailed in section 2 With South Cambridgeshire District Council.	Assessment method agreed with Environmental Health Officers.

Statutory s42 consultation

1.5.3 Table 1-7 provides a summary of key points raised during statutory s42 consultation.

Table 1-7: Key points raised during statutory consultation

Date	Consultee	Points raised	How and where addressed
27/04/2022	Natural England	Natural England is generally satisfied with the preliminary findings of the air quality assessment subject to detailed modelling and assessment confirming the initial findings through the ES and detailed mitigation measures being agreed and secured through DCO requirements. The detailed air quality assessment will need to inform the updated HRA and the ES with regard to impacts on Devil's Dyke SAC.	This is addressed in the HRA Report (Application Document Reference: 5.4.8.16).
27/04/2022	Natural England	The ES should provide a rationale for scoping out potential effects on designated sites within the zone of influence of the Proposed Development, such as air quality impacts to Wilbraham Fen and Stow-cum-Quy Fen SSSIs.	These SSSIs have been assessed. Details on the study area are presented in Section 2.3. Assessed ecological receptors are presented in Air Quality Dispersion Model Results (Application Document Reference: 5.4.7.2)
27/04/2022	Cambridgeshire County Council	It is understood that the Combined Heat and Power (CHP) facility will meet stringent emission requirements to minimise the effect on air quality. However, we await the results of the computer modelling to determine the concentrations of air pollutants (specifically, NO_2, NO_x and PM_{10}) and provide more accurate illustration of actual emissions	The boilers and CHPs would comply with Medium Combustion Plant Directive (MCPD) emission limits. Assessed pollutants from the energy plant include NOx, NO_2 and SO_2. The energy plant will operate on natural gas or biogas, therefore emissions of particulates are de minimis and have not been assessed.

Date	Consultee	Points raised	How and where addressed
			Particulate matter has been considered as part of the road traffic dispersion modelling.

Statutory s47 local community consultation

1.5.4 The Consultation Report (Application Document Reference 6.1) details the responses to all comments made during the public consultation. There were no matters raised in relevance to Air Quality.

2 Assessment Approach

2.1 Guidance

National Planning Practice Guidance

2.1.1 The National Planning Practice Guidance includes a dedicated section on air quality (Gov.uk, 2019). It notes that, for new planning applications, the local planning authority may require information on:

- 'the 'baseline' local air quality', including what would happen to air quality in the absence of the development;
- 'whether the Scheme could significantly change air quality during the construction and operational phases '(and the consequences of this for public health and biodiversity); and
- 'whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.'

2.1.2 The NPPG also states the following in relation to determining whether air quality is relevant to a planning decision:

'Whether air quality is relevant to a planning decision will depend on the Scheme and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the Scheme would be particularly sensitive to poor air quality in its vicinity.'

Defra's Technical Guidance (TG22)

2.1.3 Defra's Technical Guidance (TG22) (Defra and Devolved Administrations, 2022) document provides guidance to local authorities on the management of air quality and includes best-practice advice on how to robustly assess air quality. This guidance contains information useful for assessing planning applications and has been applied as appropriate to the EIA.

Land Use Planning and Development Control: Planning for Air Quality

2.1.4 The Land Use Planning and Development Control: Planning for Air Quality (Moorcroft and Barrowcliffe et al., 2017) guidance document produced by Environmental Protection United Kingdom (EPUK) and Institute of Air Quality Management (IAQM) provides criteria for the determination of whether a development requires an air quality assessment and provides best practice advice. This is particularly relevant to the air quality assessment as the guidance provides a framework for assessing the magnitude of impacts, which has been applied to the modelled changes in pollutant concentrations in Section 1.1 to determine significance of effect.

Guidance on the Assessment of Dust from Demolition and Construction

2.1.5 The IAQM's Guidance on the Assessment of Dust from Demolition and Construction (Holman et al., 2014) outlines a comprehensive method of assessing the risk of dust effects from construction. Following this assessment, the guidance suggests mitigation commensurate to the level of risk, effective implementation of which is expected to reduce the likely dust impacts such that they are negligible.

A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites

2.1.6 The IAQM has published A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Holman et al., 2020) to assist air quality specialists in assessment of air quality impacts of development on designated nature conservation sites. The guidance provides a procedure for air quality specialists to follow when evaluating the impacts from air pollution at designated sites and the basis for reaching a conclusion of no significant effects, where applicable.

2.1.7 The guidance states that although an air quality specialist may be able to determine whether there are no significant effects using the thresholds in the guidance, it is the role of the project ecologist to assess the effects of air pollution on the integrity of the designated site. The project ecologist has been consulted on the outcome of the assessment of ecological designations.

2.1.8 There is a relatively new recommendation from the IAQM (Holman et al., 2020) and CIEEM (Chartered Institute of Ecology and Envrionmental Management, 2021)to consider the ammonia (NH_3) contribution to nitrogen deposition from road traffic emissions. Whilst this is a relatively new area of assessment, and the tools and methodology are being developed, this assessment has considered the contribution of NH_3 at ecological designations to nitrogen deposition.

Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA 105 Air Quality

2.1.9 National Highways (previously Highways England) has published the Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA 105 Air Quality (DMRB LA 105) guidance (National Highways, 2019) to appraise air quality effects for road intervention schemes. Whilst the Proposed Development is not a road intervention scheme, the guidance is still relevant to this assessment as it details the distance from a road (200m) that receptors should be identified and included in the assessment. It also states there should be no need to model all receptors within 200m of the road.

Environment Agency Environmental Permitting Guidance

2.1.10 The Environment Agency (EA) publish a suite of guidance documents to appraise air quality effects resulting from emissions to air from energy plant. Whilst the guidance is primarily used for permit applications, it is applicable to the Proposed Development as it provides general methodology on the assessment of emissions

from combustion process, such as defining the study area and how to determine the impact of the changes in concentrations predicted by the dispersion model.

2.1.11 Environment Agency guidance requires the assessment of acid deposition from energy plant that emit pollutants contributing to acidification at ecological habitats. Whilst this is typically not assessed for road emission sources and it is not a requirement of the DMRB LA 105 or specifically recommended within the IAQM or CIEEM guidance, this assessment has included acidification from roads emission to fully assess all potential impacts in isolation and combination.

Greater Cambridge Sustainable Design and Construction Supplementary Planning Document

2.1.12 The Greater Cambridge Sustainable Design and Construction Supplementary Planning Document (CCC and SCDC, 2020), adopted by CCC and SCDC in 2020, aims to assist developers in producing planning applications, and 'should form an integral part of the design process so that minimum policy requirements are met, and where possible exceeded, in the most elegant, timely and cost effective way possible.'

2.1.13 This guidance includes a checklist to confirm whether an air quality assessment is required for a development and provides best practice advice for developers. Following best practice advice will ensure that policy requirements, stated in the SCDC and CCC local plans (Section 1.3), are met.

2.2 Assessment methodology

2.2.1 The general approach to assessment described in Chapter 5: Assessment Methodology has been followed.

2.2.2 Primary mitigation for the Proposed Development has been identified as part of an iterative design process and is described in Chapter 2 (Project Description: Application Document Reference 5.2.2) and Chapter 3 (Site Selection and Alternatives: Application Document Reference 5.2.3). The preliminary assessment of the likely significant environmental effects has been undertaken with the assumption that primary and tertiary mitigation will be implemented.

2.2.3 Following the preliminary assessment of the likely significant effects of the Proposed Development, any further mitigation measures (secondary mitigation) are identified and described. These mitigation measures would further reduce an adverse effect or enhance a beneficial one. The assessment of likely significant effects is then carried out taking into account the identified secondary mitigation measures to identify the 'residual' environmental effects.

2.2.4 This section provides specific details of the air quality methodology applied to the assessment of the Proposed Development.

2.2.5 The full method of assessment for air quality used for the Proposed Development is detailed in the ES (Application Document Reference 5.4.7.1).

2.2.6 The assessment of air quality is undertaken using qualitative and quantitative approches following a range of the IAQM's guidance on the assessment of air quality for planning purposes (Holman et al., 2014), (Holman et al., 2020) (Moorcroft and Barrowcliffe et al., 2017) and supported by guidance issued by Defra (Defra and Devolved Administrations, 2022) and National Highways (National Highways, 2019).

2.2.7 Table 2-1 summarises how different tools have been applied to assess different phases of the project and different activities.

Table 2-1: Summary of method and air quality assessment tools by phase

Phase	Activity	Method	Air quality assessment tool	Details	Rationale
Construction	Dust generation from activities such as earthworks, the provision of new structures or modifications to existing structures and trackout[3].	Qualitative	Risk based assessment using source pathway receptor approach.	Risk based score or description (negligible, low, medium, high risk impact). Risk level defines level of mitigation so that effects are not significant.	• Risk based assessment follows best practice guidance from the IAQM (Holman et al., 2014). • Risk based assessment allows for proportionate, site-specific mitigation to be included.
	Exhaust emissions from fixed and non road mobile machinery (NRMM), hereafter referred to as 'construction plant'.		Professional judgment	Exhaust emissions from construction plant based on number, hours of operation and location will be qualititavely considered to determine effects on air quality.	• Guidance from the IAQM (Holman et al., 2014) acknowledges that emissions from construction plant are unlikely to make a signifanct impact on local air quality but recommends accounting for the number, hours of operation and location of construction plant. • No published guidance is available in the UK to assess construction plant and apply

[3] Trackout refers to the transport of dust and dirt from a construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.

Phase	Activity	Method	Air quality assessment tool	Details	Rationale
					significance. Therefore professional judgement is applied.
	Exhaust emissions from on road construction vehicles	Quantitative (modelling)	New generation atmospheric disperion model, ADMS-Roads.	Model used to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at sensitive receptor locations likely to experience the largest change or the largest concentrations.	• Construction traffic movements exceed the EPUK/IAQM (Moorcroft and Barrowcliffe et al., 2017) screening criteria requiring assessmemt.
Operation	Short term abnormal operation of the proposed WWTP – Wessoe vales	Qualitative	Professional judgement	Description of likely potential impacts from emergency release of biogas caused by opening of vents for pressure release.	• There is insufficient information and not proportionate to carry out detailed predictive dispersion modelling. • Activites likely to have a low risk of adverse effects. • Only likely to occur in emergency to prevent dangerous build up of gas pressure in the digestors.

Phase	Activity	Method	Air quality assessment tool	Details	Rationale
	Short term abnormal operation of the proposed WWTP - Flare	Quantitative (modelling)	New generation atmospheric dispersion model, ADMS.	Model used to predict concentrations of NO_2 and SO_2 at sensitive receptor locations likely to experience the largest change or the largest concentrations.	• Sources of air pollutants are clearly identifiable. • Emission rates are known or can be reasonably approximated.
	Normal operation of the proposed WWTP	Quantitative (modelling)	New generation atmospheric dispersion model, ADMS.	Model used to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at sensitive receptor locations likely to experience the largest change or the largest concentrations.	• Sources of air pollutants are clearly identifiable from equipment specification. • Emission rates are known or can be reasonably approximated.
Decomissioning	Exhaust emission associated with road vehicles used for delivery/removal activities assocaited with cleaning and draining of tanks at the existing Cambridge WWTP and existing Waterbeach WRC	Quantitative (modelling)	New generation atmospheric disperion model, ADMS-Roads.	Model used to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at sensitive receptor locations likely to experience the largest change or the largest concentrations.	• Construction traffic movements exceed the EPUK/IAQM (Holman et al., 2020) screening criteria requiring assessmemt.

Qualitative assessment

Construction dust risk assessment

2.2.8 Construction activities can result in temporary effects from dust. 'Dust' is a generic term which usually refers to particulate matter in the size range 1-75 microns in diameter. The most common effects from dust emissions are soiling and increased ambient PM_{10} concentrations. Dust can arise from numerous construction activities such as concrete-batching, piling, sand blasting, wind erosion on material stockpiles and earth-moving activities. It can be mechanically transported either by wind or through the movement of vehicles onto the public highway (transport of debris on vehicle wheels, or uncovered loads).

2.2.9 The assessment for dust risk applies the assessment criteria outlined within the IAQM construction dust guidance which identifies the magnitude of an impact and the sensitivity of receptors. Overall sensitivity of receptors is based on receptor type, the number of receptors located within various distances from the dust source while the existing ambient concentrations of PM_{10} are used to determine the impacts on health.

Construction Plant Emissions

2.2.10 Guidance from the IAQM (Moorcroft and Barrowcliffe et al., 2017) notes that effects from exhaust would likely not be significant. Generally, effects of plant emissions on local air quality are considered of negligible significance relative to the surrounding road traffic contributions on the local road network. However, given the scale of the construction works, the number of site plant operating during working hours and their locations have been qualitatively reviewed in relation to baseline conditions and their distance to nearby receptors using professional judgement to confirm significant effects are unlikely to occur.

Whessoe valves

2.2.11 The operation of Whessoe valves is a short-term safety event, typically occurring during abnormal operations for emergency venting of gas to reduce pressure inside tanks and other containers to prevent a serious health and safety incident.

2.2.12 Whessoe valves are common on waste water treatment facilities and are part of the design. These would open for the minimum period required to reduce pressure to a safe level and are the final design solution used mitigate risk of major accidents and disasters. Prior to the opening of Whessoe valves, excess biogas would be combusted within the CHPs, boilers or flare, the impacts of this in local air quality are presented in section 4.3. On this basis, the air quality effects associated with Whessoe valves releases should be considered relative to the safety requirement for their inclusion in the design.

2.2.13 The operation of Whessoe valves is a rare, temporary occurrence during an emergency. Therefore, the quantity, rate and time of release is unpredictable. There is no published guidance on assessment of emergency releases to air from Whessoe

valves, therefore professional judgement has been applied to determine the magnitude and overall significance of effects.

Quantitative assessment

2.2.14 The Land-Use Planning and Development Control: Planning for Air Quality guidance (Moorcroft and Barrowcliffe et al., 2017) provides criteria for determining whether a development requires a detailed assessment (using air dispersion modelling to establish likely impacts from the Proposed Development), in combination with professional judgement.

2.2.15 The proposed WWTP will include combustion of natural gas and biogas within two boilers (one duty, one standby), two CHPs and one flare.

2.2.16 The construction and operation of the Proposed Development will lead to additional vehicle movements along roads leading to the construction works and operational proposed WWTP. Although the operational traffic flows associated with the proposed WWTP are similar to those at the existing Cambridge WWTP, the traffic would be redistributed on local roads as the workforce and deliveries take new routes to the proposed WWTP.

2.2.17 A quantitative approach using atmospheric dispersion modelling has been used in accordance with the EPUK/IAQM Land-use planning and development control guidance (Moorcroft and Barrowcliffe et al., 2017), IAQM assessment of air quality impacts on designated nature conservation sites guidance (Holman et al., 2020) and Defra's Local Air Quality Management Technical Guidance (LAQM.TG22) (Defra and Devolved Administrations, 2022).

2.2.18 The assessment uses a dispersion model, ADMS 5 (version 5.2.4) and ADMS-Roads (version 5.0.1.3); a PC-based model produced and validated by Cambridge Environmental Research Consultants (CERC) of the dispersion in the atmosphere of pollutants released from road traffic and industrial sources. A wide range of input data must be incorporated into the dispersion model including, road traffic and energy plant emission factors, energy plant emission parameter (e.g. temperature, exit velocity), building dimensions for structures close to the energy plant sources, meteorological data, surrounding land use and receptor locations. Details of model parameters are presented in Air Quality Assessment Methods within (Application Document Reference 5.4.7.1).

2.2.19 The EPUK/IAQM descriptors for air quality effect are presented in Table 2-11. 'Adverse' or 'beneficial' are added to the descriptors depending on whether there is an increase or decrease in pollutant concentration, respectively.

Impact assessment criteria

2.2.20 The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor affected by the impact of that magnitude. This section describes the criteria applied in this chapter to characterise the magnitude of potential impacts and sensitivity of receptors. The terms used to define magnitude and sensitivity are based on guidance from EPUK/IAQM (Moorcroft and Barrowcliffe

et al., 2017) for the construction dust risk assessment and IAQM (Holman et al., 2014) for quantitative assessment.

2.2.21 The assessment criteria used to assess the potential effects on air quality arising from the Proposed Development differs from the generic EIA methodology and are described below.

Construction dust risk assessment (qualitative)

2.2.22 To assess the likely dust risk, firstly the overall dust emission magnitude (small, medium or large) from each of the dust sources identified (earthworks, construction and trackout) is established in accordance with the criteria outlined in Table 2-2. The Proposed Development will not require demolition of existing structures. Therefore, demolition has therefore not been considered further and has been excluded from below tables.

Table 2-2: Dust source risk allocation (magnitude of dust emission)

Features of the source of dust emissions	Dust emission magnitude
Earthworks Total site area over 10,000m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8m in height, total material moved > 100,000 tonnes. **Construction** Total building volume over 100,000m^3, activities include piling, on-site concrete batching, sand blasting. Period of activities more than two years. **Track-out** 50 Heavy Duty Vehicle (HDV) outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100m.	Large
Earthworks Total site area between 2,500 to 10,000m^2, moderately dusty soil type (e.g. silt), five to ten heavy earth moving vehicles active at any one time, formation of bunds 4 to 8m in height, total material moved 20,000 to 100,000 tonnes. **Construction** Total building volume between 25,000 and 100,000m^3, use of construction materials with high potential for dust release (e.g. concrete), activities include piling, on-site concrete batching. Period of construction activities between one and two years. **Track-out** 10 to 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100m.	Medium
Earthworks Total site area less than 2,500m^2, Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4m in height, total material moved < 10,000 tonnes earthworks during winter months. **Construction**	Small

Features of the source of dust emissions	Dust emission magnitude
Total building volume below 25,000m^3, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Period of construction activities less than one year. **Track-out** < 10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50m.	

Source: (IAQM, 2018)

2.2.23 The sensitivity of receptors is then defined (as high, medium or low) for each dust effect (dust soiling, human health and ecosystem impacts) in accordance with the criteria presented in Table 2-3. These set out the basis for categorising the sensitivity of people, property and ecological receptors to dust and PM_{10}).

Table 2-3: **Dust sensitivity to people and property**

Receptor	Sensitivity
Principles: • users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land. Indicative examples: • Residential properties. • Museums and other culturally important collections. • Medium and long-term car parks (see note A) and car showrooms.	High
Principles: • users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative examples: • Parks, places of work.	Medium
Principles: • the enjoyment of amenity would not reasonably be expected (see note B); or • there is property that would not reasonably be expected to be diminished in appearance, aesthetics, or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative examples: • Playing fields, farmland (unless commercially sensitive horticultural).	Low

Receptor	Sensitivity
• Footpaths and roads. • Short-term car parks. (see note A).	

Notes: A: Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with workplace or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.

B The public's expectations will vary depending on the existing dust deposition in the area

Table 2-4: PM_{10} sensitivity to people and property

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

Notes: A This follows Defra guidance as set out in Defra TG22. (Defra and Devolved Administrations, 2022)

B Notwithstanding the fact that the air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM_{10}. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

C There are no standards that apply to short-term exposure, e.g. one or two hours, but there is still a risk of health effects, albeit less certain.

Table 2-5: Ecological receptor sensitivity to dust

Receptor	Sensitivity
• locations with an international or national designation and the designated features may be affected by dust soiling; or • locations where there is a community of a particular dust sensitive species such as vascular species included in the Red Data List for Great Britain (see note A).	High

Receptor	Sensitivity
• Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	
• locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. • indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	Medium
• Locations with a local designation where the features may be affected by dust deposition. • Indicative example is a local Nature Reserve with dust sensitive features.	Low

Notes: G Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

2.2.24 The approach set out with the IAQM guidance combines consideration of the pathway and receptor to derive the sensitivity of the area. The sensitivity of the surrounding area is determined for each activity in accordance with the criteria presented in Table 2-6 to Table 2-8 presents the matrices to define the sensitivity of the area on the distance of the source to the closest receptors, their number and sensitivity, and in the case of PM_{10} effects, the local background concentration. The highest level of area sensitivity defined for each dust effect has been used in this assessment.

2.2.25 For trackout, when determining sensitivity, the distances have been measured from the side of the roads used by construction traffic. Trackout may occur from roads up to 500m from large sites, 200m from medium sites and 50m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have been considered up to 50m from the edge of the road.

Table 2-6: Sensitivity of study area to dust deposition effects on people and property

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

Table 2-7: Sensitivity of study area to human health impacts

Sensitivity	Annual mean PM_{10} Concentration	Number of receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low

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

Table 2-8: Sensitivity of study area to ecological impacts

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

2.2.26 The final step of the assessment combines the dust emission magnitude and the sensitivity of the area, using the matrices presented within Table 2-9 and Table 2-10, to determine the dust risk categories for each activity for dust deposition and health effects.

2.2.27 IAQM guidance recommends that significance is only assigned to construction effects following mitigation. Implementation of proportional and appropriate mitigation measures should result in construction dust having a negligible impact on air quality and the overall effect being not significant. Therefore, the construction dust risk assessment presented in section 4.2 will combine the magnitude of effect with sensitivity of receptors to identify risk rather than significance of effect.

Table 2-9: Risk of dust impacts from 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 2-10 Risk of dust impacts from vehicle trackout

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

Quantitative assessment of road traffic and energy plant

2.2.28 The same assessment criteria for the assessment of road traffic and energy plant have been applied.

2.2.29 Several approaches can be used to determine whether the potential air quality effects associated with a development proposal are significant, however, there remains no universally recognised definition of what constitutes 'significance' for air quality effects.

2.2.30 Guidance is available from a range of regulatory authorities and advisory bodies on how best to determine and present the significance of effects within an air quality assessment. It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively and any description of an effect of a development is informed by numerical results; an element of professional judgement must also be involved.

2.2.31 To ensure that the descriptions of effects used within the assessment are clear, consistent and in accordance with the latest guidance, definitions for the assessment of changes in air quality concentration at individual human health receptors have been adapted from the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al., 2017).

Magnitude of Impact - Long-term effects

2.2.32 Long-term effects are changes in air quality assessed against the annual mean averaging period.

2.2.33 Table 2-11 provides impact descriptors for changes in long term pollutant concentrations as a result of the Proposed Development.

Table 2-11: Impact magnitude descriptors for individual receptors (long-term)

% Change in concentration relative to Air Quality Assessment Level (AQAL)	Magnitude of impact
1% or less of AQAL	Negligible
2%-5% of AQAL	Small
6%-10% of AQAL	Medium
10% or more of AQAL	Large

Notes: (a) AQAL = Air Quality Assessment Level i.e. 40µg/m^3 for annual mean NO_2 and $PM_{2.5}$ and 25µg/m^3 for annual mean $PM_{2.5}$.

(b) Percentage pollutant concentrations are intended to be rounded to whole numbers. For example, the '<1%' category in this table includes all changes from 0.5% to 1.4% (equivalent to an annual mean NO_2 or

$PM_{2.5}$ absolute concentration change of between 0.2µg/m^3 and 0.6µg/m^3). Changes of 0% (i.e. less than 0.5%) are described as negligible.

(c) When defining the concentration as a percentage of the AQAL, use the 'do minimum' concentrations where there is a decrease in pollutant concentration and the 'do something' concentration for an increase

Magnitude of Impact - Short-term effects

2.2.34 Short-term effects are changes in air quality assessed against the daily (24 hour), hourly and 15 minute averaging periods.

2.2.35 In relation to road traffic, Defra's TG22 guidance indicates that the hourly NO_2 air quality objective of 200µg/m^3 (not to be exceeded more than 18 times per year) is unlikely to be exceeded at roadside and kerbside locations where the annual mean concentration is less than 60µg/m^3. In accordance with TG22, a similar assumption has been made with reference to the daily PM_{10} objective; where annual mean PM_{10} concentrations are less than 32µg/m^3 the daily PM_{10} concentrations are considered to be below the objective.

2.2.36 In relation to point sources (boilers, CHPs and flare), the EPUK/IAQM guidance recommends using the Environment Agency threshold of 10% of the short-term AQAL as a screening criterion for the maximum short-term impact. Where the modelled short-term concentration is less than 10% of the short-term AQAL, it can be assumed that the impact is sufficiently small as to not have a significant effect. Table 2-18 provides impact descriptors for short-term impacts when impacts are above 10% of the AQAL.

Table 2-12: Impact magnitude descriptors for individual receptors

Short-term concentration at receptor in assessment year	Magnitude of impact
10% or less of AQAL	Negligible
10%-20% of AQAL	Small
20%-50% of AQAL	Medium
50% or more of AQAL	Large

Notes: (a) AQAL = Air Quality Assessment Level

Sensitivity of receptors - long-term effects

2.2.37 The magnitude of any concentration change identified has been considered in relation to the air quality assessment level (AQAL), which may be an air quality objective, limit value or target value and defines the sensitivity of receptors to changes in air quality. The most important aspects to consider are the percentage of long-term average pollutant concentrations at the individual receptors in the assessment year in relation to the AQAL and the percentage of change in concentration in relation to the AQAL. Table 2-13 presents the sensitivity descriptors for individual receptors and has been adapted from the EPUK/IAQM guidance.

Table 2-13: Sensitivity of individual receptors (long term)

Long-term average concentration at receptor in assessment year	Sensitivity of receptors
75% or less of AQAL	Very Low
76%-94% of AQAL	Low
95%-102% of AQAL	Medium
103%-109% of AQAL	High
110% or more of AQAL	Very High

Sensitivity of receptors - short term effects

2.2.38 The sensitivity of receptors is not defined for short term effects as short term air quality concentrations can vary substantially from one hour to the next. Therefore, only magnitude of impacts is used to define significance.

Significance of effect

2.2.39 EPUK/IAQM recognises that professional judgement is required in the interpretation of air quality assessment significance. Table 2-14 and Table 2-15 present effects matrices and are intended as a tool to help interpret the results to the air quality assessment and has therefore been employed in conjunction with professional judgement. For example, a substantial change at a single individual receptor does not necessarily constitute a significant effect whereas multiple moderate changes may incur a judgement of significance.

2.2.40 An exceedance of any air quality objective at a new receptor introduced by the Proposed Development is 'significant'.

2.2.41 The EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al., 2017) states that professional judgment should take account of:

- the existing and future air quality in the absence of a development;
- the extent of current and future population exposure to the impacts; and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Table 2-14: Effects matrix for individual receptors (long-term)

Sensitivity of receptor	Magnitude of Change			
	Negligible	**Small**	**Medium**	**Large**
Very Low	Negligible	Negligible	Slight	Moderate
Low	Negligible	Slight	Moderate	Moderate
Medium	Slight	Moderate	Moderate	Substantial
High	Moderate	Moderate	Substantial	Substantial
Very High	Moderate	Substantial	Substantial	Substantial

Table 2-15: Effects matrix for individual receptors (short-term)

Magnitude of impact	Severity of impact
Negligible	Negligible
Small	Slight
Medium	Moderate
Large	Substantial

Notes: (a) AQAL = Air Quality Assessment Level

Ecological receptors

2.2.42 In accordance with the respective Environment Agency (Environment Agency, 2022) and National Highways (National Highways, 2019) guidance, the following thresholds have been used when assessing the air quality impacts on ecological receptors:

- the short-term change in air quality is less than 10% of the short-term environmental standard; and
- the long-term change in air quality is less than 1% of the long-term environmental standard.

2.2.43 Below these thresholds, the air quality impacts on the designated site are considered not significant. However, as stated within IAQM's nature conservation sites guidance (Holman et al., 2020), 'a change of more than 1% in long-term PC does not necessarily indicate that a significant effect (or adverse effect on integrity) will occur; it simply means that the change in concentration or deposition rate cannot in itself be described as numerically inconsequential or imperceptible and therefore requires further consideration'.

2.2.44 Where the 1% and 10% thresholds are exceeded and the total NO_x and SO_2 concentrations are less than the critical level or the nitrogen deposition and acid deposition rates are less than the applicable critical load (CLO), significant effects are not anticipated.

2.2.45 The greater weight in judgement of significance is applied to the critical load as they are site specific. The critical level does not differentiate between the role of deposition, it is a precautionary general threshold not specific to a particular habitat, plant species or impact pathway and some species or habitats may not show adverse effects until higher concentrations are present. (Holman et al., 2020)

2.2.46 The total concentration (change caused by the Proposed Development, plus the background pollutant concentration) has been calculated and the likelihood of a significant impact (i.e. whether there is an adverse effect on the integrity of the designated site) has been discussed with the project ecologist.

Residual Effect

2.2.47 The assessment of effects follows the approach set out within Chapter 5: EIA Methodology (Application Document Reference 5.2.5). Effects have been assessed to take into account for both embedded (primary) mitigation and legal requirements

(tertiary mitigation), and after the application of further mitigation measures (secondary mitigation). Effects after mitigation are referred to as 'residual effects'.

2.3 Study area

2.3.1 The maximum area of land required for the construction, operation, and maintenance of the Proposed Development and decommissioning of the existing WWTP, including land required for permanent and temporary purposes, within the Location and Scheme Order Limits Plan (Application Document Reference 4.1).

2.3.2 The study area is defined for air quality in Table 2-16.

Table 2-16: Study Area

Aspect	Study area
Construction dust[(a)]	Human receptors within: • 350m of the construction works or 50m from the edge of construction access routes (trackout route) up to 500m from the site access along the public highway. Ecological receptors within: • 50m from the boundary of the Proposed Development or 50m from the edge of construction access routes (trackout route) up to 500m from the site boundary along the public highway.
Construction and operational traffic[(b) (c)]	Human and ecological receptors within 200m of 'affected' roads defined as • a change of Light-Duty Vehicle (LDV)[4] flows of: – more than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA for over 6 months; or – more than 500 AADT elsewhere for over 6 months. • a change of Heavy-Duty Vehicle (HDV) flows of: – more than 25 AADT within or adjacent to an AQMA for over 6 months; or – more than 100 AADT elsewhere for over 6 months. • A road realignment of 5m or more and the road is within an AQMA.
Operational energy plant[(d)]	• 5km from the proposed WWTP energy plant for human health receptors. The modelling results show that the maximum impacts at receptor locations are very close (within 100m) to the proposed WWTP, therefore this study area is suitable. • 2km from the proposed WWTP energy plan for ecological receptors (Environment Agency, 2022).

Source: (a) (Holman et al., 2014) , (b) (National Highways, 2019), (c) (Moorcroft and Barrowcliffe et al., 2017), (d) (Environment Agency)

2.3.3 The receptors relevant for air quality are:

- human locations where people are considered receptors in reference to
  - dust emissions;

[4] A light duty vehicle (LDV) has a gross weight less than 3.5 tonnes. A heady duty vehicles (HDV) has a gross weight greater than 3.5 tonnes and includes heavy goods vehicles (HGVs), buses and coaches.

  - the air quality objectives provided in Table 1-3; and
  - limit values – the assessment will determine if the Proposed Development would change the conclusions of Defra's assessment of air quality against limit values (see Section 3.2, Pollution Climate Mapping)
- statutory and non-statutory ecological designations including those
  - within 2km of the proposed WWTP's energy plant based on guidance from the Environment Agency (Environment Agency, 2022);
  - Wilbraham Fen and Stow-Cum-Quy Fen SSSIs have also been included as they are approximately 2.2km from the energy plant and are nationally designated with statutory protection; and
  - Within 200m of roads affected by the Proposed Development during construction and/or operation.

Construction and operational traffic study area

2.3.4 A review of the traffic data provided by the Proposed Development's traffic team has been undertaken and compared with the affected roads criteria presented in Table 2-16.

2.3.5 Typically, air quality modelling assessments use AADT flows for comparison with the annual mean air quality objectives as an AADT is representative of the average number of vehicle movements on a road on an average day. For base traffic movements i.e. the number of vehicles on roads in the base year uses the AADT flow.

2.3.6 The Proposed Developments construction traffic movements available are for a peak day. It is possible that, if the peak day construction movements were calculated as an AADT, they would be below the threshold for assessment set out in Table 2-16. However, this assessment has adopted the peak day movements and applied them as an AADT for comparison with the relevant air quality objectives and limit values presented in section 1.4.

2.3.7 Vehicle movements discussed in this section are presented as two way flows e.g. 100 movements is equivalent to 50 outbound and 50 inbound movements.

2.3.8 Whilst increases in LDVs are expected and included within the air quality model, the discussion of traffic movements associated with Proposed Development focuses on HDVs only as LDVs do not exceed the threshold for assessment presented in Table 2-16 in both the construction and operation phases.

2.3.9 During construction, the largest increase in LDVs is 320 movements on the A14 between J33 and J34, which as discussed above is based on a peak day and is therefore likely to be lower.

2.3.10 During operation, the largest increase in LDVs is 138 movements on the A14 between J33 and J34.

Construction

2.3.11 Based on peak day movements, roads affected during the construction phase include the:

- A14 between Junction (J) 32 and J34;
- A14 J34 entry and exit ramps; and
- Horningsea Road between A14 J34 and the access to the proposed WWTP.

2.3.12 The largest increase in construction vehicles is 528 HDVs on the A14 between J32 and J33. At A14 J33 the number of two way movements reduces as 155 HDVs exit the A14 and continue to the transfer access works via the A1309. The remaining continue on the A14 and exit at J34.

2.3.13 Due to the A14 J34 having only west facing entry and exit ramps, all vehicles accessing the Proposed WWTP main works from the east must continue on the A14 existing J33 and re-entering the A14 heading eastbound. This doubling of two way movements has been accounted for on the A14 between J33 and J34. Overall, there are 474 HDV two way movements on the A14 between J33 and J34 in the construction phase.

2.3.14 Traffic movements on A14 J34 entry and exit ramps will increase by 415 HDVs in total, of which, 370 HDVs will use the B1047 between the A14 J34 and the proposed WWTP main works and 45 HDVs will use the B1047 between the A14 J34 and the transfer tunnel works access.

2.3.15 Peak construction traffic accessing the Waterbeach works areas via the A10 and existing Cambridge WWTP via the A1309 are below the threshold for assessment. Therefore, impacts and effects related to construction traffic between the A14 and Waterbeach and the A14 and the existing Cambridge WWTP have not been considered further.

Operation (including decommissioning of the existing Cambridge WWTP)

2.3.16 The operation traffic flows provided for the assessment also includes the decommissioning of the existing Cambridge WWTP. The assessment of these two elements have been combined as the decommissioning activities take place at the end of the construction phase. Decommissioning will take place December 2027 and will be completed in March 2028 which is the first year of the proposed WWTP's operation. Whilst the duration of the decommissioning is temporary lasting up to four months, the decommissioning traffic has been conservatively added on to the operational traffic flows as if it is present all year.

2.3.17 Assessment of operational traffic assumes that current vehicle movements accessing the existing Cambridge WWTP are zero. This is a conservative assumption is it means that all operational vehicle movements associated with the proposed WWTP are assumed to be new throughout the study area. The number of operational vehicle movements in the opening year west of A14 J33 and east of A14 J34 would only

increase by 17 daily HGV movements to account for future operational demand and by the small temporary number of decommissioning vehicles.

2.3.18 Roads affected during the operation phase include:

- B1047 between A14 J34 and the proposed WWTP main site access; and
- A14 between J33 and J34, extended out to include J32 to J36 as discussed in paragraph 2.3.17.

2.3.19 The B1047 between the A14 J34 and the proposed WWTP will have an increase of 146 HDV movements per day.

2.3.20 The largest increase in traffic movements caused by the Proposed Development's operation is 257 HDVs on the A14 between J33 and J34. Without decommissioning, the number of HDVs reduces to 219 movements per day and is still over the threshold for assessment. The increase on the A14 is larger than the B1047 due to decommissioning vehicles on the A14 and the requirement for vehicles from the east to double back along the A14 between J33 and J34 as J34 only has west facing entry/exit ramps.

2.3.21 Decommissioning vehicles accessing the existing Cambridge WWTP via the A1309, accounted for in the operational traffic flows, are below the threshold for assessment. Therefore, impacts and effects related to operational/decommissioning traffic between the A14 and the existing Cambridge WWTP have not been considered further.

2.4 Temporal scope of assessment

Construction

2.4.1 For the assessment, these effects will be taken to be those for which the source begins and ends during the construction and commissioning stages prior to the proposed WWTP becoming fully operational as set out in Chapter 2 Project Description (Application Document Reference 5.2.2).

2.4.2 The assumed assessment years for construction dust and plant are from 2024 until 2028.

2.4.3 The assumed assessment year for construction vehicle movements is 2026. This is when the number of vehicles required for the transportation of materials to and from construction works areas on the public road network would be at its peak.

Operation and maintenance

2.4.4 For the assessment, these are the effects that, start once the proposed WWTP is commissioned and fully operational and includes the effects of the physical presence of the infrastructure, its operation, use and maintenance, including the permanent change in land use.

2.4.5 The assessment of operational effects will be the first full 12 months of operation (excluding any commissioning period for the proposed WWTP as this is part of the Construction Phase). The proposed WWTP proposes to become fully operational in 2028, therefore the assessment year for the Operational Phase is 2028.

Duration of effects

2.4.6 Timescales associated with these effects, regardless of phase are as follows:

- Short-term – endures for up to 12 months after construction or decommissioning
- Medium-term – endures for 1-5 years
- Long-term – endures for 5-15 years
- Permanent effects – endures for more than 15 years and / or effects which cannot be reversed (e.g. where buried archaeology is permanently removed during construction)

Phase 2 expansion

2.4.7 Phase 2 construction is within the operational lifetime of the WWTP, expected to be 2036-2050, but likely before 2041

2.4.8 Construction of 2 additional tanks would not result in new or worse impacts than those considered at the construction phase years 1 – 4. Construction activities would be limited to areas of the proposed WWTP within the earth bank and and controlled by measures within a CEMP (and associated sub-plans), a CTMP, and CWTP approved prior to the start of construction.

2.4.9 In the case of short-term temporary vehicle movements, the expected construction movements in combination with operational movements would be less than the peak assessed at construction in year 3 and pollutant emission factors and background concentrations improve in future years with improvements in vehicle technology and uptake of cleaner vehicles on the roads. Therefore, short term temporary construction vehicle movements would be no worse than impacts considered a year 3 of construction.

2.4.10 Operation with an additional FST and PST would not materially alter emissions to air and does not result in new or different air quality impacts.

2.5 Baseline study

Desktop data

2.5.1 No air quality monitoring has been undertaken for the Proposed Development; existing local authority monitoring data for the surrounding area is considered to be sufficient to provide a robust determination of existing air quality. This approach has been agreed with the SCDC and the Greater Cambridge Shared Planning team (GCSP).

2.5.2 In order to assess impacts and determine significance of effects, a number of approaches to identifying receptors has been used. These include identifying individual discrete human health and ecological receptors but also using gridded receptors to allow the assessment to understand potential impacts at areas where, for example, the one hour objective applies. Further detail details of selected discrete receptors and grid dimensions are presented in Air Quality Assessment Methods (Application Document Reference 5.4.7.1).

Surveys

2.5.3 As above, no air quality monitoring has been undertaken for the Proposed Development.

2.6 Maximum design envelope (Rochdale) parameters for assessment

2.6.1 The design parameters and assumptions presented are in line with the 'maximum design envelope' approach (base scheme design) as described in introductory chapters of the ES (2 and 5). For each element of this chapter the maximum design envelope parameters detailed within Table 2-17 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group.

2.6.2 The assessment parameters are based on the design of the proposed WWTP and access, transfer tunnel route and outfall location, Waterbeach pipeline route and connections within the existing Cambridge WWTP as described Chapter 2: Project Description (Application Document Reference 5.2.2). The assessment considers a realistic maximum design envelope based on the maximum scale of the elements and as a result no effects greater significance than those assessed are likely.

2.6.3 For the operation of energy plant at the proposed WWTP, the maximum design envelope includes the operation of one boiler and two CHPs combusting biogas. However, the preferred option is to export biogas to the national gas network following appropriate treatment which would have no combustion emissions to air. This option would negate the need for combusting biogas within CHP plant. To assess the worst case impacts the combustion of biogas within one boiler and two CHPs has been considered in this assessment as detailed within Table 2-17.

Table 2-17: Maximum design envelope (Rochdale) for air quality assessment

Potential impact	Maximum design scenario	Justification
Construction		
Dust generation from trackout	Movement of vehicles from construction work areas onto the public road network.	Represents all trackout with the potential to raise dust emissions within 50m from the edge of construction access routes (trackout route) up to 500m from the site boundary along the public highway where sensitive human and/or ecological receptors exist.
Dust generation from Earthworks/construction	All construction phase works associated with processes of soil-stripping, ground-levelling, excavation and landscaping, optional use of concrete batching plant and provision of new structures or modifications to existing structures. Up to 929,000 m^2 within the area of land required for the proposed WWTP and Landscape Masterplan Up to 371,600m^2 representing the entire Waterbeach transfer pipeline corridor north of Low Fen Drove Way (assuming a worst case of full open cut excluding River Cam and Railway crossings) Up to 39,000 m^2 representing the entire Waterbeach transfer pipeline corridor south of the A14 (assuming a worst case of full open cut excluding A14, River Cam and Railway crossings) connecting to the existing Cambridge WWTP Up to 91,200m^2 representing the entirety of the works plan area required for the treated effluent pipeline installation Up to 18,000m^2 relating to the area required for Shaft 4 and 5 and temporary access roads within works area 35 Transfer Tunnel	Represents all construction activities with potential to raise dust emissions within 350m of sensitive human receptors and 50m of sensitive ecological receptors.
Exhaust emissions from construction plant	Consideration of construction plant exhaust emissions from construction plant.	Whilst IAQM guidance recognises that impacts from construction plant are likely to be negligible, the number, operational hours and location of construction plant have been accounted for.

Potential impact	Maximum design scenario	Justification
Exhaust emissions from on road construction vehicle movements	Peak construction vehicle movements in 2026 associated with the transport of materials to and from construction works areas on the public road network. The number of expected vehicle movements are discussed in section 2.3.	Represents the emissions and resultant pollutant concentrations at sensitive human and ecological receptors from the peak construction road vehicles movements.
Operation		
Operation of energy plant	Continuous operation of one 3.4MW thermal input boiler, two 1.5 MW thermal input CHPs and one flare at the proposed WWTP. The minimum height of the stack would be 19m above finished ground level and the maximum height would be 24m above finished ground level.	The continuous operation of one boiler, two CHPs and one flare represents the maximum design envelope for energy plant at the proposed WWTP. In practice, the operation of CHPs with heat recovery would negate the requirement for the operation of the boiler Exporting biogas to the national gas grid is the preferred option and would negate the requirement for CHPs. There is no operational energy plant outside of the proposed WWTP. Increasing the height of the stack decreases the predicted ground level concentrations. This is true of all modelled receptor locations and not just the maximum point of impact. On this basis, this assessment has modelled a stack height of 19m which is the lowest stack height this assessment recommends. When the proposed WWTP is constructed, a final stack height greater than 19m (up to 24m) would have lower impacts than predicted in this assessment.
Operational vehicle movements	Movements of road vehicles during working hours, 7 days a week. Road vehicle movements have been assessed assuming the Proposed Development is operating at its future year full capacity with emission factors and background concentrations representative of 2028. The number of expected vehicle movements are discussed in section 2.3.	Represents the emissions and resultant pollutant concentrations at sensitive human and ecological receptors from operational and decommissioning (see decommissioning vehicle movements justification below) road vehicle movements. Combining road vehicle movements in the future year at the Proposed Development's full capacity with 2028 pollutant emission factors and background concentrations is a conservative assumption as pollutant emission factors and background concentrations are expected to improve in future

Potential impact	Maximum design scenario	Justification
		years with improvements in vehicle technology and uptake of cleaner vehicles on the roads.
Venting – abnormal operations	Occasional release of biogas from pressurised tanks and containers from Whessoe valves.	The operation of Whessoe valves is a short-term safety event, typically occurring during abnormal operations for emergency venting of gas to reduce pressure inside pressurised tanks and other containers.
Decommissioning		
Cleaning and draining of tanks at the existing Cambridge WWTP and existing Waterbeach WRC	Consideration of exhaust emissions from construction plant used for decommissioning.	Whilst IAQM guidance recognises that impacts from construction plant are likely to be negligible, the number, operational hours and location of construction plant have been accounted for.
Decommissioning vehicle movements	Movements of road vehicles during working hours	Represents the emissions and resultant pollutant concentrations at sensitive human and ecological receptors from decommissioning road vehicle movements. As decommissioning would commence when the proposed WWTP is operational, the vehicle movements associated with the decommissioning of the existing Cambridge WWTP have been added on to the operational phase movements and the impacts assessed together.

2.7 Impacts scoped out of the assessment

2.7.1 An EIA scoping report was submitted to PINS in October 2021 and a scoping opinion received in November 2021. Table 2-18 presents the potential impacts scoped out of assessment as agreed at the scoping stage.

2.7.2 Operational vehicle movements previously scoped out are now included within the assessment as predicted vehicle movements exceed the IAQM criteria.

2.7.3 The operation of the proposed WWTP will produce biogas. Biogas would be combusted within one of two boilers (one duty and one standby) to generate heat for the digestion process. Additional biogas will either be exported to the national gas network following appropriate treatment, this is the preferred option, or combusted within a Combined Heat and Power (CHP) plant if exporting to the national gas network becomes infeasible. There are no combustion emissions to air from exporting the biogas to the national gas network and therefore this option has not been considered further in this chapter.

Table 2-18: Impacts scoped out of the air quality assessment

Potential impact	Justification
Operational energy plant emissions outside of the proposed WWTP	Scoped out as there will be no energy plant operating within these areas of the Proposed Development.
Operation of the proposed FE tunnel to outfall and transfer tunnels and shafts	Scoped out as there will be no relevant emissions to air from these elements of the design.
Exporting biogas to the national gas network	Scoped out as there are no relevant emissions to air from these elements of the design.

Commissioning and decommissioning

2.7.4 Commissioning and decommissioning works are not anticipated to result in additional emissions to air, and although changes to vehicle movements can be expected due to these activities, traffic flows to and from the existing Cambridge WWTP during decommissioning will be broadly similar to existing flows accessing the existing Cambridge WWTP whilst it is operational. The assessment in relation to decommissioning of the existing Cambridge WWTP is included within the assessment of vehicle traffic which includes movements associated with decommissioning.

2.7.5 Traffic flows at the proposed WWTP during commissioning will be similar to traffic during normal operation of the proposed WWTP. There may be a short duration (17 months) where movements at both sites occur in tandem. This is not expected to result in significant effects as operational vehicle movements would not overlap, i.e. proposed WWTP vehicle movements would not use local roads around the existing Cambridge WWTP, and therefore assessment of this has been scoped out. However, the impacts associated with the period of overlap between operation of the proposed WWTP and decommissioning of the existing Cambridge WWTP have been assessed assuming decommissioning traffic is present on the road network for the full first year of operation.

2.8 Mitigation measures adopted as part of the Proposed Development

2.8.1 This section refers to the mitigation types, as defined in Section 1.5 of Chapter 5: EIA Methodology (Application Document Reference 5.2.5), and how they apply to the assessment of Air Quality.

2.8.2 In developing the Proposed Development through an iterative process including consultation and engagement with consultees, and through the Environmental Impact Assessment (EIA) process, the Applicant has sought to identify and incorporate suitable measures and mitigation for potentially significant adverse effects, as well as maximising beneficial effects where possible.

2.8.3 Some measures are '**embedded**' in the design of the Proposed Development for which consent is sought by virtue of the scope of the authorised development as set out in Schedule 1 to the DCO and the accompanying Works Plans. These are considered **primary mitigation**. For example, adjustment of Order Limits to avoid sensitive features, amending the sizing and location of temporary access routes and compounds.

2.8.4 Secondary measures may be detailed activities for example the preparation of detailed AIMS in accordance with the CoCP, the preparation and delivery of a monitoring plan for specific matters (air quality, water quality) or the preparation and delivery of specific environmental management plans (for example air, noise, water), and the preparation and implementation is secured through the CoCP. These secondary measures are differentiated from the good practice measures

2.8.5 Tertiary measures comprise good practice measures (such as measures within Considerate Contractors Scheme) and measures integrated into legal requirements secured through environmental permits and consents (least flexible as either the legislation exists to create the mitigation or does not (i.e. Protected Species Licensing).

2.8.6 Section 5.3 of Chapter 5: EIA Methodology (Application Document Reference 5.2.5) sets out required permits and consents related to the Proposed Development.

2.8.7 Where beneficial effects are voluntarily introduced without the requirement to mitigate an effect, these are termed 'enhancement measures'.

2.8.8 The remainder of this section sets out the embedded measures (primary) and tertiary, and additional measures (secondary) relevant to the assessment of air quality.

Primary (embedded) and tertiary measures

2.8.9 Primary and tertiary mitigation form part of the Proposed Development and therefore, the preliminary assessment of effects takes account of these measures.

2.8.10 Table 2-19 sets out the embedded mitigation measures that will be adopted during the construction, operation and maintenance of the Proposed Development.

Table 2-19: Primary and tertiary mitigation measures relating to air quality adopted as part of the Proposed Development

Mitigation measures	Type	Applied to	Justification
Construction			
Minimising construction corridor width – pipelines	Primary	Waterbeach transfer pipeline	A smaller construction corridor may help to reduce risk of loss of amenity and health impacts from construction dust and PM_{10}.
Reuse of excavated material from with the Proposed Development to reduce vehicle trip distances	Primary	All construction areas	Fewer vehicle trips would reduce road traffic emissions
Operation			
Energy plant will have suitable exhaust stack height	Primary	Proposed WWTP energy plant	Optimum stack height will ensure effective dispersion of emissions
Relevant emission limit values for energy plant will be specified within a site-specific Environmental Permit.	Tertiary	Proposed WWTP energy plant	Energy plant must meet relevant emission limit values as prescribed within UK law. An Environmental Permit must be granted by the Environment Agency prior to the commissioning of any energy plant.
Incorporation of flare	Primary	Proposed WWTP	Relief of pressure to prevent opening of Whessoe Valves, which would release raw biogas, when biogas cannot be combusted in boilers/CHP or exported to the gas grid.

Secondary mitigation

Construction

2.8.11 During the construction phase, the CoCP and associated management plans specify the range of measures to avoid and minimise impacts that may occur in construction CoCP Part A (Application Document Reference 5.4.2.1) and Part B (Application Document Reference 5.4.2.2). Post approval of the DCO and prior to commencement of construction of the specific construction activities the contractor will prepare the CEMP and associated sub-plans as specified in the COCP Part A. These detailed plans will be approved by the Employer. The CEMP and associated management plans will remain 'live' documents and periodically modified throughout the duration of construction.

2.8.12 The CoCP requires that the Principal Contractor(s) appointed by the Applicant will be required to produce a Construction Environmental Management Plan (CEMP) before works associated with each part of the Proposed Development commence. This will contain the detailed commitments derived from the measures set out in the CoCP and approved as part of the requirements of the DCO.

2.8.13 Section 6.5 of the CoCP Part A, Land quality, includes measures in relation to soil management including stockpile controls.

2.8.14 Section 6.9 of the CoCP Part A, Air quality, sets out a framework for the control of air quality during construction, identifying a number of ‘standard’ mitigation measures which will be implemented whilst construction work takes place. These will be reflected in an Air Quality Management Plan (AQMP) appended to/as part of the CEMP.

2.8.15 Construction dust effects will be mitigated proportionally, using the recommendations within the IAQM 'Guidance on the assessment of dust from demolition and construction'.

2.8.16 During the construction phase, the Construction Traffic Management Plan (CTMP) (Application Document Reference: 5.4.19.7) will include measures relating to the control of construction vehicle movements.

2.8.17 The outline CTMP secures the commitments in relation to the management of construction vehicle movements. The outline CTMP (Application Document Reference 5.4.19.7) will be developed into a final plan post approval of the DCO and prior to commencement of development. The final CTMP will set out the detailed management measures, procedures and best practices required for managing the impact of construction traffic on the local and strategic road networks during the construction period.

Decommissioning

2.8.18 Decommissioning of the existing Cambridge WWTP would be subject to a Decommissioning Management Plan which is to be agreed with the Local Planning Authority (LPA). An Outline Decommissioning Management Plan (Application Document Reference: 5.4.2.3) describes measures applied to this activity. Post

approval of the DCO and prior to commencement of decommissioning a detailed plan will be prepared and agreed with the LPA.

2.9 Assumptions and limitations

Data limitations and assumptions

2.9.1 The air quality modelling predictions are based on the most reasonable, robust and representative methodologies. However, there is an inherent level of uncertainty associated with the model predictions due to:

- uncertainties with model input parameters such as surface roughness length (defined by land use) and minimum Monin-Obukhov length (used to calculate stability in the atmosphere);
- uncertainties with vehicle emission predictions;
- uncertainties with background air quality data;
- uncertainties with recorded meteorological data; and
- simplifications made in the model algorithms or post processing of the data that represent atmospheric dispersion or chemical reactions.

2.9.2 In order to best manage these uncertainties, the air quality model has been evaluated using the results from local authority air quality monitoring to verify model outputs. This model verification process has been undertaken in line with Defra TG22 guidance. It does this by comparing base year predicted modelled concentrations from road sources and monitored pollutant concentrations and, if necessary, adjusting the model output to account for systematic bias. Two adjustment factors representative of different model areas (A14 elevated and all other areas) were calculated due to systematic underprediction of the model. The verification process is presented in Air Quality Assessment Methods (Application Document Reference 5.4.7.1).

2.9.3 The effects associated with the coronavirus (Covid-19) pandemic during 2020 when England was subject to a full lockdown for periods of the year may have an influence on the 2020 air quality monitoring data and therefore it may not be representative of normal conditions at the monitoring sites; to account for this 2019 data has been used as the base year, including for road model verification purposes, for this assessment.

Assessment assumptions

2.9.4 As the energy plant within the proposed WWTP is not currently operational, predicted emission concentrations cannot be compared against monitoring data. In order to best manage uncertainties associated with energy plant, the energy plant is assumed to operate continuously, all year. In addition, pollutant mass emission rates are based on emission limit values guaranteed by the supplier i.e. the maximum

emission concentration from the equipment. In practice, emissions are likely to be lower than those assumed within the assessment.

2.9.5 The qualitative assessment of construction plant is based on information provided by Anglian Water construction teams and has been developed based on the anticipated works required to construct the Proposed Development.

2.9.6 The construction traffic movements associated with the Proposed Development are for a peak day in the peak construction year. It is possible that, if the peak day construction movements were calculated as an Annual Average Daily Traffic (AADT), they would be below the threshold for assessment set out in Table 2-16. However, this assessment has conservatively adopted the peak day movements and applied them as an AADT for comparison with the relevant air quality objectives and limit values presented in Section 1.4.

2.9.7 Assessment of operational traffic assumes that vehicle movements accessing the existing Cambridge WWTP are zero. This is a conservative assumption as it means that all operational vehicle movements are assumed to be new throughout the study area.

2.9.8 As decommissioning will take place from December 2027 to March 2028 (the first year of operation of the proposed WWTP), the assessment of operation traffic also includes the decommissioning traffic required for the existing Cambridge WWTP as changes in air quality are assessed against annual mean averages. Whilst the duration of the decommissioning is temporary lasting up to four months, the traffic has been conservatively added on to the operational traffic flows as if it is present all year.

2.9.9 Operation traffic movements are based on future movements when the proposed WWTP is at full capacity including all the built-in growth of the existing Cambridge WWTP and the additional capacity added from Waterbeach. When the proposed WWTP is commissioned, it is likely that the traffic movements will be similar to the existing Cambridge WWTP. The proposed WWTP operating at full capacity has been assessed in the 2028 opening year. This is considered the worst-case year as pollutant emission factors and background concentrations improve in future years with improvements in vehicle technology and uptake of cleaner vehicles on the roads.

2.9.10 There may be some arithmetic discrepancies associated with rounding of modelled values, especially when presenting modelled pollutant concentrations from road traffic and energy plant both in isolation and in combination. It is considered acceptable that there may be a difference in concentration of 0.1µg/m^3 between results presented for road traffic and energy plant both in isolation and in combination due to rounding. This would not change the overall conclusion on significance of effects.

3 Baseline Environment

3.1 Current baseline

3.1.1 Baseline air quality information is available from a variety of sources including local authorities, national network monitoring sites and other published sources. For the purpose of this ES, data was obtained from Defra's Air Information Resource website (Defra, 2021), SCDC and CCC.

3.1.2 The most recent year published year of monitoring data is 2020, taken from the SCDC Annual Status Report 2021 (SCDC, 2021) and CCC Annual Status Report 2021 (CCC, 2021).

3.1.3 Diffusion tube monitoring data for year 2021 presented below has been provided by SCDC via email. Ratified automatic monitoring for 2021 has been downloaded from the Air Quality England website (South Cambridgeshire District Council Monitoring Data, 2021),

3.1.4 Figure 5.3.7.1 (Book of Figures – Air Quality, App Doc Ref 5.3.7), presents the locations of the relevant monitoring sites outlined below. The baseline conditions for air quality within the Scheme Order Limits are described below. The cross-boundary nature of air quality is such that the baseline is similar across the full area of the Scheme Order Limits, so they have been assessed together.

3.1.5 Figure 5.3.7.1 (Book of Figures – Air Quality, App Doc Ref 5.3.7), presents the location of the Proposed Development in relation to the Cambridge AQMA. The Cambridge AQMA (which encompasses the Cambridge inner ring road) is located 2.9km to the south-west of the Scheme Order Limits at its closest point and was declared in 2005 for exceedances of the annual mean NO_2 objective.

3.1.6 The South Cambridgeshire AQMA (the A14 corridor AQMA) located 3.1km to the west of the Scheme Order Limits was revoked in January 2022 as consistent compliance with air quality objectives have been recorded at all monitoring sites within the AQMA since 2014. The revocation was proposed and supported by Defra in the 2020 ASR but the process was delayed due to the Covid-19 pandemic. The South Cambridgeshire AQMA has therefore not been considered further.

Local Authority Review and Assessment

South Cambridgeshire District Council

3.1.7 SCDC undertakes automatic monitoring at three locations, two of which monitor NO_2, PM_{10} and $PM_{2.5}$ and one that monitors NO_2 and PM_{10}. SCDC also undertakes NO_2 non-automatic (passive) monitoring at 35 sites within the district. The closest automatic monitors in relation to the Proposed Development are the Impington (IMP) and the Orchard Park Primary School (ORCH) automatic monitors. These monitors are located 5.3km west and 4.5km east of the Scheme Order Limits, respectively, at their closest points. The automatic monitoring results for the past three years are presented in Table 3-1 which shows that monitored concentrations

at both urban background and roadside locations are well below the air quality objectives.

3.1.8 There is one diffusion tube within 2km of the proposed WWTP located at 73 Cambridge Road, Milton (DT-28N) and two diffusion tubes representative of receptors adjacent to the A14 located at Flack End, Orchard Park (DT22) and Engledow Drive, Orchard Park (DT27). The diffusion tube monitoring data for the past four years are presented in Table 3-2 which shows that monitored concentrations at both urban background and roadside locations are well below the air quality objectives.

Table 3-1: SCDC automatic monitoring

Site ID	Site type	Distance to proposed WWTP (km)	Grid reference X,Y	Annual mean concentration (µg/m^3)			
				2018	2019	2020	2021
NO_2							
IMP	Roadside	5.9	543739, 261625	19	16	13	16
ORCH	Urban Background	5.0	544558, 261579	14	15	11	11
PM_{10}							
IMP	Roadside	5.9	543739, 261625	17	16	15	15
ORCH	Urban Background	5.0	544558, 261579	14	14	12	13
$PM_{2.5}$							
ORCH	Urban Background	5.0	544558, 261579	-	-	13*	12

Source: SCDC ASR 2021.

Data capture in 2021 was 86% for IMP and 76% for ORCH. For all other year's data capture was above 90%

No exceedances of the short-term NO_2 or PM_{10} objectives occurred in any reported year.

**PM2.5 monitoring started at this site in 2020.*

Table 3-2: SCDC non-automatic monitoring

Site ID	Site type	Distance to proposed WWTP (km)	Grid reference X,Y	Annual mean NO_2 concentration (µg/m^3)			
				2018	2019	2020	2021
DT22	Roadside	4.3	545435,261906	17.5	15.9	13.3	13.5
DT27	Urban Background	4.3	545259,261873	17.9	16.8	13.5	12.1
DT-28N	Roadside	2.6	547436, 262295	22.8	23.0	18.8	17.3

Site ID	Site type	Distance to proposed WWTP (km)	Grid reference X,Y	Annual mean NO_2 concentration (µg/m³) 2018	2019	2020	2021
DT-32N	Roadside	3.5	548742, 264698	23.4	21.6	13.9	15.3

Source: SCDC ASR 2021.

Data capture was 100% in the assessment base year of 2019.

Data has been bias-adjusted and annualised by SCDC.

The national bias-adjustment factor was 0.75 in the assessment base year 2019.

Cambridge City Council

3.1.9 CCC undertakes NO_2, PM_{10} and $PM_{2.5}$ automatic monitoring across five locations and NO_2 non-automatic (passive) monitoring at 69 sites. None of the sites are considered representative of receptors considered in this assessment as the Proposed Developments would not affect these areas and they are located in more densely urbanised areas of Cambridge.

3.2 Future baseline

Assessment of future baseline

3.2.1 Committed developments with potential to generate traffic have been incorporated into the Do-Minimum, 'Do-Construction' and Do-Something[5] traffic predictions developed for the Proposed Development. Discussion of committed developments included within the traffic model is presented within Chapter 19: Traffic and Transport (Application Document Reference 5.2.19).

3.2.2 It should be noted that, in general, pollutant concentrations are predicted to improve year-on-year into the future, mainly in response to cleaner vehicles and technologies, and actions in Defra's Air Quality Action Plan.

Pollution Climate Mapping

3.2.3 Defra uses the PCM model (Defra, 2020) to report compliance with the ambient air quality limit values. The PCM model projections are available for all years from 2019 to 2030 and these are derived from the base year of 2018. In general, the model suggests NO_2 concentrations decline into the future, mainly in response to cleaner vehicles and technologies, and actions in Defra's Air Quality Action Plan. The most recent PCM model was published in August 2019.

[5] Do-Minimum is the scenario that represents the situation that would occur without the Proposed Development in operation, which includes committed developments. Do-Construction and Do-Something refer to the Do-Minimum scenario plus the changes associated with the construction and operation of Proposed Development respectively.

3.2.4 The closest PCM model links to the Scheme Order Limits are situated on the A1303 and A1309.

3.2.5 The predicted roadside NO_2 concentration on the A1303 is 18.9µg/m^3 for 2022 and 14.7µg/m^3 for 2028, which is the opening year of the Proposed Development.

3.2.6 The predicted roadside NO_2 concentration on the A1309 is 18.0µg/m^3 for 2022 and 13.1µg/m^3 for 2028, which is the opening year of the Proposed Development.

3.2.7 As the Proposed Development traffic do not meet the criteria for assessment on these links due to the change in flow being too small, they are approximately 2km from energy plant meaning a minimal contribution from it and the PCM model concentration is well within the limit value, it is unlikely that the Proposed Development would result in non-compliance within the 'Eastern' PCM reporting zone. In addition, the closest PCM link's reported concentration is well below the maximum in the zone which has a PCM model concentration of 42.8µg/m^3 in 2022 and 29.8µg/m^3 in 2028.

Defra projected background concentrations

3.2.8 Defra provide estimates of background pollution concentrations for NO_x, NO_2, PM_{10} and $PM_{2.5}$ across the UK for each 1km grid square for every year from 2018 to 2030 (Defra, 2020). Future year projections have been developed from the base year of the background maps which is currently 2018.

3.2.9 For SO_2, Defra provides estimates of background concentrations for local air quality management (LAQM) purposes for the year of 2001 only and is applied to all future year. However, modelled background pollution data is also available for years prior to 2020 for uses other than LAQM. As modelled background pollution data is derived from the same model as the future projections discussed above and are not subject to uncertainty associated with Covid-19, the data is considered appropriate for inclusion in this baseline study.

3.2.10 The maximum background concentrations for the 1km grid squares containing the proposed WWTP in 2022, the current year, 2026, the peak year of construction, and 2028, the expected opening year of the Proposed Development, are presented in Table 3-3. A comparison of Defra projected background concentrations with SCDC 'ORCH' monitoring data presented in Air Quality Assessment Methods (Application Document Reference 5.4.7.1) shows Defra projected background concentrations are representative of monitored background concentrations in the study area. The data presented in Table 3-3 shows that the background concentrations at the proposed WWTP are all within the relevant objectives.

Table 3-3: Projected background concentrations (µg/m^3) of NO_x, NO_2, PM_{10}, $PM_{2.5}$ and SO_2

Year	NO_x	NO_2	PM_{10}	$PM_{2.5}$	SO_2
2022	15.2	11.4	17.9	10.5	1.1
2026	12.8	9.8	17.4	10.1	1.1
2028	12.1	9.3	17.3	10.0	1.1

Note: Defra does not provide projection data for SO_2. Therefore, Defra's modelled concentration for 2020 have been applied to future years.

Nitrogen and acid deposition

3.2.11 Information on baseline levels of nitrogen and acid deposition for designated sites is available from APIS (APIS, 2022). The background deposition rates and critical loads[6] from APIS for ecological receptors sensitive to nitrogen and acid deposition are presented in the Air Quality Assessment Methods (Application Document Reference 5.4.7.1).

Summary of Baseline Environment

3.2.12 Concentrations of NO_2 monitored in the past three years at local authority sites considered most representative of the Proposed Development met the annual NO_2, PM_{10} and $PM_{2.5}$ air quality objectives.

3.2.13 Defra's TG22 indicates that the hourly NO_2 air quality objective of 200µg/m^3 (not to be exceeded more than 18 times per year) is unlikely to be exceeded at roadside locations where the annual mean concentration is less than 60µg/m^3. Following this guideline, the hourly objective is therefore considered to also be met, as the monitored mean NO_2 concentrations are less than 60µg/m^3. It is generally recognised that where concentrations of NO_2 are low and road traffic is the primary source of emissions, the concentrations of PM_{10} and $PM_{2.5}$ would also not exceed the air quality objectives.

3.2.14 The predicted NO_2 concentrations for the closest PCM model link to the Scheme Order Limits are well below the limit value and therefore it is unlikely that the Proposed Development would result in an exceedance and create a non-compliance.

3.2.15 The Defra predictions also indicate that background concentrations within the Scheme Order Limits meet the relevant short-term and long-term air quality objectives.

3.2.16 Ambient pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ are generally predicted to decrease into the future, due to uptake of cleaner vehicles and technologies; as such it is considered that air quality conditions within the Scheme Order Limits and its surrounds would improve and continue to meet the air quality objectives in future years.

[6] A critical load is a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.

4 Assessment of Effects

4.1.1 The section presents the assessment of effects and sets out a preliminary assessment that takes into account primary and tertiary mitigation in determining effects and then considers secondary mitigation and the assessment of residual effects.

4.2 Construction phase

4.2.1 The potential environmental impacts to air quality from the construction of the Proposed Development are indicated in Table 2-17 together with the maximum design scenario. These are the assumptions (maximum parameters) for the purposes of the Air Quality assessment against which each impact has been assessed.

4.2.2 A description of the potential effect on air quality receptors caused by each identified impact is set out below. This assessment has been completed on the basis that designed-in measures (see Table 2-9) and the COCP requirements (Application Document Reference 5.4.2.1), Construction Workers Travel Plan (Application Document Reference 5.4.19.9), CTMP (Application Document Reference 5.4.19.7) and Outline Soil Management Plan (Application Document Reference 5.4.6.3) are implemented.

Proposed WWTP

4.2.3 This section sets out the assessment of effects in relation to the construction of the proposed WWTP including the landscaping proposals, final effluent pipeline, outfall, transfer tunnel and new access connection connecting with the B1047 Horningsea Road.

4.2.4 This section is further broken down into the assessment of

- dust risk assessment from trackout, earthworks and construction activities;
- exhaust emissions from construction plant; and
- exhaust emissions from on road construction vehicle movements Construction Dust Risk Assessment.

Dust Risk Assessment

Construction activities for Transfer tunnel and shafts

4.2.5 The transfer tunnel will use a trenchless method of construction known as pipe-jacking and will pass uninterrupted along its route without the need for traditional ‘open cut’ techniques. Temporary and permanent shafts will also be constructed for access to the transfer tunnel. Further information on the construction activities for the transfer tunnel and shafts is provided in the Chapter 2: Project Description (Application Document Reference 5.2.2).

Magnitude of impact

4.2.6 The proposed duration of the construction activities for the transfer tunnel and shafts will be approximately 24 months. The magnitude descriptors that have been applied to the construction activities are presented in Table 4-1 along with the justification.

4.2.7 Dust emission magnitudes associated with the construction of the transfer tunnel and shafts with no mitigation are predicted to be 'Large' for earthworks and construction activities and 'Medium' for trackout.

Table 4-1: Dust emission magnitude

Activity	Dust emission magnitude	Justification
Earthworks	Large	The soils within the land required for the construction of the proposed WWTP, access road and landscape masterplan are generally loamy, which have low potential for dust release. However, the earthworks activities are expected to have an area greater than 10,000m^2 and have at least 10 heavy earth moving vehicles at any one time. Further to this, the duration of earthworks activities at each shaft site is expected to be up to approximately 4 to 12 months. Earthworks will take place all year round.
Construction	Large	The construction activities are expected to take place all year round. It is expected that there will be on-site concrete batching for the first two years of construction serving the main WWTP construction site and piling and use of potentially dusty construction materials i.e. concrete. However, no sandblasting, crushing and screening is expected to take place on site.
Trackout	Medium	The unpaved road length at each shaft and at the transfer tunnel will be greater than 100m, and surface material will be made of moderate clay and sand. The duration of trackout activities requiring HDV movements to/from site is 18 months for each shaft. Trackout activities will also take place all year round. However, there will be between 10 and 50 HDV outward movements in any one day[7] at each shaft site. The soils are also generally loamy, which have low potential for dust release.

Sensitivity of receptor

4.2.8 In accordance with IAQM guidance, the sensitivity of the area to dust soiling and health effects was determined through the identification of sensitive receptors within a given distance from dust emitting activities (as presented in Figures 5.3.7.2 and 5.3.7.3 within the Book of Figures – Air Quality (App Doc Ref 5.3.7) and background particulate levels, which are expressed as annual mean PM_{10} concentrations. Table 4-2 provides details of the sensitivity of the receptors to the different activities.

[7] HDV movements during the construction phase will vary over its lifetime, and the number of movements presented is the maximum in any one day and not the average across the construction phase or calendar year.

Table 4-2: Sensitive dust receptors

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
Earthworks and construction	There are 47 sensitive receptors within 350m of the activities for the transfer tunnel and shafts. Of these 47 receptors, two are of **high** sensitivity (residential) within 100m of the activity.	There are 47 sensitive receptors within 350m of the activities for transfer tunnels and shafts. Of these 47 receptors, two are of **high** sensitivity (residential) within 100m of the activity. Background annual mean PM_{10} concentration is less than 24µg/m^3 based on Defra Air Information Resource Background Maps.	There are no international ecological designated sites within 50m of the activity.
Trackout	There are no sensitive receptors within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage.	There are no sensitive receptors within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. Background annual mean PM_{10} concentration is less than 24µg/m^3.	There are no international, national or locally designated sites within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage.

Note: Property counts based on data from OS AddressBase Plus used under licence © Crown copyright and database rights 2022 Ordnance Survey 100022432.

4.2.9 Table 4-3 summarises the overall sensitivity of the area to construction activities relating to the transfer tunnel and shafts using the criteria outlined in Table 2-3 to Table 2-5, Section 2.2.

Table 4-3: Overall sensitivity of the area

Potential impact	Sensitivity of the surrounding area		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	NA
Health effects	Low	Low	NA
Ecological	NA	NA	NA

Notes: NA – not applicable as there are no sensitive human receptors or international, national or locally designated sites within 500m of compounds or works exits and within a distance of 50m of local roads used for haulage.

Identified Risk

4.2.10 The overall risk to receptors from dust soiling effects and human health effects are presented in Table 4-4. Risk is based on the criteria outlined in Table 2-9 to Table 2-10, Section 2.2.

Table 4-4: Dust risk summary

Potential impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	NA
Health effects	Low	Low	NA
Ecological	NA	NA	NA

Notes: NA – not applicable as there are no sensitive human receptors or international, national or locally designated sites within 500m of compounds or works exits and within a distance of 50m of local roads used for haulage.

Secondary mitigation or enhancement

4.2.11 The risk of the construction activities for the transfer tunnel and shafts causing a potential impact is, at worst, '**low**'. Measures to control the dust risk have been determined using the recommendations set out in IAQM guidance and are contained within the CoCP Part A (App Doc Ref 5.4.2.1) and AQMP to reduce the potential impact from the transfer tunnel and shafts to '**negligible**'. Measures to reduce dust risk include:

- An Air Quality Management Plan(s) to be produced by the Principal Contractor(s) prior to works commencing as defined in Section 4.4 (CEMP) of the CoCP Part A (App Doc Ref 5.4.2.1) CoCP Part B (App Doc Ref 5.4.2.1).
- Measures outlined in Section 7.8 (Air quality) of CoCP Part A (App Doc Ref 5.4.2.1) including:
  - Minimising the movement of construction traffic around the working area as far as possible.
  - provision of adequate water supplies for effective dust/particulate matter suppression
  - sweeping and damping down of surfaces at regular intervals
  - use of enclosed chutes and conveyors and covered skips
  - where necessary the use of solid screens or barriers when activities will a high potential for dust generation are carried out
  - removal of materials which have the potential to produce dust will from site as soon as possible, unless being re-used on site. If they are being re-used on-site, they will be covered or stored in locations where there is less potential for impact
  - positioning of stockpiles as far as practicable from residential areas and at least 10 metres from watercourses where practical;
  - sealing of stockpiles by means of back blading the stockpile to help reduce dust and to not promote areas for wildlife habitat.
- Measures outlined in Section 3.2 (Transfer Tunnel) of CoCP Part B (App Doc Ref 5.4.2.1) which includes:

- Stockpiles associated with shaft 5 will be 'back bladed' with the back of an excavator bucket, to shape and compact the surface of the stockpile to control dust.

Residual effect

4.2.12 The residual effect is **negligible** and **not significant**. No significant residual effects have been determined.

Construction activities for the treated effluent pipeline to outfall

4.2.13 Open cut techniques will be used for the construction of the FE pipeline, which will carry the final effluent from the proposed WWTP to the outfall chamber. Further information on the construction activities for the treated effluent pipeline to outfall is available in the Chapter 2: Project Description (Application Document Reference 5.2.2).

Magnitude of impact

4.2.14 The proposed duration of the construction activities for the FE pipeline to outfall will be approximately 18 months. The magnitude descriptors that have been applied to the construction activities are presented in Table 4-5 along with the justification.

4.2.15 Dust emission magnitudes associated with the construction of the FE pipeline to outfall with no mitigation are predicted to be 'Large' for earthworks and construction activities and 'Medium' for trackout.

Table 4-5: Dust emission magnitude

Activity	Dust emission magnitude	Justification
Earthworks	Large	The soils within the area of land required for the construction of the treated effluent pipeline are generally loamy, which have low potential for dust release. However, the treated effluent pipeline construction area is expected to have an area greater than 10,000m^2 and could have at least 10 heavy earth moving vehicles at any one time. Earthworks will take place all year round and last up to 12 months.
Construction	Large	The construction volume of the treated effluent pipeline is expected to be greater than 100,000m^3 in aggregate, but much lower than this at any one time as sections of the pipeline would be progressively reinstated in situ. The construction activities are expected to take place all year round. It is expected that there will be use of potentially dusty construction materials i.e. concrete. However, no sandblasting, crushing and screening is expected to take place in this location.

Activity	Dust emission magnitude	Justification
Trackout	Medium	The unpaved road length at the treated effluent pipeline construction corridor will be greater than 100m, and site surface material is likely to comprise moderate clay and sand. The duration of trackout activities requiring HDV movements to/from land required for the construction of the pipeline and outfall is up to 12 months for the treated effluent pipeline construction corridor, although this would progress in stages. Trackout activities will also take place all year round. However, there will be between 10 and 50 HDV outward movements in any one day[8].

Sensitivity of receptor

4.2.16 In accordance with IAQM guidance, the sensitivity of the area to dust soiling and health effects was determined through the identification of sensitive receptors within a given distance from dust emitting activities (as presented in Book of Figures – Air Quality (App Doc Ref 5.3.7, Figures 5.3.7.4 and 5.3.7.5) and background particulate levels, which are expressed as annual mean PM_{10} concentrations. Table 4-6 provides details of the sensitivity of the receptors to the different activities.

Table 4-6: Sensitive dust receptors

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
Earthworks and construction	There are 16 sensitive receptors within 350m of the activities within the land required for the construction of the treated effluent pipeline construction corridor. Of these 16 receptors, 14 are of **high** sensitivity (residential).	There are 16 sensitive receptors within 350m of the activities for the FE pipeline construction corridor. Of these 16 receptors, 14 are of **high** sensitivity (residential). Background annual mean PM_{10} concentration is less than 24µg/m^3 based on Defra Air Information Resource Background Maps.	There are no international ecological designated sites within 50m of the activity.
Trackout	There are no sensitive receptors within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage.	There are no sensitive receptors within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. As above, background annual mean PM_{10} concentration is less than 24µg/m^3.	There are no international, national or locally designated sites within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage.

[8] HDV movements during the construction phase will vary over its lifetime, and the number of movements presented is the maximum in any one day and not the average across the construction phase or calendar year.

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4.2.17 Table 4-7 summarises the overall sensitivity of the area to construction activities relating to the FE pipeline to outfall using the criteria outlined in Table 2-3 to Table 2-5, Section 2.2.

Table 4-7: Overall sensitivity of the area

Potential impact	Sensitivity of the surrounding area		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	NA
Health effects	Low	Low	NA
Ecological	NA	NA	NA

Notes: *NA – not applicable as there are no sensitive receptors within 500m of compounds or works exits and within a distance of 50m of local roads used for haulage.*

Identified risk

4.2.18 The overall risk to receptors from dust soiling effects and human health effects are presented in Table 4-8. Risk is based on the criteria outlined in Table 2-9 to Table 2-10, Section 2.2.

Table 4-8: Dust Risk summary

Potential impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	NA
Health effects	Low	Low	NA
Ecological	NA	NA	NA

Notes: NA – not applicable as there are no sensitive receptors within 500m of compounds or works exits and within a distance of 50m of local roads used for haulage.

Secondary mitigation or enhancement

4.2.19 The risk of the construction activities for the treated effluent pipeline to outfall causing a potential impact is, at worst, '**low**'. Measures to control the dust risk have been determined using the recommendations set out in IAQM guidance and are contained within the CoCP Part A (App Doc Ref 5.4.2.1) and AQMP to reduce the potential impact to '**negligible**'. Measures to reduce dust risk include:

- An Air Quality Management Plan(s) to be produced by the Principal Contractor(s) prior to works commencing as defined in Section 4.4 (CEMP) of the CoCP Part A (App Doc Ref 5.4.2.1).
- Measures outlined in Section 7.8 (Air quality) of CoCP Part A (App Doc Ref 5.4.2.1) including:
  - Minimising the movement of construction traffic around the working area as far as possible.
  - provision of adequate water supplies for effective dust/particulate matter suppression

- sweeping and damping down of surfaces at regular intervals
- use of enclosed chutes and conveyors and covered skips
- where necessary the use of solid screens or barriers when activities will a high potential for dust generation are carried out
- removal of materials which have the potential to produce dust will from site as soon as possible, unless being re-used on site. If they are being re-used on-site, they will be covered or stored in locations where there is less potential for impact
- positioning of stockpiles as far as practicable from residential areas and at least 10 metres from watercourses where practical;
- sealing of stockpiles by means of back blading the stockpile to help reduce dust and to not promote areas for wildlife habitat.

Residual effect

4.2.20 The residual effect is **negligible** and **not significant**. No significant residual effects have been determined.

Construction activities within the area of land required for the construction of the proposed WWTP including landscaping

4.2.21 Construction activities will be undertaken for the proposed WWTP and associated infrastructure, which includes a construction compound area, permanent access route, public visitor parking, earth bank and landscaping. Further information on the construction activities is available in the Chapter 2: Project Description (Application Document Reference 5.2.2)

Magnitude of impact

4.2.22 The proposed duration of the construction activities for the proposed WWTP will be approximately 56 months. The magnitude descriptors that have been applied to the construction activities are presented in Table 4-9 along with the justification.

4.2.23 Dust emission magnitudes associated with the construction of the proposed WWTP with no mitigation are predicted to be 'Large' for earthworks, construction and trackout activities.

Table 4-9: Dust emission magnitude

Activity	Dust emission magnitude	Justification
Earthworks	Large	The area of land required for the construction of the proposed WWTP, access road and landscape masterplan will be greater than 10,000m^2. During the construction of the earthwork bank it is expected that the estimated volume of material for the proposed WWTP and landscaping will be up to 265,000m^3. Earthworks activities will take place all year round intermittently over the full construction programme, although the bulk of this will be in the first year. However, the soils within this area are generally loamy, which have low potential for dust release.
Construction	Large	The duration of construction activities for earthworks and landscaping is expected to be up to 39 months and take place under favourable conditions at any time of the year. There will be on-site concrete batching and piling, and use of potentially dust construction materials i.e. concrete. The estimated volume of material for the proposed WWTP and landscaping will be up to 265,000m^3. However, it is expected that there will be no sandblasting, crushing and screening on site.
Trackout	Large	The unpaved road length at the proposed WWTP will be greater than 100m, and site surface material will be made of moderate clay and sand. The duration of trackout activities requiring HDV movements to/from the proposed WWTP is 56 months. Trackout activities will take place all year round. Further to this, at the peak there will be over 50 HDV outward movements in any one day[9]. Wheel washing facilities will be provided near the main construction site and the access road will be swept and cleaned.

Sensitivity of receptor

4.2.24 In accordance with IAQM guidance, the sensitivity of the area to dust soiling and health effects was determined through the identification of sensitive receptors within a given distance from dust emitting activities (as presented in Figures 5.3.7.6 and 5.3.7.7 within the Book of Figures – Air Quality, App Doc Ref 5.3.7) and background particulate levels, which are expressed as annual mean PM_{10} concentrations. Table 4-10 provides details of the sensitivity of the receptors to the different activities.

Table 4-10: Sensitive dust receptors

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
Earthworks and construction	There are 61 sensitive receptors within 350m of the activities for the proposed WWTP. Of these receptors, 56	There are 61 sensitive receptors within 350m of the activities for the proposed WWTP. Of	There are no international ecological

[9] HDV movements during the construction phase will vary over its lifetime, and the number of movements presented is the maximum in any one day and not the average across the construction phase or calendar year.

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
	are of **high** sensitivity (residential) and five are of medium sensitivity (commercial).	these receptors, 56 are of **high** sensitivity (residential) and five are of medium sensitivity (commercial). Background annual mean PM_{10} concentration is less than 24µg/m^3 based on Defra Air Information Resource Background Maps.	designated sites within 50m of the activity.
Trackout	There are no sensitive receptors within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage.	There are no sensitive receptors within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. As above, background annual mean PM_{10} concentration is less than 24µg/m^3.	There are no international, national or locally designated sites within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage.

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4.2.25 Table 4-11 summarises the overall sensitivity of the area to construction activities relating to the proposed WWTP using the criteria outlined in Table 2-3 to Table 2-5, Section 2.2.

Table 4-11: Overall sensitivity of the area

Potential impact	Sensitivity of the surrounding area		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	NA
Health effects	Low	Low	NA
Ecological	NA	NA	NA

Notes: *NA – not applicable as there are no sensitive receptors within 350m of earthworks and construction activities, or within 500m of compounds or works exits and within a distance of 50m of local roads used for haulage.*

Identified risk

4.2.26 The overall risk to receptors from dust soiling effects and human health effects are presented in Table 4-12. Risk is based on the criteria outlined in Table 2-9 to Table 2-10, Section 2.2.

Table 4-12: Dust Risk summary

Potential impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	NA

Potential impact	Risk		
	Earthworks	Construction	Trackout
Health effects	Low	Low	NA
Ecological	NA	NA	NA

Notes: NA – not applicable as there are no sensitive receptors within 350m of earthworks and construction activities, or within 500m of compounds or works exits and within a distance of 50m of local roads used for haulage.

Secondary mitigation or enhancement

4.2.27 The risk of the construction activities for the proposed WWTP causing a potential impact is, at worst, '**low**'. Measures to control the dust risk have been determined using the recommendations set out in IAQM guidance and are contained within the CoCP Part A (App Doc Ref 5.4.2.1) and AQMP to reduce the potential impact to '**negligible'**. Measures to reduce dust risk include:

- An Air Quality Management Plan(s) to be produced by the Principal Contractor(s) prior to works commencing as defined in Section 4.4 (CEMP) of the CoCP Part A (App Doc Ref 5.4.2.1).
- Measures outlined in Section 7.8 (Air quality) of CoCP Part A (App Doc Ref 5.4.2.1) including:
  - Minimising the movement of construction traffic around the working area as far as possible.
  - provision of adequate water supplies for effective dust/particulate matter suppression
  - sweeping and damping down of surfaces at regular intervals
  - use of enclosed chutes and conveyors and covered skips
  - where necessary the use of solid screens or barriers when activities will a high potential for dust generation are carried out
  - removal of materials which have the potential to produce dust will from site as soon as possible, unless being re-used on site. If they are being re-used on-site, they will be covered or stored in locations where there is less potential for impact
  - positioning of stockpiles as far as practicable from residential areas and at least 10 metres from watercourses where practical;
  - sealing of stockpiles by means of back blading the stockpile to help reduce dust and to not promote areas for wildlife habitat.

Residual effect

4.2.28 The residual effect is **negligible** and **not significant**. No significant residual effects have been determined.

Use of construction plant

Magnitude of impact

4.2.29 Construction of the Proposed Development would require the use of different equipment such as excavators, cranes, on-site generators, compressors and pumps. All construction plant has an energy demand; with some plant resulting in direct emissions to air from exhausts. Emissions from construction plant and would quickly disperse and would be localised to the source.

4.2.30 Table 4-13 presents the anticipated location, duration and number of construction plant which could potentially operate in all areas of construction activity within the Scheme Order Limits containing the proposed WWTP, outfall and transfer areas and shafts and tunneling. It is anticipated that the construction plant listed below would be utilised across different activities and the number of construction plant listed below should not be aggregated to form a total in operation at any one time or location.

4.2.31 In line with guidance from the IAQM, the magnitude of impact associated with construction plant is **'negligible'**.

Table 4-13: Anticipated location, duration and number of construction plant

Location	Activity	Approximate duration (months)	Total number of construction plant
Proposed WWTP	Proposed WWTP Phase 1 Enabling works	3.5	25
Proposed WWTP	Proposed WWTP Phase 2 Enabling works	3.5	35
Proposed WWTP	Proposed WWTP Water Recycling and Sewage Treatment Centre (Compound and external to earth bank area)	48	12
Proposed WWTP	Proposed WWTP Water Recycling and Sewage Treatment Centre (Within earth bank area)	48	79
Outfall & Transfer	Enabling, Construct access / haul road	1	5
Outfall & Transfer	Enabling, Setup of site hoarding and compounds	1	8
Outfall & Transfer	Excavate Outfall Trench and FE pipe installation	4	10
Outfall & Transfer	Outfall, Construct cofferdam and riverbank improvements	4	10
Shafts & Tunnelling	Enabling, Construct access / haul road	2	5
Shafts & Tunnelling	Enabling, Setup of site hoarding and compounds	2	8
Shafts & Tunnelling	Works at Shaft 1,2	12	14

Location	Activity	Approximate duration (months)	Total number of construction plant
Shafts & Tunnelling	Excavate and construct Shaft 3	3	9
Shafts & Tunnelling	Excavate and construct Shaft 4	3	9
Shafts & Tunnelling	Demobilisation activities	4	17

Sensitivity of receptor

4.2.32 Pollutant concentrations are less than 75% of the relevant long term AQAL and therefore, in accordance with assessment criteria presented in section 2.2, the sensitivity of human health receptors is **very low.**

Significance of effect

4.2.33 The use of construction plant has **negligible** effect on air quality is therefore **not significant.**

Secondary mitigation or enhancement

4.2.34 The impact of construction plant is **negligible**, nevertheless mitigation and enhancement measures to further reduce the impact of construction plant have been determined using the recommendations set out in IAQM guidance and are presented in the CoCP Part A (App Doc Ref 5.4.2.1) and AQMP. The CoCP Part A Section 7.8. (Air Quality) includes the following general measures to be in place to minimise emissions and avoid nuisance:

- the engines of all vehicles and plant onsite will be turned off when not in use;
- low emission vehicles and plant will be used as far as possible; and
- movement of construction traffic around the working area will be minimised as far as possible.

Residual effect

4.2.35 The residual effect is **negligible** and **not significant.** No significant residual effects have been determined.

Construction traffic using the public highway

Magnitude of impact

4.2.36 Construction of the Proposed Development will lead to additional vehicle movements on the public highway network. A detailed interpretation of results is presented in detail in Air Quality Dispersion Model Results (Application Document reference 5.4.7.2).

4.2.37 The largest predicted change in annual mean NO_2, PM_{10} and $PM_{2.5}$ concentration at modelled human health receptors is less than 0.1µg/m^3 (less than 1% of the AQAL of 40µg/m^3 for NO_2 and PM_{10} and 20µg/m^3 for $PM_{2.5}$).

4.2.38 There are no predicted annual mean NO_2 concentrations above 60µg/m^3 or annual mean PM_{10} concentrations above 32µg/m^3. Therefore, in accordance with Defra TG22 guidance, there are no predicted exceedances of the short term AQAL.

4.2.39 In line with guidance from the EPUK/IAQM, the magnitude of impact associated with construction traffic is therefore **'negligible'.**

4.2.40 There are no modelled ecological receptors with a change in NO_x concentration greater than 1% of the critical level.

4.2.41 There is one modelled ecological receptor, Milton Road Hedgerows City Wildlife Site, with a change in nitrogen deposition greater than 1% of the minimum critical load and where the total nitrogen deposition rate exceeds the minimum critical load in the Base, Do-Minimum and Do-Construction scenarios. In accordance with best practice guidance magnitude of impact are not qualitatively defined (i.e. negligible, small, medium, large) for ecological receptors and the significance of effects is discussed below.

4.2.42 There are no modelled ecological receptors with a change in acid deposition greater than 1% of the critical load.

Sensitivity of receptor

4.2.43 Pollutant concentrations are less than 75% of the relevant long term AQAL and therefore, in accordance with assessment criteria presented in section 2.2, the sensitivity of human health receptors is very low.

Significance of effect

4.2.44 The construction traffic is predicted to have a **negligible** effect on air quality at human health receptors.

4.2.45 The construction traffic is predicted to have a **negligible** effect on air quality at ecological receptors based on the conservative assumptions (i.e. peak construction movements), the temporary nature of construction traffic and noting that the Do-Construction nitrogen deposition in the peak construction year of 2026 is lower than the 2019 base year. As nitrogen sensitive species are also unlikely to be present adjacent to the A14, it is unlikely that loss of a species/habitat would occur as a result of the minor temporary increase in nitrogen deposition. Therefore, there are **no likely significant effects** from construction traffic at assessed ecological receptors. A detailed interpretation and justification for concluding that the effect is not significant is presented in Air Quality Assessment Methods (Application Document Reference 5.4.7.1).

4.2.46 Overall, the Proposed Development's effect on air quality is concluded to be not significant.

Secondary mitigation or enhancement

4.2.47 The impact of construction traffic using the public highway is **negligible**. Nevertheless, the assessment of construction traffic using the public highways is based on construction traffic vehicles using designated routes and therefore the implementation of the CTMP (App Doc Ref 5.4.19.7) with specific reference to Section 6.3 (Adherence to Designated Routes).

Residual effect

4.2.48 The residual effect remains as **negligible** and is **not significant**.

Waterbeach pipeline

4.2.49 This section sets out the assessment of effects in relation to the Waterbeach pipeline which consists of a transfer section running from the north near Waterbeach to Low Fen Drove Way, a section crossing the area of land required for the construction of the proposed WWTP, a connection from this direct to the proposed WWTP and a section south of the A14 which connects to the existing Cambridge WWTP. This pipeline would be constructed using open cut techniques, with directional drilling under the A14, River Cam and railway. It would progress in a linear fashion and be progressively reinstated along its route, so that all activities would be temporary, including associated construction compounds.

Dust Risk Assessment

Open cut installation of pipe sections including soil stripping and stockpiling

4.2.50 As mentioned above in Section 4.1.48, open cut techniques will be used for the construction of the majority of the Waterbeach pipeline, with directional drilling only being used for crossing the River Cam, A14 and railway. Where the pipeline is installed by open cut techniques, the topsoil will be stripped and placed to one side of the working corridor. Further information on the open cut installation of sections of the Waterbeach pipeline is available in the Chapter 2: Project Description (Application Document Reference 5.2.2)

4.2.51 Given the relatively long length of the Waterbeach transfer pipeline, and that the majority of works will be open cut, this section has assessed the full length of the Waterbeach transfer pipeline as open cut to provide a conservative assessment of risk.

Magnitude of impact

4.2.52 The proposed duration of the construction activities for the entirety of the Waterbeach pipeline will be approximately 12 months. The magnitude descriptors that have been applied to the construction activities are presented in Table 4-14 along with the justification.

4.2.53 Dust emission magnitudes associated with the construction of the Waterbeach transfer pipeline with no mitigation are predicted to be 'Large' for earthworks and construction, and 'Medium' for trackout activities.

Table 4-14: Dust Emission Magnitude

Activity	Dust emission magnitude	Justification
Earthworks	Large	The soils within the land required for the Waterbeach pipeline corridor are generally loamy, which have low potential for dust release. In its entirety, the area of land required for the Waterbeach transfer pipeline is expected to have an area greater than 10,000m^2. Further to this, earthworks will take place all year round and last up to 12 months.
Construction	Large	The construction volume of the Waterbeach pipeline is expected to be greater than 100,000m^3 in aggregate, but much lower than this at any one time as sections of the pipeline would be progressively reinstated in situ. The construction activities are expected to take place sequentially over a duration of up to 12 months.
Trackout	Medium	The unpaved lengths of road associated with the Waterbeach transfer pipeline will be greater than 100m, and site surface material will be made of moderate clay and sand. The duration of trackout activities requiring HDV movements to/from the Waterbeach pipeline is up to 12 months. Trackout activities will take place all year round. However, there will be between <10 outward movements in any one day[10] and the soils are generally loamy, which have low potential for dust release.

Sensitivity of receptor

4.2.54 In accordance with IAQM guidance, the sensitivity of the area to dust soiling and health effects was determined through the identification of sensitive receptors within a given distance from dust emitting activities (as presented in Book of Figures – Air Quality (App Doc Ref 5.3.7), Figures 5.3.7.8 and 5.3.7.9) and background particulate levels, which are expressed as annual mean PM_{10} concentrations. Table 4-15 provides details of the sensitivity of the receptors to the different activities.

Table 4-15: Sensitive dust receptors

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
Earthworks and construction	There are approximately 850 sensitive receptors within 350m of the activities for the Waterbeach pipeline. Of these receptors, one is of **high** sensitivity (residential) and two are of medium sensitivity	There are approximately 850 sensitive receptors within 350m of the activities for the Waterbeach pipeline. Of these receptors, one is of **high** sensitivity (residential) and two are of medium sensitivity	There are no international ecological designated sites within 50m of the activity.

[10] HDV movements during the construction phase will vary over its lifetime, and the number of movements presented is the maximum in any one day and not the average across the construction phase or calendar year.

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
	(commercial) within 20m of the activity.	(commercial) within 20m of the activity. Background annual mean PM_{10} concentration is less than 24µg/m^3 based on Defra Air Information Resource Background Maps	
Trackout	There are 200 **high** sensitivity receptors (all residential) and 170 **medium** sensitivity receptors (all commercial) within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. Of these, 46 high sensitivity receptors and seven medium sensitivity receptors are within 20m of the road.	There are 200 **high** sensitivity receptors (all residential) and 170 **medium** sensitivity receptors (all commercial) within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. Of these, 46 **high** sensitivity receptors and seven **medium** sensitivity receptors are within 20m of the road. As above, background annual mean PM_{10} concentration is less than 24µg/m^3.	There are no international, national or locally designated sites within 500m of compound exits and within a distance of 50m of the kerb of local roads used for haulage.

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4.2.55 Table 4-16 summarises the overall sensitivity of the area to construction activities relating to the Waterbeach pipeline using the criteria outlined in Table 2-3 to Table 2-5, Section 2.2.

Table 4-16: Overall sensitivity of the area

Potential impact	Sensitivity of the surrounding area		
	Earthworks	Construction	Trackout
Dust soiling	Medium	Medium	High
Health effects	Low	Low	Low
Ecological	NA	NA	NA

Notes: *NA – not applicable as there are no international, national or locally designated sites within 500m of compounds or works exits and within a distance of 50m of local roads used for haulage.*

Significance of effect

4.2.56 The overall risk to receptors from dust soiling effects and human health effects are presented in Table 4-17. Risk is based on the criteria outlined in Table 2-9 to Table 2-10, Section 2.2.

Table 4-17: Dust risk summary

Potential impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Medium	Medium	Medium
Health effects	Low	Low	Low
Ecological	NA	NA	NA

Notes: NA – not applicable as there are no international, national or locally designated sites within 500m of compounds or works exits and within a distance of 50m of local roads used for haulage.

Secondary mitigation or enhancement

4.2.57 The risk of the construction activities for the Waterbeach pipeline causing a potential impact is, at worst, '**medium**'. Measures to control the dust risk have been determined using the recommendations set out in IAQM guidance and are contained within the CoCP Part A (App Doc Ref 5.4.2.1) and AQMP to reduce the potential impact to '**negligible**'. Measures to reduce dust risk include:

- An Air Quality Management Plan(s) to be produced by the Principal Contractor(s) prior to works commencing as defined in Section 4.4 (CEMP) of the CoCP Part A (App Doc Ref 5.4.2.1).
- Measures outlined in Section 7.8 (Air quality) of CoCP Part A (App Doc Ref 5.4.2.1) including:
  - Minimising the movement of construction traffic around the working area as far as possible.
  - provision of adequate water supplies for effective dust/particulate matter suppression
  - sweeping and damping down of surfaces at regular intervals
  - use of enclosed chutes and conveyors and covered skips
  - where necessary the use of solid screens or barriers when activities will a high potential for dust generation are carried out
  - removal of materials which have the potential to produce dust will from site as soon as possible, unless being re-used on site. If they are being re-used on-site, they will be covered or stored in locations where there is less potential for impact
  - positioning of stockpiles as far as practicable from residential areas and at least 10 metres from watercourses where practical;
  - sealing of stockpiles by means of back blading the stockpile to help reduce dust and to not promote areas for wildlife habitat.

Residual effect

4.2.58 The residual effect is **negligible** and **not significant**. No significant residual effects have been determined.

Use of construction plant

Magnitude of impact

4.2.59 Construction of the Proposed Development would require the use of different equipment such as excavators, cranes, on-site generators, compressors and pumps. All construction plant has an energy demand; with some plant resulting in direct emissions to air from exhausts. Emissions from construction plant and would quickly disperse and would be localised to the source.

4.2.60 Table 4-18 presents the anticipated location, duration and number of construction plant which could potentially operate in all areas of construction activity within the Scheme Order Limits containing the Waterbeach pipeline. It is anticipated that the construction plant listed below would be utilised across different activities and the number of construction plant listed below should not be aggregated to form a total in operation at any one time or location.

4.2.61 In line with guidance from the IAQM, the magnitude of impact associated with construction plant is '**negligible**'.

Table 4-18: Duration and number of construction plant used on the Waterbeach pipeline

Activity	Approximate duration (months)	Total number of construction plant
Enabling, construct access / haul road	1	5
Enabling, setup of site hoarding and compounds	1	8
Compound	12	4
Horizontal directional drilling	1	5
Excavation trench and installation of pipe	12	10
Pipejacking for tunnel sections	-	10

Sensitivity of receptor

4.2.62 Pollutant concentrations are less than 75% of the relevant long term AQAL and therefore, in accordance with assessment criteria presented in section 2.2, the sensitivity of human health receptors is very low.

Significance of effect

4.2.63 The use of construction plant has negligible effect on air quality is therefore **not significant**.

Secondary mitigation or enhancement

4.2.64 The impact of construction plant is **negligible**, nevertheless mitigation and enhancement measures to further reduce the impact of construction plant have been determined using the recommendations set out in IAQM guidance and are presented in the CoCP Part A (App Doc Ref 5.4.2.1) and AQMP. The CoCP Part A

Section 7.8. (Air Quality) includes the following general measures to be in place to minimise emissions and avoid nuisance:

- the engines of all vehicles and plant onsite will be turned off when not in use;
- low emission vehicles and plant will be used as far as possible; and
- movement of construction traffic around the working area will be minimised as far as possible.

Residual effect

4.2.65 The residual effect is **negligible** and is **not significant.** No significant residual effects have been determined.

Existing Cambridge WWTP

4.2.66 This section sets out the assessment of effects in relation to activities within the existing Cambridge WWTP.

Dust Risk Assessment

4.2.67 The connection shaft will be constructed for permanent access to the transfer tunnel. The shaft will be excavated to the required depth and then connected to the existing sewer and new transfer tunnel which will divert flows from the existing Cambridge WWTP to the proposed WWTP. Further information on the construction and use of the connection shaft is available in Chapter 2: Project Description (Application Document Reference 5.2.2).

Ground break and excavation to provide connection to existing sewer

Magnitude of impact

4.2.68 The proposed duration of the construction activities for the connection shaft will be up to approximately 6 months. The magnitude descriptors that have been applied to the construction activities are presented in Table 4-19 along with the justification.

4.2.69 Dust emission magnitudes associated with the construction of the connection shaft with no mitigation are predicted to be 'Medium' for earthworks, construction and trackout activities.

Table 4-19: Dust emission magnitude

Activity	Dust emission magnitude	Justification
Earthworks	Medium	The soils within the area of land required for the connection shaft are generally loamy, which have low potential for dust release. The connection shaft is also expected to have an area of approximately 900m^2. However, there will be at least 10 heavy earth moving vehicles at any one time and the duration of earthworks activities is expected to be up to 6 months. Earthworks will also take place all year round.

Activity	Dust emission magnitude	Justification
Construction	Medium	The construction volume of the connection shaft is expected to be less than 25000m^3 and no sandblasting, crushing and screening are expected to be required. However it is expected that there will be on-site concrete pours and piling, and use of potentially dust construction materials i.e. concrete. The construction activities are not seasonally restricted.
Trackout	Medium	The unpaved road length at the connection shaft will be less than 100m, and surface material is an existing surfaced road with small areas on unsurfaced areas. Trackout activities will take place all year round and last up to 6 months. However, there will be <10 HDV outward movements in any one day[11] at the peak and the soils are generally loamy, which have low potential for dust release.

Sensitivity of receptor

4.2.70 In accordance with IAQM guidance, the sensitivity of the area to dust soiling and health effects was determined through the identification of sensitive receptors within a given distance from dust emitting activities (as presented in Book of Figures – Air Quality, Figures 5.3.7.10 and 5.3.7.11, App Doc Ref 5.3.7) and background particulate levels, which are expressed as annual mean PM_{10} concentrations. Table 4-20 provides details of the sensitivity of the receptors to the different activities.

Table 4-20: Sensitive dust receptors

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
Earthworks and construction	There are 182 sensitive receptors within 350m of the activities for the connection shaft. Of these 182 receptors, four are of **high** sensitivity (residential and car parking) and 169 are of medium sensitivity (commercial).	There are 182 sensitive receptors within 350m of the activities for the connection shaft. Of these 182 receptors, four are of **high** sensitivity (residential and car parking) and 169 are of medium sensitivity (commercial). Background annual mean PM_{10} concentration is less than 24µg/m^3 based on Defra Air Information Resource Background Maps.	There are no international ecological designated sites within 50m of the activity.
Trackout	There are three **high** sensitivity receptors (all residential) and 116 **medium** sensitivity receptors (all	There are three **high** sensitivity receptors (all residential) and 116 **medium** sensitivity	There are no international, national or locally designated sites within 200m of

[11] HDV movements during the construction phase will vary over its lifetime, and the number of movements presented is the maximum in any one day and not the average across the construction phase or calendar year.

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
	commercial) within 200m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. Of these, two medium sensitivity receptors are within 20m of the road.	receptors (all commercial) within 200m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. Of these, two medium sensitivity receptors are within 20m of the road. As above, background annual mean PM_{10} concentration is less than 24µg/m^3.	compound exits and within a distance of 50m of the kerb of local roads used for haulage.

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4.2.71 Table 4-21 summarises the overall sensitivity of the area to construction activities relating to the connection shaft using the criteria outlined in Table 2-3 to Table 2-5, Section 2.2.

Table 4-21: Overall sensitivity of the area

Potential impact	Sensitivity of the surrounding area		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low
Health effects	Low	Low	Low
Ecological	NA	NA	NA

Notes: *NA – not applicable as there are no international, national or locally designated sites within 200m of compounds or works exits and within a distance of 50m of local roads used for haulage.*

Significance of effect

4.2.72 The overall risk to receptors from dust soiling effects and human health effects are presented in Table 4-22. Risk is based on the criteria outlined in Table 2-9 to Table 2-10, Section 2.2. As general dust control measures are incorporated into the design through the CoCP and AQMP the dust risk presented in Table 4-22 is based on the controlled dust emission magnitude.

Table 4-22: Dust risk summary

Potential impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low
Health effects	Low	Low	Low
Ecological	NA	NA	NA

Notes: NA – not applicable as there are no international, national or locally designated sites within 200m of compounds or works exits and within a distance of 50m of local roads used for haulage.

Secondary mitigation or enhancement

4.2.73 The risk of the construction activities for the connection shaft causing a potential impact is, at worst, **'low'**. Measures to control the dust risk have been determined using the recommendations set out in IAQM guidance and are contained within the CoCP Part A (App Doc Ref 5.4.2.1) and AQMP to reduce the potential impact to **'negligible'**. Measures to reduce dust risk include:

- An Air Quality Management Plan(s) to be produced by the Principal Contractor(s) prior to works commencing as defined in Section 4.4 (CEMP) of the CoCP Part A (App Doc Ref 5.4.2.1).
- Measures outlined in Section 7.8 (Air quality) of CoCP Part A (App Doc Ref 5.4.2.1) including:
  - Minimising the movement of construction traffic around the working area as far as possible.
  - provision of adequate water supplies for effective dust/particulate matter suppression
  - sweeping and damping down of surfaces at regular intervals
  - use of enclosed chutes and conveyors and covered skips
  - where necessary the use of solid screens or barriers when activities will a high potential for dust generation are carried out
  - removal of materials which have the potential to produce dust will from site as soon as possible, unless being re-used on site. If they are being re-used on-site, they will be covered or stored in locations where there is less potential for impact
  - positioning of stockpiles as far as practicable from residential areas and at least 10 metres from watercourses where practical;
  - sealing of stockpiles by means of back blading the stockpile to help reduce dust and to not promote areas for wildlife habitat.

Residual effect

4.2.74 The residual effect is **negligible** and **not significant**. No significant residual effects have been determined.

Construction and use of Shaft 3

4.2.75 Shaft 3 will be constructed for temporary access to the transfer tunnel. The shaft will be excavated to the required depth and connected to the transfer tunnel. Further information on the construction and use of Shaft 3 is available in the Chapter 2: Project Description (Application Document Reference 5.2.2)

Magnitude of impact

4.2.76 The proposed duration of the construction activities for the Shaft 3 will be approximately 18 months. The magnitude descriptors that have been applied to the construction activities are presented in Table 4-23 along with the justification.

4.2.77 Dust emission magnitudes associated with the construction of Shaft 3 with no mitigation are predicted to be 'Medium' for earthworks, construction and trackout activities.

Table 4-23: Dust emission magnitude

Activity	Dust emission magnitude	Justification
Earthworks	Medium	The soils within the area of Shaft 3 are generally loamy, which have low potential for dust release. This part of the area of land required for construction will have an area of between 2500m^2 and 5000m^2. However, there will be at least 10 heavy earth moving vehicles at any one time during the construction of the shaft which will take up to 3 months. Earthworks are not seasonally restricted.
Construction	Medium	The construction volume of Shaft 3 is expected to be less than 25,000m^3 and no sandblasting, crushing and screening is required at this location. However, it is expected that there will be piling, and use of potentially dusty construction materials i.e. concrete. The construction activities are not seasonally restricted.
Trackout	Medium	The unpaved road length at Shaft 3 will be greater than 100m, and site surface material will be made of moderate clay and sand. Trackout activities will take place all year round and last 3 months during shaft construction and thereafter limited to tunnelling equipment retrieval and shaft reinstatement. However, during construction of the shaft there could be between 10 and 50 HDV outward movements in any one day[12]. Soils are generally loamy, which have low potential for dust release.

Sensitivity of receptor

4.2.78 In accordance with IAQM guidance, the sensitivity of the area to dust soiling and health effects was determined through the identification of sensitive receptors within a given distance from dust emitting activities (as presented in Figures 5.3.7.12 and 5.3.7.13 within Book of Figures – Air Quality, App Doc Ref 5.3.7) and background particulate levels, which are expressed as annual mean PM_{10} concentrations. Table 4-24 provides details of the sensitivity of the receptors to the different activities.

[12] HDV movements during the construction phase will vary over its lifetime, and the number of movements presented is the maximum in any one day and not the average across the construction phase or calendar year.

Table 4-24: Sensitive dust receptors

Activity	Dust soiling sensitivity	Human health sensitivity	Ecological designations sensitivity
Earthworks and construction	There are 11 sensitive receptors within 350m of the activities for Shaft 3. Of these 11 receptors, one is of **high** sensitivity (residential) and three are of **medium** sensitivity (commercial).	There are 11 sensitive receptors within 350m of the activities for Shaft 3. Of these 11 receptors, one is of **high** sensitivity (residential) and three are of **medium** sensitivity (commercial). Background annual mean PM_{10} concentration is less than 24µg/m^3 based on Defra Air Information Resource Background Maps	There are no international ecological designated sites within 50m of the activity.
Trackout	There are three **high** sensitivity receptors (all residential) and 116 **medium** sensitivity receptors (all commercial) within 200m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. Of these, two medium sensitivity receptors are within 20m of the road.	There are three **high** sensitivity receptors (all residential) and 116 **medium** sensitivity receptors (all commercial) within 200m of compound exits and within a distance of 50m of the kerb of local roads used for haulage. Of these, two medium sensitivity receptors are within 20m of the road. As above, background annual mean PM_{10} concentration is less than 24µg/m^3.	There are no international, national or locally designated sites within 200m of compound exits and within a distance of 50m of the kerb of local roads used for haulage.

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4.2.79 Table 4-25 summarises the overall sensitivity of the area to construction activities relating to Shaft 3 using the criteria outlined in Table 2-3 to Table 2-5, Section 2.2.

Table 4-25: Overall sensitivity of the area

Potential impact	Sensitivity of the surrounding area		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low
Health effects	Low	Low	Low
Ecological	NA	NA	NA

Notes: *NA – not applicable as there are no international, national or locally designated sites within 200m of compounds or works exits and within a distance of 50m of local roads used for haulage.*

Significance of effect

4.2.80 The overall risk to receptors from dust soiling effects and human health effects are presented in Table 4-26. Risk is based on the criteria outlined in Table 2-9 to Table 2-10, Section 2.2.

Table 4-26: Dust risk summary

Potential impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low
Health effects	Low	Low	Low
Ecological	NA	NA	NA

Notes: NA – not applicable as there are no international, national or locally designated sites within 200m of compounds or works exits and within a distance of 50m of local roads used for haulage.

Secondary mitigation or enhancement

4.2.81 The risk of the construction activities for Shaft 3 causing a potential impact is, at worst, **'low'**. Measures to control the dust risk have been determined using the recommendations set out in IAQM guidance and are contained within the CoCP Part A (App Doc Ref 5.4.2.1) and AQMP to reduce the potential impact to **'negligible'**. Measures to reduce dust risk include:

- An Air Quality Management Plan(s) to be produced by the Principal Contractor(s) prior to works commencing as defined in Section 4.4 (CEMP) of the CoCP Part A (App Doc Ref 5.4.2.1).
- Measures outlined in Section 7.8 (Air quality) of CoCP Part A (App Doc Ref 5.4.2.1) including:
  - Minimising the movement of construction traffic around the working area as far as possible.
  - provision of adequate water supplies for effective dust/particulate matter suppression
  - sweeping and damping down of surfaces at regular intervals
  - use of enclosed chutes and conveyors and covered skips
  - where necessary the use of solid screens or barriers when activities will a high potential for dust generation are carried out
  - removal of materials which have the potential to produce dust will from site as soon as possible, unless being re-used on site. If they are being re-used on-site, they will be covered or stored in locations where there is less potential for impact
  - positioning of stockpiles as far as practicable from residential areas and at least 10 metres from watercourses where practical;

- sealing of stockpiles by means of back blading the stockpile to help reduce dust and to not promote areas for wildlife habitat.

Residual effect

4.2.82 The residual effect is **negligible** and **not significant**. No significant residual effects have been determined.

Monitoring

4.2.83 During the construction phase, monitoring will be in accordance with the CoCP Part B (Application Document Reference 5.4.2.2). This requires the contractor to:

- Increase the frequency of off-site and on-site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

4.3 Operation phase

4.3.1 The potential environmental air quality impacts from the operation of the Proposed Development indicated in Table 2-17 together with the maximum design scenario, which are the assumptions (maximum parameters) for the purposes of the air quality assessment against which each impact has been assessed are presented in this section.

4.3.2 A description of the potential effect on air quality receptors caused by each identified impact is set out below. This assessment has been completed on the basis that designed-in measures are implemented.

Proposed WWTP

4.3.3 This section sets out the assessment of effects in relation to the operation and maintenance of the proposed WWTP including the landscaping proposals, final effluent pipeline, outfall, transfer tunnel and new access connection connecting with the B1047 Horningsea Road.

Operation of Whessoe valve

Magnitude of impact

4.3.4 In the rare event that the Whessoe valve opened in an emergency situation, biogas containing part methane, part carbon dioxide and other trace gases would be directly released to air from the highest point of a pressurised tank or container.

4.3.5 The methane component of the biogas is approximately 50% less dense than air and would rise and disperse quickly.

4.3.6 The magnitude of impact associated with the opening of Whessoe valves is therefore **negligible.**

Sensitivity of receptor

4.3.7 Methane and carbon dioxide exist in low levels in the natural environment and are generally considered non-toxic gases at the levels of exposure that could occur at offsite locations from the operation of a Whessoe valve.

4.3.8 There are no ambient air quality standards for the protection of public health or ecology for methane or carbon dioxide. Therefore, the sensitivity of human health receptors is **very low.**

4.3.9 The sensitivity of ecological receptors is determined by the project ecologist, but both methane and carbon dioxide are present in the natural environment and the sensitivity of ecological receptors to these gases is also considered to be **very low**.

Significance of effect

4.3.10 Given the extremely infrequent operation, the very limited duration, the limited quantity, the dispersion characteristics, and the very low sensitivity of receptors, the operation of Whessoe valves is unlikely and even if they do operate, they are not expected to cause a new significant effect. Whessoe valves are nonetheless an important, intrinsic part of the operational safety controls within the proposed WWTP.

Secondary mitigation or enhancement

4.3.11 No secondary mitigation or enhancement measures are proposed.

Residual effect

4.3.12 The residual effect remains as **negligible** and is **not significant.**

Operational traffic using the public highway

Magnitude of impact

4.3.13 Operation of the Proposed Development will lead to additional vehicle movements on the public highway network. A detailed interpretation of results are presented in detail in Air Quality Assessment Methods (Application Document Reference 5.4.7.1).

4.3.14 The largest predicted change in annual mean NO_2, PM_{10} and $PM_{2.5}$ concentration at modelled human health receptors is less than 0.1µg/m^3 (less than 1% of the AQAL of 40µg/m^3 for NO_2 and PM_{10} and 20µg/m^3 for $PM_{2.5}$).

4.3.15 There are no predicted annual mean NO_2 concentrations above 60µg/m^3 or annual mean PM_{10} concentrations above 32µg/m^3. Therefore, in accordance with Defra TG22 guidance, there are no predicted exceedances of the short term AQAL.

4.3.16 In line with guidance from the EPUK/IAQM, the magnitude of impact at human health receptors associated with construction traffic is therefore **'negligible'.**

4.3.17 There are no modelled ecological receptors with a change in NO_x concentration, nitrogen deposition or acid deposition greater than 1% of the critical level or critical loads.

Sensitivity of receptor

4.3.18 Pollutant concentrations are less than 75% of the long term AQAL and therefore the sensitivity of human health receptors is **'very low'**.

Significance of effect

4.3.19 The operational traffic is predicted to have a **'negligible'** effect on air quality is therefore **not significant.**

Secondary mitigation or enhancement

4.3.20 No secondary mitigation or enhancement measures required.

Residual effect

4.3.21 The residual effect remains as **negligible** and is **not significant.**

Operation of energy plant

Magnitude of impact

4.3.22 Operation of energy plant at the proposed WWTP will lead to emissions to air. This assessment has considered the operation of one boiler, two CHPs and a flare in two scenarios including:

- Scenario 1 (normal operation): One biogas boiler and two biogas CHPs operating at full load, all year.
- Scenario 2 (abnormal operation): One biogas boiler, two biogas CHPs and one flare operating at full load, all year.

4.3.23 Scenario 2 has been compared to short term AQALs only as it would not occur for extended periods of time so would not operate for periods commensurate with the long term AQALs set for the protection of human health and critical levels and critical loads set for the protection of ecology.

4.3.24 A detailed interpretation of results, including contour plots, is presented in Air Quality Dispersion Model Results (Application Document Reference 5.4.7.2).

4.3.25 The maximum long term (annual mean) modelled NO_2 process contribution is 3.2µg/m^3 (8% of the AQAL) in scenario 1 and is located immediately south of the proposed WWTPs boundary where there is no long term human health exposure. This is a **'medium'** magnitude of impact.

4.3.26 The maximum modelled predicted change in short term (15 minute, 1 hour, daily) pollutant concentrations relative to the AQAL was predicted in scenario 2 and is from NO_2 with a change of 32.7µg/m^3 (16% of the AQAL) and is also located immediately south of the proposed WWTPs boundary. This is a **'small'** magnitude of impact.

4.3.27 At modelled human health receptors, the largest predicted change in long term (annual mean) NO_2 concentration in scenario 1 is 0.5µg/m^3 (1% of the AQAL) at receptor HH3 which is both the closest receptor and is located downwind of the energy plant. This is a **'negligible'** magnitude of impact.

4.3.28 At modelled human health receptors, the largest predicted change in short term (15 minute, 1 hour, daily) pollutant concentrations in scenario 2 is 2% of the relevant AQALs at multiple receptors. This is a **'negligible'** magnitude of impact.

4.3.29 In line with guidance from the EPUK/IAQM, the magnitude of impacts at discrete human health receptors associated with energy plant range from **'negligible to medium'**.

4.3.30 At all ecological receptors, the largest predicted change in long term (annual mean) NO_x and SO_2 concentration and nitrogen and acid deposition in scenario 1 is 1% or less than the critical levels and critical loads.

4.3.31 When conservatively assuming bryophytes and lichens are present at the assessed ecological designations, the more stringent critical level for SO_2 of 10µg/m^3 should be applied. The predicted change in SO_2 is greater than 1% of the critical level of 10µg/m^3, however, the total predicted environmental concentration does not exceed the critical level.

4.3.32 Measures in place to mitigate against continuous emissions of nitrogen oxides and sulphur dioxide to air resulting in reduced local air quality comprise of measures integrated into legal requirements secured through environmental permits and consents, such as Medium Combustion Plant Directive (MCPD) permits required by the Environment Agency, and design measures including suitable exhaust stack height at the energy plant.

Sensitivity of receptor

4.3.33 Long term (annual mean) pollutant concentrations are less than 75% of the relevant AQAL and therefore the sensitivity of human health receptors is **'very low'.**

Significance of effect

4.3.34 A 'medium' magnitude of impact is predicted for the maximum annual mean NO_2 concentration. When coupled with a very low receptor sensitivity the effect is defined as 'slight'. However, the annual mean AQAL only applies where members of the public have access, are regularly present and can be exposed for a significant portion of the averaging time of the AQAL. For the annual mean AQAL examples include residential properties, schools, hospitals, care homes. (Defra and Devolved Administrations, 2022) and (Environment Agency, 2019). As the impact is located at a location where the annual mean air quality objective does not apply, the effect is reported as **'negligible'.**

4.3.35 For the long term averaging period at modelled discrete human health receptors, and for all short term averaging periods, the energy plant's effect on air quality is **'negligible'**.

4.3.36 Based on the assessment criteria adopted for this assessment, the operation of the energy plant at the proposed WWTP is therefore **not significant**.

Secondary mitigation or enhancement

4.3.37 No secondary mitigation or enhancement measures required.

Residual effect

4.3.38 The residual effect remains as **negligible** and is **not significant.**

Monitoring

4.3.1 During the operational phase, monitoring of air quality from combustion activities will be a requirement of the Environmental Permit issued by the Environment Agency and in accordance with the Medium Combustion Plant Directive (European Union, 2015) as implemented by the Environmental Permitting (Amendment) Regulations 2018 (Gov.uk, 2018).

4.3.2 The permit will specify the monitoring parameters, duration, frequency and reporting requirements.

4.3.3 During the operational phase, monitoring of the energy plant stack emissions and the number of hours of operation of the flare will be a requirement of the Environmental Permit issued by the Environment Agency.

4.3.4 Data will be used by the regulator to determine compliance to the operating permit and be used in instances where permits are varied.

4.4 Decommissioning

4.4.1 The potential impacts to air quality from the decommissioning of the existing Cambridge WWTP for the purpose of surrendering the existing environmental permit, as described in Chapter 2 of the ES (App Doc Ref 5.2.2), as indicated in Table 2-17 together with the maximum design scenario which are the assumptions (maximum parameters) for the purposes of the air quality assessment against which each impact has been assessed. Decommissioning for the purpose of surrendering the existing environmental permit is detailed within Chapter 2: Project Description. Demolition activities and intrusive works to decommission the existing Cambridge WWTP are considered within the cumulative assessment. Decommissioning of the existing Waterbeach WRC is considered within the cumulative assessment.

4.4.2 A description of the potential effect on air quality receptors caused by each identified impact is set out below. This assessment has been completed on the basis that designed-in measures (see Table 2-19), the Outline Decommissioning Plan (Application Document Reference: 5.4.2.3) and AQMP requirements are implemented during decommissioning activities.

Existing Cambridge WWTP

4.4.3 Predicted impacts and effects on air quality associated with construction vehicle movements and construction plant during the decommissioning of the existing Cambridge WWTP have been assessed within section 4.2 and were found to be **not significant**.

Monitoring

4.4.4 For air quality no monitoring is required for the decommissioning of the Proposed Development.

4.5 Cumulative effects

4.5.1 Cumulative effects are those arising from impacts of the Proposed Development in combination with impacts of other proposed or consented development projects that are not yet built or operational. An assessment of cumulative effects for air quality has been completed and is reported in Chapter 21: Cumulative Effects (Application Document Reference 5.2.21).

4.5.2 The construction of Waterbeach New Town East has the potential to overlap with the construction of the Proposed Development and may cause cumulative effects along the A10, Denny End Road and Bannold Road. However, cumulative traffic movements (Proposed Development plus Waterbeach New Town East) are expected to be below the EPUK/IAQM indicative criteria of 500 LDVs and 100 HDVs movements per day on an annual average daily basis and therefore have not been considered further.

4.5.3 All other cumulative effects on air quality have been assessed through the incorporation of committed developments within all traffic scenarios and decommissioning activities within the 'Do-Something' traffic data as decommissioning would only take place when the proposed WWTP is operational.

4.5.4 There are no residual cumulative effects on air quality.

4.6 Inter-related effects

4.6.1 Inter-relationships are the impacts and associated effects of different aspects of the construction, operation of the Proposed Development and the decommissioning of the existing Cambridge WWTP on the same receptor. The assessment of inter-related effects is reported in Chapter 21: Cumulative Effects (Application Document Reference 5.2.21).

Construction Phase

4.6.2 The risk of construction activities causing nuisance and/or loss of amenity, health effects or causing adverse effects at ecological designations at are limited to within 350m of construction activities and will be suitably mitigated using dust control measures within the CoCP so residual effects are negligible. The air quality effect associated with construction traffic at modelled receptors are also negligible without the requirement for any air quality mitigation. Therefore, inter-related effects during the construction phase are 'negligible' and not significant.

Operational Phase

Combined operation of energy plant and road vehicles to and from the proposed WWTP

Magnitude of impact

4.6.3 Both energy plant and road traffic will have operational impacts on air quality. Therefore, the impact of both sources has been combined to demonstrate the predicted effect on air quality at modelled receptor locations.

4.6.4 Only NO_2 for human health, NO_x and nitrogen deposition for ecology have been considered in this section as only these parameters are considered in both the assessment of energy plant and road vehicle emissions. Emissions of particulate matter from the combustion of biogas or natural gas in energy plant would be de minimis and has therefore not been considered in this section.

4.6.5 Further interpretation of results is presented in detail in Air Quality Dispersion Model Results (Application Document Reference: 5.4.7.2).

4.6.6 At modelled human health receptors, the largest predicted change in long term (annual mean) NO_2 concentration in scenario 1 is 0.4µg/m^3 (1% of the AQAL)[13] at receptor HH3. This is a 'negligible' magnitude of impact.

4.6.7 There are no predicted annual mean NO_2 concentrations above 60µg/m^3.

4.6.8 In line with guidance from the EPUK/IAQM, the magnitude of impacts at modelled human health receptors associated with combined energy plant and road vehicle emissions are 'negligible'.

4.6.9 There is one modelled ecological receptor, Low Fen Drove Way Grasslands and Hedges Country Wildlife Site, with a change in NO_x concentration greater than 1% of the critical level and where the NO_x critical level of 30µg/m^3 is exceeded in the Base, Do-Minimum and Do-Something scenarios. In accordance with best practice guidance magnitude of impact are not qualitatively defined (i.e. negligible, small, medium, large) for ecological receptors and the significance of effects is discussed below.

4.6.10 There are no predicted increases in nitrogen deposition or acid deposition greater than 1% of the minimum nitrogen deposition critical load applied to the assessed habitats.

Sensitivity of receptor

4.6.11 Pollutant concentrations are less than 75% of the relevant AQAL and therefore the sensitivity of receptors is 'very low'.

[13] Predicted change of 0.4µg/m^3 in the combined assessment is 0.1µg/m^3 less than the predicted change of energy plant assessed in isolation. This is due to the inclusion of the Do-Minimum road emissions in the combined assessment which increases concentrations.

4.6.12 As discussed in Section 2.2, the sensitivity of receptor is not defined for short term averaging periods.

Significance of effect

4.6.13 The combined operation of energy plant and road vehicles during operation has a **'negligible'** effect on air quality is therefore **not significant.**

4.6.14 The combined operation of energy plant and road vehicles is predicted to have a negligible effect on air quality at ecological receptors. The Do-Something predicted NO_x concentration remains less than the predicted base NO_x concentration and the change in concentration between the Do-Minimum and Do-Something is an order of magnitude lower than the improvement between the base year and opening year. This demonstrates that the small increase in NO_x concentration caused by the Proposed Development do not retard the overall reduction in NO_x concentrations between the base year and the opening year and no species loss would be expected as a result of the minor increase in atmospheric NO_x. Furthermore, receptor E3 is located immediately adjacent to the A14 which is the main contributor to the elevated NO_x concentrations. It is unlikely that ecological species sensitive to high concentrations of NO_x would be present at this location.

Secondary mitigation or enhancement

4.6.15 No secondary mitigation or enhancement measures required.

Residual effect

4.6.16 On the basis that no secondary mitigation or enhancement measures are proposed, the residual effect remains **not significant.**

5 Conclusion and Summary

5.1.1 This assessment has considered the construction and operation of the Proposed Development including the decommissioning of the existing Cambridge WWTP for the purpose of rescinding its existing Environmental Permit and leaving the site in an acceptable condition for future development.

5.1.2 Impacts during the construction phase of the Proposed Development will be associated with dust generation, and emissions from construction plant and vehicle movements. These impacts will be temporary and will be subject to measures within the CoCP, AQMP and the CTMP.

5.1.3 The dust risk assessment has been completed using the IAQM dust guidance and indicates that the risk of dust impacts would be **'negligible'** to **'medium'.**

5.1.4 Implementation of mitigation measures listed in the CoCP will reduce the residual dust effects to a level categorised as **'negligible'**.

5.1.5 Emissions from vehicle movements generated by construction activities have been assessed using an atmospheric dispersion model and the effects are considered to be **not significant**.

5.1.6 Once operational, the proposed WWTP will include two boilers (one duty, one standby) to generate heat for the process. Additional biogas will either be exported to the national grid network following appropriate treatment, this is the preferred option, or combusted within a CHP plant if exporting to the national gas network becomes infeasible.

5.1.7 The maximum design parameters for the proposed WWTP, i.e. the design that produces the largest emissions to air, will include two boilers (one duty, one standby), two CHPs and a flare. Emissions from the energy plant have been assessed using an atmospheric dispersion model and best practice approaches. Even accounting for the conservative nature of the assessment, the results of dispersion modelling indicate the predicted effects are 'negligible' at individual receptor locations and are **not significant.**

5.1.8 The operational assessment has also considered abnormal / emergency scenarios and effects are considered are **'negligible'** and are **not significant.**

5.1.9 In operation there will be a reassignment of vehicles moving to and from the existing Cambridge WWTP to the proposed WWTP, leading to a reduction of traffic flows including HGVs in Cambridge, due to the Proposed Development. Emissions from operational vehicle movements generated have been assessed and the effects are considered to be **not significant**.

5.1.10 The Proposed Development does not conflict with national or local policies in relation to air quality.

5.1.11 A summary of potential environmental effects, mitigation and monitoring is provided in Table 5-1. Table 5-2 sets out how mitigation would be secured.

Table 5-1: Summary of Air quality effects

Works area	Description of effect	Primary and tertiary mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Initial classification of effect	Additional mitigation	Residual effect significance	Proposed monitoring	Secured via
Construction									
Proposed WWTP	Earthworks and soil handling create dust resulting in reduced air quality, reduced visibility, dust soiling of adjacent areas	None	Small to Medium	Low to Medium	Negligible to Low	Dust control measures within CoCP and AQMP	Negligible (not significant in EIA terms)	None	Requirement (CoCP and AQMP is complied with)
	Emissions from use of plant result in local reduced air quality	None	Negligible	Very Low	Negligible	Best practice measures within CoCP and AQMP	Negligible (not significant in EIA terms)	None	Requirement (CoCP and AQMP is complied with)
	Emissions from construction traffic using the public highway results in short term temporary reduction in air quality	None	Negligible	Very Low	Negligible	Management of construction vehicle movements described within the CTMP to minimise disruption on the public highway	Negligible (not significant in EIA terms)	None	Requirement (CoCP, AQMP and CTMP is complied with)
Waterbeach transfer pipeline	Earthworks and soil handling create dust resulting in reduced air quality, reduced visibility, dust soiling of adjacent areas	None	Small to Medium	Low to High	Negligible to Medium	Dust control measures within CoCP and AQMP	Negligible (not significant in EIA terms)	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions	Requirement (CoCP and AQMP is complied with)
	Emissions from use of plant result in local reduced air quality	None	Negligible	Very Low	Negligible	Best practice measures within CoCP and AQMP	Negligible (not significant in EIA terms)	None	Requirement (CoCP and AQMP is complied with)
Existing Cambridge WWTP	Earthworks and soil handling create dust resulting in reduced air quality, reduced visibility, dust soiling of adjacent areas	None	Small	Low	Negligible	Dust control measures within CoCP and AQMP	Negligible (not significant in EIA terms)	None	Requirement (CoCP and AQMP is complied with)
	Emissions from use of plant result in local reduced air quality	None	Negligible	Very Low	Negligible	Best practice measures within CoCP and AQMP	Negligible (not significant in EIA terms)	None	Requirement (CoCP and AQMP is complied with)
Operation									
Proposed WWTP	Operation of Whessoe Valves results in short term reduction of air	Flaring of biogas prior to emergency	Negligible	Very Low	Negligible	None	Negligible (not significant in EIA terms)	None	Engineering design

Works area	Description of effect	Primary and tertiary mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Initial classification of effect	Additional mitigation	Residual effect significance	Proposed monitoring	Secured via
	quality as a result of biogas release	operation of Whessoe Valves							
	Emissions from operational traffic using the public highway contributes to reduced air quality	None	Negligible	Very Low	Negligible	None	Negligible (not significant in EIA terms)	None	N/A
	Operation of energy plant contributes to reduced local air quality from continuous emissions during operation	Energy plant will have suitable exhaust stack height and relevant Medium Combustion Plant Directive (MCPD) emission limit values for energy plant will be specified within a site-specific Environmental Permit.	Negligible to Medium	Very Low	Negligible	None	Negligible to slight (not significant in EIA terms)	The Environmental Permit will specify the emission limits, monitoring parameters, duration, frequency and reporting requirements.	Engineering design and legal requirement for Environmental Permit from the Environment Agency
	Combined operation of energy plant and road vehicles to and from the WWTP result in emissions and contribution to reduced local air quality	Energy plant will have suitable exhaust stack height and relevant MCPD emission limit values for energy plant will be specified within a site-specific Environmental Permit.	Negligible	Very Low	Negligible	None	Negligible to slight (not significant in EIA terms)	The Environmental Permit will specify the emission limits, monitoring parameters, duration, frequency and reporting requirements.	Engineering design, vehicle emission standards and legal requirement for Environmental Permit from the Environment Agency

5.2 Securing mitigation

5.2.1 The delivery of mitigation will be controlled through the 'Development Consent Order (DCO) requirements' which:

- identify parameters within which certain works activities can be located and constructed (e.g. maximum and minimum building dimensions (including below ground), or locational zones);
- sets requirements for construction, operation and maintenance to be undertaken in accordance with 'control documents' (including those that are related to compliance with environmental permits); and
- sets requirements for the control of specific issues or works (e.g. time limits around the completion of the outfall construction).

5.2.2 Table 5-2 summarises all mitigation in relation to air quality, how these measures are secured, the party responsible for the implementation of the measure, when the measure would be delivered and any mechanisms to deliver the measure.

Table 5-2: Air quality mitigation summary

Description of impact	Residual effect	Mitigation measure	Mitigation type	Secured by	Responsible party	Timing on the provision of the measure	Trigger for the discharge of any related requirement
Construction							
Temporary instances of dust creation from construction activities (such as land clearance, earthworks, materials handling) leading to impacts from construction dust	Negligible	• Management of construction activities to control dust risk have been determined using the recommendations set out in IAQM guidance and are described within the CoCP Part A (App Doc Ref 5.4.2.1). These measures include: Section 4.4 (CEMP) of CoCP Part A (App Doc Ref 5.4.2.1) which requires the Principal Contractor(s) to produce an Air Quality Management Plan(s) before works commence on site. The Plan will be appended to or incorporated into the CEMP(s). • Section 7.8 (Air Quality) of CoCP Part A (App Doc Ref 5.4.2.1) which requires the following general measures will be put in place to minimise dust including but not limited to: – Minimising the movement of construction traffic around the working area as far as possible. – provision of adequate water supplies for effective dust/particulate matter suppression – sweeping and damping down of surfaces at regular intervals – use of enclosed chutes and conveyors and covered skips – where necessary the use of solid screens or barriers when activities will a high potential for dust generation are carried out – removal of materials which have the potential to produce dust will from site as soon as possible, unless being re-used on site. If they are being re-used on-site, they will be covered or stored in locations where there is less potential for impact – positioning of stockpiles as far as practicable from residential areas and at least 10 metres from watercourses where practical; – sealing of stockpiles by means of back blading the stockpile to help reduce dust and to not promote areas for wildlife habitat • Section 3.2 (Transfer tunnel) of the CoCP Part B specifies that stockpiles associated with Shaft 5 will be back bladed with the back of the excavator bucket, to shape and compact the surface of the stockpile to control dust.	Secondary	Approval and implementation of a Construction Environmental Management Plan and Air Quality Management Plan (Section 4.4 and 7.8 CoCP Part A (App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (Application Document Reference 2.1).	Appointed contractor(s)	Prior to the start of construction	Approved phasing plan Approved CEMP with AQMP sub plan required prior to construction commencement (land clearance and earthworks)
Short term emissions from the use of construction plant results in short term reduction in local air quality	Negligible	The CoCP Part A Section 7.8. (Air Quality) includes the following general measures to be in place to minimise emissions and avoid nuisance: • the engines of all vehicles and plant onsite will be turned off when not in use; • low emission vehicles and plant will be used as far as possible; and • movement of construction traffic around the working area will be minimised as far as possible	Secondary	Approval and implementation of a Construction Environmental Management Plan (Section 4.4 CoCP Part A (App Doc Ref 5.4.2.1) secured through a requirement of the draft DCO (Application Document Reference 2.1).	Appointed contractor(s)	Prior to the start of construction	Approved CEMP with AQMP sub plan required prior to construction commencement

Description of impact	Residual effect	Mitigation measure	Mitigation type	Secured by	Responsible party	Timing on the provision of the measure	Trigger for the discharge of any related requirement
Short term emissions from construction traffic using the public highway results in short term reduction in local air quality	Negligible	Management of construction vehicle movements described within the CTMP (Application Document Reference 5.4.19.7) to minimise disruption on the public highway in particular: • Section 6.3 (Adherence to Designated Routes) of the CTMP (App Doc Ref 5.4.19.7)	Secondary	Construction Traffic Management Plan (Application Document Reference 5.4.19.7), secured through a requirement of the draft DCO (Application Document Reference 2.1)	Appointed contractor(s)	Prior to the start of construction	Approved CTMP required prior to construction commencement
Operation							
Operation of Whessoe Valves resulting in short term very infrequent emissions to air	Negligible	Operation of the energy facility so that there is flaring of biogas prior to emergency operation of Whessoe Valves	Primary	DCO Schedule 2 Requirement 7 (Detailed Design) (App Doc Ref 2.1)(Detailed Design)	Anglian Water	Prior to start of operation	Environmental permit granted prior to commission. Preparation of an operational monitoring programme as part of the written EMS to cover periodic monitoring activities to accord with the requirements of the Environmental Permit (and subsequent variations).
Operation of energy plant requiring continuous emissions of nitrogen oxides and sulphur dioxide to air resulting in reduced local air quality	Negligible	Energy plant will have suitable exhaust stack height and operate in accordance with the relevant MCPD emission limit values for energy plant which will be specified within a site-specific Environmental Permit.	Primary/ Tertiary	The Environmental Permit for the STC will include medium combustion plant directive emission limits and conditions for monitoring and reporting.	Anglian Water	Prior to start of operation	Environmental permit granted prior to commission. Preparation of an operational monitoring programme as part of the written EMS to cover periodic monitoring activities to

Description of impact	Residual effect	Mitigation measure	Mitigation type	Secured by	Responsible party	Timing on the provision of the measure	Trigger for the discharge of any related requirement
							accord with the requirements of the Environmental Permit (and subsequent variations).

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Get in touch

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You can view all our DCO application documents and updates on the application on The Planning Inspectorate website:

https://infrastructure.planninginspectorate.gov.uk/projects/eastern/cambridge-waste-water-treatment-plant-relocation/