Thurrock Flexible Generation Plant

Preliminary Environmental Information Report
Chapter 12: Air Quality

Date: September 2018

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume 3

Chapter 12

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Summary

This chapter assesses the effect of the proposed development on air quality. It considers the effects from emissions of the gas engines and the effect of dust from the construction phase on sensitive receptors.

Qualifications

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1. Introduction

1.1 Purpose of this chapter

1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the findings of Environmental Impact Assessment (EIA) work undertaken to date concerning potential impacts of Thurrock Flexible Generation Plant on air quality.

1.1.2 The PEIR is being published to inform pre-application consultation. Following consultation, comments on the PEIR will be reviewed and taken into account in preparation of the Environmental Statement (ES) that will accompany the application to the Planning Inspectorate (PINS) for development consent.

1.1.3 For the construction phase, the most important consideration is dust. Without appropriate mitigation, dust could cause temporary soiling of surfaces, particularly windows, cars and laundry. The mitigation measures provided within this report should ensure that the risk of adverse dust effects is reduced to a level categorised as "not significant".

1.1.4 During the operational phase, the most important consideration is the emissions from the proposed gas-fired plant. The proposed development is not expected to significantly change traffic flows on the surrounding road network.

1.1.5 This chapter summarises information contained within the following technical reports, which are included in Volume 6:

- Appendix 12.1: Assessment of Air Quality Impacts on Ecological Receptors.
- Appendix 12.2: Baseline Air Quality Conditions.
- Appendix 12.3: Stack Height Determination.
- Appendix 12.4: Model Inputs and Outputs.
- Appendix 12.5: Results of Other Scenarios.

1.1.6 In particular, this PEIR chapter:

- presents the existing environmental baseline established from desk studies, surveys and consultation to date;
- presents the potential environmental effects on air quality arising from Thurrock Flexible Generation Plant, based on the information gathered and the analysis and assessments undertaken to date;
- identifies any assumptions and limitations encountered in compiling the environmental information; and
- highlights any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

1.2 Planning policy context

1.2.1 Planning policy for energy generation Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to Air Quality, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a) and the NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2, DECC, 2011b).

1.2.2 NPS EN-1 and NPS EN-2 include guidance on what matters are to be considered in the assessment. These are summarised in Table 1.1 below.

Table 1.1: Summary of NPS EN-1 and EN-2 provisions relevant to this chapter.

Summary of NPS EN-1 and NPS EN-2 provision	How and where considered in the PEIR
Air Quality	
NPS EN-1 includes generic guidance on the assessment of air quality impacts for major energy projects: *"Where the project is likely to have adverse effects on air quality the applicant should undertake an assessment of the impacts of the proposed project as part of the Environmental Statement."* (Paragraph 5.2.6). This requires the Environmental Statement to 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;* • *the predicted absolute emission levels of the proposed project, after mitigation methods have been applied;* • *existing air quality levels and the relative change in air quality from existing levels; and* • *any potential eutrophication impacts."* (Paragraph 5.2.7)	The potential air quality impacts which may arise as a result of Thurrock Flexible Generation Plant have been described and considered within this chapter. This chapter focuses on the potential impacts from dust during the construction phase and emissions from the gas engines. This Chapter describes: • the potential impacts from dust during the construction phase and emissions from the gas engines, mitigation measures and residual emissions which are described in Section 2.9 and Section 4.2. The effects of emissions from road traffic generated by the proposed development have been scoped out on the basis that traffic generated by the development will be below the thresholds set out in the EPUK&IAQM Land Use Planning & Development Control: Planning for Air Quality guidance; • the predicted absolute emission levels which are presented in Table 4.5 and Table 4.7 and considered in the Residual Effects section; • existing air quality levels and the relative change in air quality which are shown in Table 4.5 and Table 4.7; and • the air quality impacts at ecological sites which have been considered in Volume 6, Appendix 12.1: Assessment of Air Quality Impacts on Ecological Receptors.

Summary of NPS EN-1 and NPS EN-2 provision	How and where considered in the PEIR
Section 2.5 of NPS EN-2 follows a similar structure to EN-1 and refers to relevant sections of EN-1. Paragraph 2.5.5 states: *"The applicant should carry out an assessment as required in EN-1, consulting the EA and other statutory authorities at the initial stages of developing their proposals, as set out in EN-1 Section 4.2. If the applicant requests a scoping opinion from the IPC* [now PINS] *before an application is submitted, any views received from the EA* [Environment Agency] *should be made known to the IPC so that they can take account of the EA's advice on potential emissions."*	A summary of consultation undertaken for this proposed development is shown in Section 1.4.

1.2.3 NPS EN-1 and EN-2 also highlight a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 1.2 below.

Table 1.2: Summary of NPS EN-1 and NPS EN-2 policy on decision making relevant to this chapter.

Summary of NPS EN-1 and NPS EN-2 policy on decision making (and mitigation)	How and where considered in the PEIR
Air Quality	
Paragraph 5.2.9 and 5.2.10, NPS EN-1 states: *"The IPC should generally give air quality considerations substantial weight where a project would lead to a deterioration in air quality in an area, or leads to a new area where air quality breaches any national air quality limits. However air quality considerations will also be important where substantial changes in air quality levels are expected, even if this does not lead to any breaches of national air quality limits.* *In all cases the IPC must take account of any relevant statutory air quality limits. Where a project is likely to lead to a breach of such limits the developers should work with the relevant authorities to secure appropriate mitigation measures to allow the proposal to proceed. In the event that a project will lead to non-compliance with a statutory limit the IPC should refuse consent."*	Section 4.2 discusses the change in concentrations and the absolute concentrations with the proposed development.
Paragraphs 5.2.11 to 5.2.13 of NPS EN-1 outlines the approach the IPC (now PINS) should take in regards to mitigation: *"The IPC should consider whether mitigation measures are needed both for operational and construction emissions over and above any which may form part of the project application. A construction management plan may help codify mitigation at this stage.* *In doing so the IPC may refer to the conditions and advice in the Air Quality Strategy or any successor to it.* *The mitigations identified in Section 5.13 on traffic and transport impacts will help mitigate the effects of air emissions from transport."*	Mitigation measures proposed as part of the proposed development are outlined in Section 2.9.
Paragraph 2.5.6 of NPS SEN-2 states: *"In considering whether to grant consent, the IPC should take account of likely environmental impacts resulting from air emissions and that in the case of SOx, NOx or particulates in particular, it follows the advice in EN-1 on interaction with the EA's regulatory processes."* Paragraphs 5.2.7 and 5.2.8 outlines the approach the IPC should take in regards to mitigation: *"Mitigation will depend on the type and design of a generating station. However Flue Gas Desulphurisation (FGD) and Selective Catalytic Reduction (SCR) – which reduces NOx by the injection of a suitable reagent into flue gas over a catalyst – will have additional adverse impacts for noise and vibration, release of dust and handling of potentially hazardous materials, for example the ammonia used as a reagent.* *In line with Section 5.2 of EN-1 the IPC* [now PINS], *in consultation with EA, should be satisfied that any adverse impacts of mitigation measures for emissions proposed by the applicant have been described in the ES and taken into account in the assessments."*	Section 4.2 discusses the likely environmental impacts resulting from air emissions of NO_x. SO_x and particulates are not relevant to this assessment.

National Planning Policy Framework

1.2.4 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2018) is a material consideration for local planning authorities and decision-takers in determining applications. At the heart of the NPPF is a presumption in favour of sustainable development. For determining planning applications, this means approving development proposals if they accord with an up-to-date local development plan, unless material considerations indicate otherwise. If the development plan does not contain relevant policies, or the policies are out of date, then planning permission should be granted unless the application of policies in the NPPF that protect areas or assets of particular importance provides a clear reason for refusing the development, or any adverse impacts would significantly outweigh the benefits.

1.2.5 The NPPF sets out three overarching objectives to achieve sustainable development. The relevant objective in the context of this air quality assessment is:

"an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution and adapting to climate change, including moving to a low carbon economy" (Paragraph 8c).

1.2.6 Under the heading 'Promoting sustainable transport', the NPPF states:

"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making." (Paragraph 103)

1.2.7 Under the heading 'Conserving and enhancing the natural environment', the NPPF states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) …

e) Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; …" (Paragraph 170)

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan." (Paragraph 181)

National Planning Practice Guidance

1.2.8 The National Planning Practice Guidance (NPPG) was issued on-line in March 2014 and is updated periodically by government as a live document. The Air Quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.

1.2.9 The NPPG advises that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

1.2.10 The NPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *"Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*

- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

1.2.11 The NPPG provides advice on how air quality impacts can be mitigated and notes; *"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met."*

Local Planning Policy

1.2.12 The Thurrock Local Development Framework document (Thurrock Council, 2015) was adopted in January 2015 and sets out four policies related to air quality. Three of the four policies relate to traffic generated by a development and ensuring its impact on air quality is minimised. The fourth policy, PMD1, also relates more specifically to air quality and so it relevant for the point source emissions.

PMD1 – Minimising Pollution and Impacts on Amenity, Health, Safety and the Natural Environment

"1. Development will not be permitted where it would cause or is likely to cause unacceptable effects on:

i. the amenities of the area;

ii. the amenity, health or safety of others;

iii. the amenity, health or safety of future occupiers of the site; or

iv. the natural environment.

2. Particular consideration will be given to the location of sensitive land uses, especially housing, schools and health facilities, and nationally, regionally and locally designated biodiversity sites, and areas of recreational and amenity value which are relatively undisturbed by noise and valued for this reason.

3. The Council will require assessments to accompany planning applications where it has reasonable grounds to believe that a development may suffer from, or cause:

i. Air pollution;

ii. Noise pollution;

iii. Contaminated land/soil;

iv. Odour;

v. Light pollution and shadow flicker;

vi. Water pollution;

vii. Invasion of privacy;

viii. Visual intrusion;

ix. Loss of light;

x. Ground instability;

xi. Vibration

Where the assessment confirms such potential harm, planning permission will only be granted if satisfactory solutions can be achieved through design, or suitable mitigation measures can be put in place through conditions or a planning obligation. Where an assessment is not forthcoming the Council may refuse permission on a precautionary basis.

5. The Council will seek compliance with, and contribution to, EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality in local areas arising from individual sites.

6. In the interests of supporting legitimate business activity pursuant to policy CSSP2 the Council will resist the introduction of sensitive uses in locations where their presence would be likely to lead to unreasonable restrictions over business activity having to be imposed in order to avoid unacceptable nuisance to those sensitive uses. Exceptionally the Council may accept co-location of sensitive uses with business uses where the sensitive uses are part of approved proposals for the redevelopment of a wider area from business use to a predominantly residential use."

1.3 Legislation

Industrial Emissions Directive Limits

1.3.1 The plant would be designed and operated in accordance with the requirements of the Industrial Emissions Directive (2010/75/EU), known hereafter as the IED, which requires adherence to emission limits for a range of pollutants.

Air Quality Directive and Air Quality Standards Regulations

1.3.2 The 2008 Ambient Air Quality Directive (2008/50/EC) aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants; it sets legally binding concentration-based limit values, as well as target values. There are also information and alert thresholds for reporting purposes. These are to be achieved for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene. This Directive replaced most of the previous EU air quality legislation and in England was transposed into domestic law by the Air Quality Standards Regulations 2010, which in addition incorporates the 4^{th} Air Quality Daughter Directive (2004/107/EC) that sets targets for ambient air concentrations of certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). Member states must comply with the limit values (which are legally binding on the Secretary of State) and the Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

UK Air Quality Strategy

1.3.3 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 (Department for Environment, Food and Rural Affairs (Defra), 2007). The Strategy sets UK air quality standards and objectives for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem.

1.3.4 Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels. Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

1.3.5 There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives.

1.3.6 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and putting in place Air Quality Action Plans to improve air quality. These plans also contribute, at local level, to the achievement of EU limit values. Defra is currently reviewing the LAQM process.

1.3.7 For the purposes of this assessment, the limit values set out in the Air Quality Standards Regulations 2010 and the objective levels specified under the current UK AQS have been used. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives.

1.3.8 The limit values and objectives relevant to this assessment are summarised in Table 1.3.

Table 1.3: Summary of Relevant Air Quality Limit Values and Objectives.

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than
Nitrogen Dioxide (NO_2)	1 hour	200 µg.m^{-3}	18 times per calendar year
	Annual	40 µg.m^{-3}	-
Particulate Matter (PM_{10})	Annual	40 µg.m^{-3}	-

1.3.9 In July 2017, Defra published the 'UK plan for tackling roadside nitrogen dioxide concentrations' (Defra, 2017). This describes the Government's plan for bringing roads with NO_2 concentrations above the EU Limit Value back into compliance within the shortest possible time. This plan has since been found to be unlawful and the UK Government has been instructed to prepare a supplementary plan by October 2018.

1.4 Consultation

1.4.1 Key issues raised during scoping and consultation to date specific to Air Quality are listed in Table 1.4, together with details of how these issues have been considered in the production of this PEIR and cross-references to where this information may be found.

Table 1.4: Key points raised during scoping and consultation to date.

Date	Consultee and type of response	Points raised	How and where addressed
September 2018	Scoping opinion – Inspectorates Comments	i. The Inspectorate is content that assessment of operational traffic is scoped out but the ES should address cumulative impacts from operational traffic emissions with other developments including Tilbury2, Tilbury Energy Centre and the Lower Thames Crossing. ii. The Inspectorate requires specific details of the likely construction traffic flows to determine if construction traffic can be scoped out. If the option to transport construction materials/abnormal loads via water is pursued, the ES should assess the associated impacts where significant effects are likely. iii. AQMAs should be illustrated on a plan and the projects effect on AQMAs should be assessed. iv. The Applicant should discuss and agree with relevant consultation bodies whether diffusion tube monitoring (supplemented by local authority NO_2 monitoring data and Defra mapped NO_2 concentrations) is sufficient to inform a robust assessment. *v.* The ES should explain which construction activities are likely to generate dust and assess the impacts which are likely to result in significant effects on sensitive human and ecological receptors. This should include consideration of cumulative impacts. The construction dust study area should be defined and justified. vi. The ES should model and assess NOx, deposition of nitrogen, acid and ammonia. vii. A stack height and stack diameter assessment should be undertaken. viii. Sensitive receptors should be described and identified in the ES, including receptors on the south side of the river and neighbouring local authorities. ix. The study area for ecological receptors should be justified and the ES should assess the likely effects on the North Downs Woodlands Special Area of Conservation (SAC). x. For the cumulative assessment, the Inspectorate recommends used of a quantitative assessment methodology, particularly in respect of other point-source emitters. xi. The ES should describe the plant which is likely to be required for construction/decommissioning, the likely location and duration of their use and any mitigation measures to be implemented. The ES should assess any impacts on sensitive receptors as a result of emissions to air from plant required for construction/decommissioning.	i. Cumulative traffic emissions have been considered in Section 5. ii. Construction traffic flows are outlined in Table 2.19. The use of water transport for construction materials is no longer considered as part of the proposed development. iii. Figure 1.1shows the AQMAs and identifies the modelled sensitive receptors located within/adjacent to the AQMAs. iv. The proposed scope and methodology (including the baseline monitoring) was agreed with Thurrock Borough Council Environmental Health. The baseline concentrations are discussed in Volume 6, Appendix 12.2: Baseline Air Quality Conditions. v. Construction dust activities and the construction dust study area are described in Section 4 and cumulative construction dust effects are considered in Section 5.3. vi. The impacts of NO_2 on human-health receptors have been assessed and the results shown in Section 5. The impacts of NOx, nitrogen deposition and acid deposition on ecological receptors are assessed in Volume 6, Appendix 12.1: Assessment of Air Quality Impacts on Ecological Receptors. Ammonia will be assessed for the subsequent ES. vii. A stack height assessment has been undertaken in Volume 6, Appendix 12.3: Stack Height Determination. The air quality assessment (including the stack height determination) are based on stack characteristics provided by the applicant. No specific stack diameter assessment has been undertaken, however, the stack diameter affects the vertical velocity of emissions from the stack and, therefore, the momentum of emissions. The air quality effects for the determined stack height are not considered to be significant. The velocity of the stack emissions, and therefore the stack diameter, are considered to be appropriate. viii. Table 2.4 and Figure 1.1outlines the sensitive receptors modelled. This includes receptors on the south side of the river in the neighbouring borough of Gravesham. ix. Justification for the study area for ecological receptors is outlined in Section 0 and Volume 6, Appendix 12.1: Assessment of Air Quality Impacts on Ecological Receptors. This includes the North Downs Woodlands SAC. x. The cumulative assessment methodology is described in Section 5. This includes quantitative assessment of the Tilbury Energy Centre, Tilbury2 and semi-quantitative assessment of Tilbury Green Power biomass plant and the Lower Thames Crossing. xi. The plant likely to be used during the construction period is provided in Volume 2, Chapter 2: Project Description. Mitigation measures are summarised in Table 2.20. The impacts from construction activities on sensitive receptors is provided in Section 27.
	Scoping Opinion – Gravesham Borough Council Comments	The ES should provide sufficient information to determine any potential impacts on air quality with the Gravesham area, including the AQMAs.	Sensitive receptors have been considered in Gravesham adjacent to the AQMA that covers the Gravesend town Centre one-way system. Table 2.4 and Figure 1.1 outlines the sensitive receptors modelled.

Date	Consultee and type of response	Points raised	How and where addressed
	Scoping Opinion – Port of London Authority Comments	The ES should consider the effects of the transport of materials by barge and an assessment of the appropriateness, as a mitigation, of providing shore power should also be included within the ES.	The use of water transport for construction materials is no longer considered as part of the proposed development.
	Scoping Opinion – Tilbury2	Tilbury2 do not anticipate that there will be any significant cumulative effects between Thurrock Flexible Generation Plant and Tilbury2 during construction but dust emissions should be adequately mitigated through CEMPs.	Table 2.20 sets out the dust mitigation measures to be implemented during the construction phase. These measures are set out in the Code of Construction Practice (CoCP) (Volume 5, Appendix 2.2: Code of Construction Practice).
	Scoping Opinion – Thurrock Borough Council Comments	Thurrock Council was satisfied with the proposed methodology outline and the proposal to scope out the operational traffic air pollutant emissions.	N/A
September 2018	Thurrock Borough Council Environmental Health Officer - email	Purpose of email was to agree scope and methodology. The Officer questioned whether daily-mean NO_2 would be considered and highlighted that cumulative effects should be considered including "*the proposed 2,500 MW Gas Fired Power Station*", *"Tilbury Green Power site, and any other activities which give rise to significant emissions of NOx nearby such as the Dock activities if appropriate".*	Hourly-mean NO_2 has been considered as shown in Table 4.7 and Table 5.4. Cumulative developments including the 2,500 MW Gas Fired Power Station and Tilbury Green Power Site have been considered as described in Section 5.

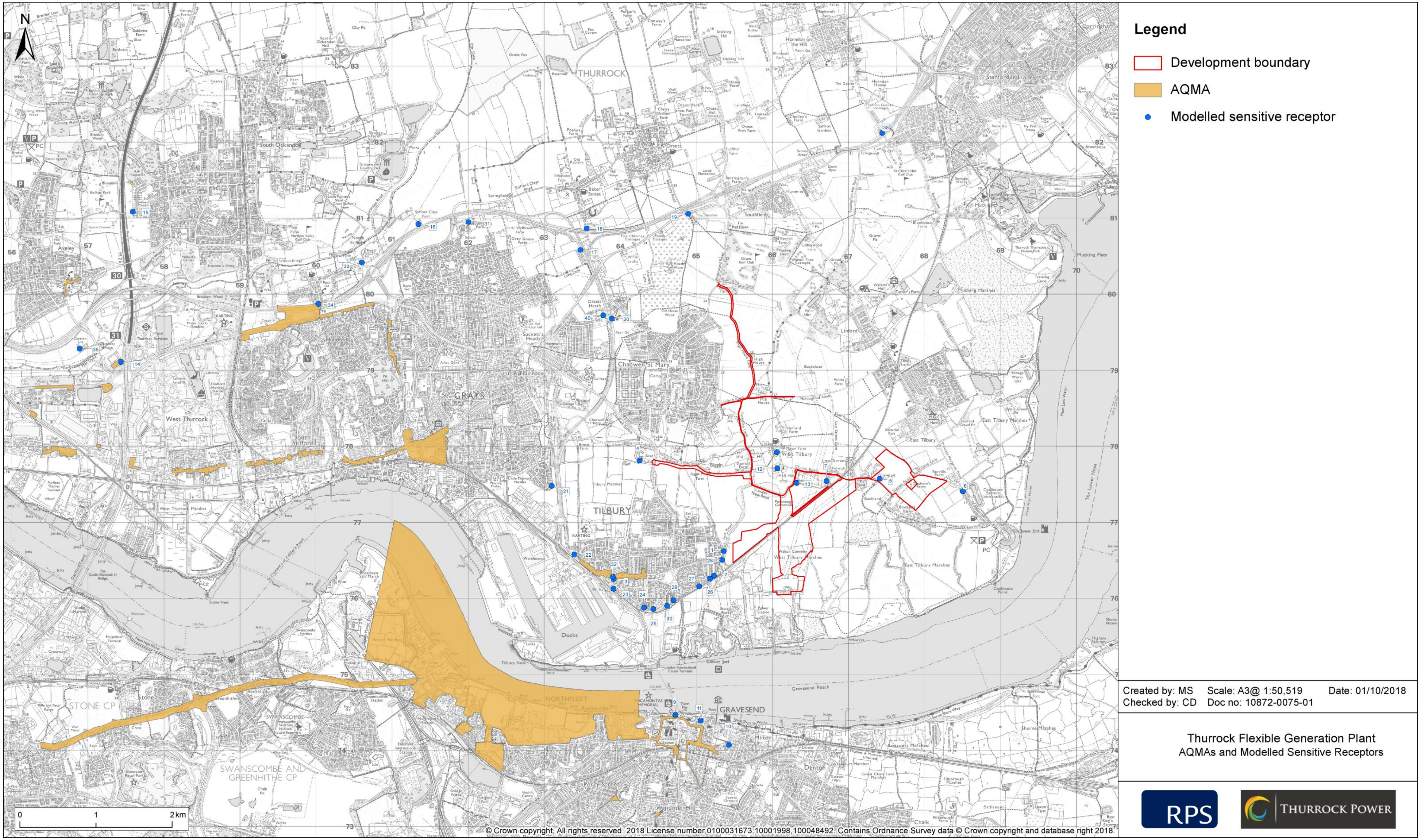

Figure 1.1: Air Quality Management Areas Modelled Sensitive Receptors.

2. Assessment Approach

2.1 Guidance

2.1.1 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM). However, the NPPG does advise that;

2.1.2 *"Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific. The scope and content of supporting information is therefore best discussed and agreed between the local planning authority and applicant before it is commissioned."*

2.1.3 The guidance lists a number of areas that might be usefully agreed at the outset.

2.1.4 This air quality assessment covers the elements recommended in the NPPG. The approach is consistent with the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document (EPUK & IAQM, 2017), the IAQM Guidance on the assessment of dust from demolition and construction (IAQM, 2014) and, where relevant, Defra's Local Air Quality Management Technical Guidance: LAQM.TG16 (Defra, 2016). It includes the key elements listed below:

- Establishing the background Ambient Concentration (AC).
- Qualitative assessment of likely construction-phase impacts with mitigation and controls in place.
- Quantitative assessment of the effects from the completed development on local air quality from stack emissions utilising a "new generation" Gaussian dispersion model, ADMS 5. The assessment has considered both the Process Contributions (PC) from the facility in isolation, and the resultant Predicted Environmental Concentrations (PEC) that includes the AC.

2.1.5 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of this assessment have professional affiliations that include Fellow and Member of the Institute of Air Quality Management, Chartered Chemist, Chartered Scientist, Chartered Environmentalist and Member of the Royal Society of Chemistry and have the required academic qualifications for these professional bodies. In addition, the Director responsible for authorising all deliverables has over 14 years' experience.

2.2 Assessment Methodology

Construction Phase Methodology

2.2.1 Dust is the generic term used to describe particulate matter in the size range 1-75 μm in diameter (British Standards Institute, 1983). Particles greater than 75 μm in diameter are termed grit rather than dust.

2.2.2 Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

2.2.3 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 μm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
- Dust, generally considered to be particles larger than 10 μm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, such deposited dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

2.2.4 Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for deposited dust annoyance or nuisance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

2.2.5 Consistent with the recommendations in the IAQM guidance (IAQM, 2014), a risk-based assessment has been undertaken, using the well-established source-pathway-receptor approach:

- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.
- The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the dust impact risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

Operational Phase Methodology

Summary of Key Pollutants Considered

2.2.6 The key pollutant emissions associated with combustion processes in general are oxides of nitrogen (NO_X), CO, SO_2, volatile organic compounds (VOCs), water and other pollutants in trace quantities. However, for gas turbines specifically, the pollutants of local concern are NO_x.

2.2.7 Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO_2. The NO oxidises in the atmosphere to form NO_2.

2.3 Baseline study

Desktop study

2.3.1 Information on air quality within the construction phase and operational phase study areas was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 2.1 below.

Table 2.1: Summary of key desktop reports.

Title	Source	Year	Author
Defra, which produces projections of pollutant concentrations for years from 2015 to 2030 for each 1 km grid square in the UK.	https://uk-air.defra.gov.uk/data/laqm-background-home	2015	Defra (2018)
Air Quality Review and Assessment documents prepared by Thurrock Borough Council	https://www.thurrock.gov.uk/air-quality/air-quality-monitoring	2017	Thurrock Borough Council (2017)
Air Quality Review and Assessment documents prepared by Gravesham Borough Council	http://www.kentair.org.uk/Pagesfiles/Gravesham%20Annual%20Status%20Report%20ASR%202017.pdf	2017	Gravesham Borough Council (2017)

Site specific surveys

2.3.2 In order to inform the EIA, the site-specific surveys listed in in Table 2.2 have been undertaken.

Table 2.2: Summary of site-specific surveys undertaken.

Title	Extent of survey	Overview of survey	Survey provider	Year	Reference to further information
NO_2 monitoring	Six months of NO_2 monitoring at five locations	Monitoring of NO_2 using passive diffusion tubes at five locations around the site to characterise the baseline conditions.	RPS	2018	Volume 6, Appendix 12.2: Baseline Air Quality Conditions

2.4 Study area

2.4.1 For the construction phase the study area is up to 350 m from the site boundary and up to 50 m from roads within 500 m of the site based on the IAQM dust guidance (IAQM, 2014).

2.4.2 For the operational phase, the air quality assessment predicts the impacts at locations that could be sensitive to any changes. For assessing human-health impacts, such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LAQM.TG16 (Defra, 2016) provides examples of exposure locations and these are summarised in Table 2.3.

Table 2.3: Example of Where Air Quality Objectives Apply.

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building's façades), or any other location where public exposure is expected to be short-term.
Daily-mean	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's façade), or any other location where public exposure is expected to be short-term.
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. 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 to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.

2.4.3 Representative sensitive receptors for this assessment have been selected at properties where pollutant concentrations and/or changes in pollutant concentrations are anticipated to be greatest, as listed in Table 2.4.

Table 2.4: Modelled Sensitive Receptors.

ID	Description	x	y
1	Fort Road	565364	176620
2	Sandhurst Road	565234	176294
3	School	563917	176252
4	Gateway Academy	564255	177812
5	Gravel Pit Cottages	567414	177570
6	Princess Margaret Rd	568507	177407
7	Walnut Tree Farm	566713	177540
8	The Green	566062	177921
9	West Street	564727	174466
10	Milton School	565429	174069
11	Royal Pier Road	565057	174392
12	West Tilbury Hall	566066	177709
13	Cooper Shore	566322	177515
14	R1	557439	179107
15	R2	557597	181084
16	R3	561350	180920
17	R4	563478	180584
18	R5	563560	180866
19	R6	564894	181056
20	R7	563889	179678
21	R8	563101	177478
22	R9	563399	176576
23	R10	563911	176123
24	R11	564314	175875
25	R12	564434	175856
26	R13	565181	176256
27	R14	565039	176156
28	R15	565339	176504
29	R16	564701	175973
30	R17	564617	175897
31	R18	562008	180949
32	R19	563904	176281
33	R20	560604	180416
34	R21	560035	179870
35	R22	556895	179284
36	R23	555379	179902
37	R24	558144	183519
38	R25	567446	182119
39	R26	558009	184058

ID	Description	x	y
40	R27	563778	179720

2.4.4 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all residential properties and at the School.

2.4.5 The study area for ecological receptors is up to 15 km from the stacks. This is based on the EA online guidance (EA, 2018) which recommends that;

“some larger (greater than 50 megawatt) emitters may be required to screen to 15km for European sites and to 10km or 15km for SSSIs.”

2.4.6 To ensure that the study area is broad enough, the impacts at ecological receptors within 15 km of the stacks have been included in the dispersion modelling.

2.5 Uncertainties and/or data limitations

2.5.1 All air quality assessment tools, whether models or monitoring measurements, have limitations. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

2.5.2 The atmospheric dispersion model itself has limitations, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

2.5.3 Each of the data inputs for the model will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data.

2.5.4 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in Table 2.5.

Table 2.5: Approaches to Dealing with Uncertainty in the Assessment.

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of current baseline air quality conditions	The background concentration used within the assessment is the most representative value for each receptor.	The background concentration is the major proportion of the total predicted concentration. The conservative assumptions adopted ensure that the background concentration used within the model should lead to a forecast concentration that is towards the top of the uncertainty range, rather than a central estimate.
	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	
Model Input/Output Data	Meteorological Data	Uncertainties arise from any differences between the conditions at the meteorological station and the development site, and between the historical meteorological years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for 5 full years of meteorological conditions.	The modelled fraction is likely to contribute to the result being between a central estimate and the top of the uncertainty range.
	Receptors	Receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	

2.5.5 The analysis of the component uncertainties indicates that, notwithstanding the limitations of the assessment, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is completed are unlikely to be higher than those presented within this report and are more likely to be lower.

2.6 Impact assessment criteria

Assessment of Construction Dust

2.6.1 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. For other chapters in this PEIR, the terms used to define magnitude and sensitivity are based on those used in the Design Manual for Roads and Bridges (DMRB) methodology, which is described in further detail in Volume 2, Chapter 4: Environmental Impact Assessment Methodology.

2.6.2 For this air quality chapter, the IAQM dust guidance has its own methodology to determine the significance of an effect. It follows a similar approach in that the magnitude of an impact is considered in the context of the sensitivity of air quality at each receptor to determine the risk of dust to allow the appropriate level of mitigation to be recommended. This then allows the significance of effect to be determined.

Source Magnitude

2.6.3 The IAQM guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and track-out. These example dust emission magnitudes are based on the site area, building volume, number of Heavy Duty Vehicle (HDV) movements generated by the activities and the materials used. These example magnitudes have been combined with the duration of construction activities and the resulting ranking of source magnitude is set out in Table 2.6.

Table 2.6: Risk allocation – source (dust emission magnitude).

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

Pathway and receptor – sensitivity of the area

2.6.4 Pathway means the route by which dust and particulate matter may be carried from the source to a receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. The orientation of the receptors to the source compared to the prevailing wind direction is a relevant risk factor for long-duration construction projects; however, short-term construction projects may be limited to a few months when the most frequent wind direction might be quite different, so adverse effects can potentially occur in any direction from the site.

2.6.5 As noted in the IAQM guidance, a number of attempts have been made to categorise receptors into high, medium and low sensitivity categories; however, there is no unified sensitivity classification scheme that covers the quite different potential effects on property, human health and ecological receptors. Table 2.7 and Table 2.8 set out the IAQM basis for categorising the sensitivity of people, property and ecological receptors to dust and PM_{10}.

Table 2.7: Sensitivities of people and property receptors to dust.

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 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; 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) • Footpaths and roads • Short-term car parks.	Low

Table 2.8: Sensitivities of people and property receptors to PM_{10}.

Receptor	Sensitivity
Principles: • Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples: • Residential properties. • Schools, hospitals and residential care homes.	High
Principles: • Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples: • Office and shop workers (but generally excludes workers occupationally exposed to PM_{10} as protection is covered by Health and Safety at Work legislation).	Medium
Principles: • Locations where human exposure is transient. Indicative examples:- • Public footpaths, playing fields, parks. • Shopping streets.	Low

2.6.6 Table 2.9 sets out the basis for determining the sensitivity of ecological receptors to dust.

Table 2.9: Sensitivities of ecological receptors to dust.

Receptor	Sensitivity
Principles: • 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 particularly dust sensitive species such as vascular plant species included in the Red Data List For Great Britain. Examples: • 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.	High

Receptor	Sensitivity
Principles:- • 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. Examples:- • Site of Special Scientific Interest (SSSI) with dust sensitive features.	Medium
Principles:- • Locations with a local designation where the features may be affected by dust deposition Examples:- • A Local Nature Reserve, with dust sensitive features.	Low

2.6.7 The IAQM methodology combines consideration of the pathway and receptor to derive the sensitivity of the area. Table 2.10, Table 2.11 and Table 2.12 show how the sensitivity of the area has been derived for this assessment using the IAQM approach.

Table 2.10: Sensitivity of the Area to Dust Soiling Effects on People and Property.

Receptor Sensitivity	Number of Receptors [a]	Distance from the Source (m) [b]			
		<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

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

[a] The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

[b] For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

Table 2.11: Sensitivity of the Area to Human Health Impacts.

Receptor Sensitivity	Annual Mean PM_{10} Concentration [a]	Number of Receptors [b, c]	Distance from the Source (m) [d]				
			<20	<50	<100	<200	<350
High	> 32 $\mu g.m^{-3}$	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32 $\mu g.m^{-3}$	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 - 28 $\mu g.m^{-3}$	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	< 24 $\mu g.m^{-3}$	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	> 32 $\mu g.m^{-3}$	>10	High	Medium	Low	Low	Low
		1 – 10	Medium	Low	Low	Low	Low
	28 – 32 $\mu g.m^{-3}$	> 10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	< 28 $\mu g.m^{-3}$	>1	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} Concentration [a]	Number of Receptors [b, c]	Distance from the Source (m) [d]				
			<20	<50	<100	<200	<350

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

[a] This refers to the background concentration derived from the assessment of baseline conditions later in this report. The concentration categories listed in this column apply to England, Wales and Northern Ireland but not to Scotland.

[b] The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

[c] For high sensitivity receptors with high occupancy (such as schools or hospitals), the approximate number of occupants has been used to derive an equivalent number of receptors.

[d] For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

Table 2.12: Sensitivity of the Area to Ecological Impacts.

Receptor Sensitivity	Distance from the Source (m) [a]	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout and for each designated site.

[a] Only the highest level of area sensitivity has been recorded.

2.6.8 The matrices in Table 2.13, Table 2.14, Table 2.15 and Table 2.16 have been used to assign the risk for each activity, which has been used to determine the level of mitigation that should be applied. For those cases where the risk category is negligible, no dust controls beyond those required by legislation are considered necessary.

Table 2.13: Risk of dust impacts – demolition.

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

Table 2.14: Risk of dust impacts – earthworks.

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 2.15: Risk of dust impacts – 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 2.16: Risk of dust impacts – trackout.

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

2.6.9 The dust risk categories that have been determined for each of the four activities above have been used to define the appropriate site-specific dust control measures based on those described in the IAQM guidance. The guidance states that provided the dust control measures are successfully implemented, the resultant effects of the dust exposure will normally be *"not significant"*.

Assessment of Operational-Phase Effects

2.6.10 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. For other chapters in this PEIR, the terms used to define magnitude and sensitivity are based on those used in the DMRB methodology, which is described in further detail in Volume 2, Chapter 4: Environmental Impact Assessment Methodology.

2.6.11 For this air quality chapter, the EPUK & IAQM guidance has its own methodology to determine the significance of an effect. It follows a similar approach in that the magnitude of an impact is considered in the context of the sensitivity of air quality at each receptor to determine the significance of effect. However, the matrix used to determine the significance of effect for air quality is the same as outlined in the EPUK & IAQM guidance, not the matrix outlined in Volume 2, Chapter 4: Environmental Impact Assessment Methodology.

2.6.12 Volume 6, Appendix 12.4: Model Inputs and Outputs sets out the model inputs and outputs.

Magnitude of impact

2.6.13 For the purposes of this assessment, the magnitude of impact is considered to be the change in concentration relative to the Air Quality Assessment Level (AQAL).

Sensitivity of the receptor

2.6.14 For the purposes of this assessment, the sensitivity of the receptor is indicated by the long term average concentration at each receptor. Receptors with a higher baseline concentration are therefore considered to be more sensitive to changes in air quality concentrations.

Significance of effect

2.6.15 The change in concentration relative to the Air Quality Assessment Level is considered with the long term average concentration at each receptor to determine an impact descriptor as outlined in the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document (EPUK & IAQM, 2017).

2.6.16 The EPUK & IAQM guidance advises that:

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

2.6.17 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 2.17 provides the EPUK & IAQM approach for describing the long-term human-health air quality impacts on sensitive receptors in the surrounding area.

Table 2.17: Annual-mean Descriptors for Individual Sensitive Receptors.

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

2.6.18 The following notes accompany Table 2.17:

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

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

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

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

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

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

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

2.6.19 The human-health impact descriptors above apply at individual receptors. The EPUK & IAQM guidance states that the impact descriptors;

"are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."

2.6.20 The above criteria and matrix are for assessing the long-term impacts; for short term impacts the EPUK & IAQM guidance states in paragraphs 6.36 and 6.39 that:

"The Environment Agency uses a threshold criterion of 10% of the short term AQAL as a screening criterion for the maximum short term impact. This is a reasonable value to take and this guidance also adopts this as a basis for defining an impact that is sufficiently small in magnitude to be regarded as having an insignificant effect. Background concentrations are less important in determining the severity of impact for short-term concentrations, not least because the peak concentrations attributable to the source and the background are not additive.

Where such peak short term concentrations from an elevated source are in the range 10-20% of the relevant AQAL, then their magnitude can be described as small, those in the range 20-50% medium and those above 50% as large. These are the maximum concentrations experienced in any year and the severity of this impact can be described as slight, moderate and substantial respectively, without the need to reference background or baseline concentrations. That is not to say that background concentrations are unimportant, but they will, on an annual average basis, be a much smaller quantity than the peak concentration caused by a substantial plume and it is the contribution that is used as a measure of the impact, not the overall concentration at a receptor. This approach is intended to be a streamlined and pragmatic assessment procedure that avoids undue complexity."

2.6.21 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

2.6.22 In assigning significance levels to the likely effects, the following terms have been used:

- Substantial: Only adverse effects are normally assigned this level of significance. They represent key factors in the decision making process with regard to planning consent;
- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision making process;
- Moderate: These beneficial or adverse effects may be important, but are not likely to be key decision making factors;
- Minor: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision making process, but are important in enhancing the subsequent design of the project; and
- Negligible: No effects or those that pose a very small risk in comparison to normal risks in everyday life, or are beneath levels of perception, or are within normal bounds of variation or within the margin of forecasting error.

2.6.23 Effects assessed as moderate or above are considered within this assessment to be significant in terms of the EIA Regulations.

2.7 Maximum design envelope parameters for assessment

2.7.1 The maximum design envelope parameters identified in Table 2.18 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These parameters have been identified based on the overview description of the development provided in Volume 2, Chapter 2: Project Description, including all potential development options where these are under consideration by the applicant.

2.7.2 Effects of greater adverse significance are not predicted to arise should any other development scenario within the project design envelope be taken forward in the final design scheme.

2.8 Impacts scoped out of the assessment

2.8.1 The impacts listed in Table 2.19 have been scoped out of the assessment for air quality as agreed through the EIA scoping process detailed in Volume 2, Chapter 5: Scoping and Consultation.

Table 2.18: Maximum design envelope parameters assessed.

Potential impact	Maximum design scenario	Justification
Construction		
Increase in suspended particulate matter concentrations and deposited dust	Earthworks and construction assumed to occur simultaneously in all working areas during first 18 month phase of total six year construction programme.	Reasonable maximum for potential construction dust generation; construction work in subsequent phases would have lower dust generation potential.
	Total site area for earthworks exceeds 10,000 m^2. During construction, total building volume >100,000 m^3 and/or use of on-site concrete batching is assumed.	Reasonable maximum for potential construction dust generation.
Operation and maintenance		
Increase in NO_2 concentrations due to emission from gas engines	Gas engine maximum operating hours 4000 per annum with NO_x emission rate at IED limit (75 mg/Nm^3).	Maximum potential long-term (annual mean) air quality impact.
	Maximum of six gas start-ups (with temporary higher emissions) during any 24 hour period.	Reasonable maximum potential short-term (hourly mean) air quality impact.
	Up to 60 gas engines with individual exhaust stacks or 12 groups of five clustered stacks assessed with exhaust flow characteristics of GE 10.4 MWe engine.	Reasonable maximum potential air pollutant impact from larger number of smaller gas engines.
	Up to 33 gas engines with individual exhaust stacks or six groups of five clustered stacks and one of three, assessed with exhaust flow characteristics of MAN 18.4 MWe engine.	Reasonable maximum potential air pollutant impact from smaller number of larger gas engines.
	Gas engine exhaust stacks modelled at locations specified in Table 1.3 of of Volume 6, Appendix 12.4: Model Input and Outputs with up to 5 m limit of deviation for absolute stack locations or locations relative to modelled buildings.	Proposed design with reasonable limit of deviation within which impact on air pollutant concentrations would not be materially affected.
	Maximum building envelopes modelled (located within areas labelled on Figure 1.5 of Volume 2, Chapter 2: Project Description): • Gas engine buildings or encasements each up to 50 m wide by 125 m long by 20 m high; and • Battery units or building up to 75 m wide by 120 m long by 10 m high. On-site substation components up to 15 m high	Maximum potential building wake effect on air pollutant dispersion.
Decommissioning		
Increase in suspended particulate matter concentrations and deposited dust	Duration and dust-generating activities of deconstruction work no greater than construction but may involve demolition activity.	Reasonable maximum assumption; in practice with deconstruction and potential re-use of recycling of components, *impacts from decommissioning are likely to be less than during construction.*
Increase in NO_2 concentrations due to emission from gas engines	Ongoing operation of all or part of flexible generation plant after 35 years.	Greatest ongoing, long-term impact.

Table 2.19: Impacts scoped out of the assessment.

Potential impact	Justification
Construction phase	
Increase in NO_2, PM_{10} and $PM_{2.5}$ concentrations from traffic generated by the construction of the development.	The EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document (EPUK & IAQM, 2017) indicates that air quality assessments should include developments increasing annual average daily HDV flows by more than 25 within or adjacent to an AQMA and more than 100 elsewhere. For Light Duty Vehicle (LDV) traffic flows, the increase is more than 100 within or adjacent to an AQMA and more than 500 elsewhere. As such, the EPUK & IAQM thresholds are highly unlikely to be exceeded; therefore, the impacts from construction-vehicle exhaust emissions have not been assessed and can be considered negligible.
Operation and maintenance	
Increase in NO_2, PM_{10} and $PM_{2.5}$ concentrations from traffic generated by the operation of the development.	During operation, access is needed mainly for occasional maintenance, as the plant is designed for remote operation and will not have a large regular workforce on site day to day. As such, the EPUK & IAQM thresholds are highly unlikely to be exceeded; therefore, the impacts from operational-vehicle exhaust emissions have not been assessed and can be considered negligible. The assessment of the completed development focuses on emissions from the gas-fired engines.
Decommissioning phase	
Increase in NO_2, PM_{10} and $PM_{2.5}$ concentrations from traffic generated by the decommissioning phase of the development.	Traffic generated during the decommissioning phase is expected to be the same or lower than the construction phase. As such, the EPUK & IAQM thresholds are highly unlikely to be exceeded; therefore, the impacts from construction-vehicle exhaust emissions have not been assessed and can be considered negligible.

2.9 Measures adopted as part of Thurrock Flexible Generation Plant

2.9.1 A number of measures have been designed in to the Thurrock Flexible Generation Plant to reduce the potential for impacts on air quality. These are based on the 'highly recommended' and 'desirable' (indicated by a *) mitigation measures recommended in the IAQM dust guidance (IAQM, 2014). These are listed in Table 2.20.

Table 2.20: Designed-in measures.

Measures adopted as part of Thurrock Flexible Generation Plant	Justification
Implementation of recommended construction dust control measures listed in Section 5.8 of Volume 5, Appendix 2.3 Code of Construction Practice.	Ensures that the effects from dust during the construction phase are 'not significant'.
Communications Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. Display the head or regional office contact information.	To facilitate community engagement and a proactive approach to complaints regarding nuisance dusts.
Dust Management Develop and implement a Dust Management and Monitoring Plan (DMMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the 'highly-recommended' measures in the IAQM guidance. The 'desirable' measures should be included as appropriate for the site. The DMMP may also include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.	To document controls to prevent or control the generation and release of nuisance dusts during construction.
Site Management Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. Make the complaints log available to the local authority when asked. Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.	To facilitate community engagement and a proactive approach to complaints regarding nuisance dusts.
Monitoring Visual Checks: *Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary, with cleaning to be provided if necessary. Carry out regular site inspections to monitor compliance with the DMMP, record inspection results, and make an inspection log available to the local authority when asked. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Quantitative Monitoring: Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	To verify the effective control of dust releases at the site.
Preparing and maintaining the site Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extended period. Avoid site runoff of water or mud. Keep site fencing, barriers and scaffolding clean using wet methods. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. Cover, seed or fence stockpiles to prevent wind whipping.	To minimise generation of nuisance dusts during construction.

Measures adopted as part of Thurrock Flexible Generation Plant	Justification
Operating vehicle/machinery and sustainable travel Ensure all vehicles switch off engines when stationary – no idling vehicles. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable. *Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate). Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials. *Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	To minimise generation of nuisance dusts during construction.
Operations Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction (e.g. suitable local exhaust ventilation systems). Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. Use enclosed chutes and conveyors and covered skips. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	To minimise generation of nuisance dusts during construction.
Waste management Avoid bonfires and burning of waste materials.	To minimise generation of nuisance dusts during construction.
Measures specific to earthworks *Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. *Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. *Where practicable, only remove the cover in small areas during work and not all at once.	To minimise generation of nuisance dusts during construction.

Measures adopted as part of Thurrock Flexible Generation Plant	Justification
Measures specific to construction *Avoid scabbling (roughening of concrete surfaces) if possible. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. *Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. *For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	To minimise generation of nuisance dusts during construction.
Measures specific to trackout Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. Avoid dry sweeping of large areas. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record all inspections of haul routes and any subsequent action in a site log book. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. Access gates to be located at least 10 m from receptors where possible.	To minimise generation of nuisance dusts during construction.

3. Baseline environment

3.1 Current baseline

3.1.1 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. NPPG and EPUK & IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LAQM.TG16 recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that:

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

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

- Defra maps, which show estimated pollutant concentrations across the UK in 1 km grid squares;
- published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies; and
- project specific NO_2 monitoring.

3.1.3 A detailed description of how the baseline air quality has been derived for this proposed development site is summarised in Volume 6, Appendix 12.2: Baseline Air Quality Conditions.

3.1.4 For the construction dust assessment, the annual-mean PM_{10} baseline concentration is 19.4 $\mu g.m^{-3}$, the average concentration monitored at the Gravesham ZG3, between 2012 and 2016.

3.1.5 Table 3.1 summarises the annual-mean NO_2 baseline concentrations for each modelled receptor. The location of the modelled receptors are presented in Figure 12.1.

Table 3.1: Summary of Baseline Annual-Mean (Long-term) NO_2 Concentrations used in the Assessment.

Receptor ID	Receptor Name	Data Source	Concentration ($\mu g.m^{-3}$)
1	Fort Road	Project specific monitoring -location 3	26.4
2	Sandhurst Road	Project specific monitoring -location 3	26.4
3	School	Thurrock monitoring - Average of TILE, TL, TK4, TILD	34.7
4	Gateway Academy	Thurrock monitoring - TSR	29.6
5	Gravel Pit Cottages	Project specific monitoring location 5	18.0
6	Princess Margaret Rd	Project specific monitoring location 5	18.0
7	Walnut Tree Farm	Project specific monitoring location 4	18.3
8	The Green	Project specific monitoring location 4	18.3
9	West Street	Gravesham monitoring - GR13	42.7
10	Milton School	Gravesham monitoring - GR62	32.1
11	Royal Pier Road	Gravesham monitoring - GR90	32.3
12	West Tilbury Hall	Project specific monitoring location 4	18.3
13	Cooper Shore	Project specific monitoring location 4	18.3
14	R1	Tilbury2 Air Quality Assessment (Note: these concentrations are the predicted concentrations with Tilbury2 in place in 2020 (Tilbury2, 2017))	31.1
15	R2		27.6
16	R3		28.3
17	R4		26.9
18	R5		32.2
19	R6		26.9
20	R7		28.1
21	R8		28.9
22	R9		36.6
23	R10		30.6
24	R11		26.6
25	R12		26.1
26	R13		26.4
27	R14		26.8
28	R15		23.6
29	R16		25.8
30	R17		26.2

Receptor ID	Receptor Name	Data Source	Concentration (µg.m^{-3})
31	R18		24.1
32	R19		31.6
33	R20		23.5
34	R21		34.8
35	R22		24.8
36	R23		34.1
37	R24		28.5
38	R25		33.8
39	R26		22.6
40	R27		24.5

3.2 Future baseline

3.2.1 To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years and the concentrations presented in Table 3.1 are considered to be the future baseline.

Climate change

3.2.2 The Met Office UK Carbon Projections ('UKCP09') dataset[1] provides probabilistic projections of change in climatic parameters over time for 25 km grid squares across the UK. Projected changes during low, medium and high future global greenhouse gas emissions scenarios have been reviewed for the period from 2020 up to 2069, encompassing the potential six year construction and 35 year operational periods of the proposed development.

3.2.3 The dispersion modelling of operational effects has been undertaken for five years of hourly meteorological conditions. The assessment therefore already takes into account a wide range of ambient temperatures and wind speeds. The assessment has been undertaken using the relevant technical guidance and based on current knowledge, the results of the assessment are not expected to be significantly influenced by climate change effects within the reasonably expected operational lifetime of the development.

[1] CP09 is presently being updated to CP18, expected to be published in November 2018 (Met Office, 2018). CP09 remains the most up-to-date available data and remains an appropriate tool for adaptation planning (Met Office, 2017).

4. Assessment of Effects

4.1 Construction phase

4.1.1 The types of activities that could cause fugitive dust emissions are:

- earthworks;
- handling and disposal of spoil;
- wind-blown particulate material from stockpiles;
- handling of loose construction materials; and
- movement of vehicles, both on and off site.

4.1.2 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.

4.1.3 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is "not significant".

Magnitude of impact

4.1.4 To follow the methodology outlined in the IAQM dust guidance, this section defines the unmitigated dust emission magnitude for demolition, earthworks, construction and trackout.

4.1.5 There is no demolition proposed for the development so demolition is not considered further.

4.1.6 The site area is greater than 10,000 m^2, the dust emission magnitude for the earthworks phase is classified as **large**.

4.1.7 The total volume of the buildings to be constructed would be greater than 100,000 m^3, the dust emission magnitude for the construction phase is classified as **large**.

4.1.8 Assuming that the maximum number of outwards movements in any one day is greater than 50 HDVs, the dust emission magnitude for trackout would be classified as **large**.

Table 4.1: Dust emission magnitude for earthworks, construction and trackout

Earthworks	Construction	Trackout
Large	Large	Large

4.1.9 The dust emission magnitude is predicted to be of local spatial extent, short term duration, intermittent and reversible. It is predicted that the impact will affect the receptors directly.

Sensitivity of the receptor

4.1.10 All earthworks and construction activities are assumed to occur across all zones within the site boundary except for the exchange Common Land areas (Zone F in Figure 1.5 of Volume 2, Chapter 2: Project Description). In practice, earthworks and construction will only occur in stages so by assuming that activities will occur simultaneously is a worst-case approach. As such, receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the site boundary (excluding Zone F), as described in the IAQM dust guidance, have been identified and are illustrated in Figure 4.1. The IAQM methodology requires that the collective sensitivity of the surrounding area to construction and earthworks is categorised. The results are provided in Table 4.2 below.

Table 4.2: Sensitivity of the surrounding area for earthworks and construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Medium	1 – 10 residential/high sensitivity receptors located within 20 m of the site boundary (Table 2.10).
Human Health	Low	Background PM_{10} concentrations for the assessment = 19.4 µg.m^{-3} 1 – 10 residential/high sensitivity receptors located within 20 m of the site boundary and PM_{10} concentrations below 24 µg.m^{-3} (Table 2.11).
Ecological	Low	Low Street Pit and Broom Pit Local Wildlife Sites (low sensitivity receptors) are within 20 m of site boundary. (Table 2.12).

4.1.11 The Dust Emission Magnitude for trackout is classified as large and trackout may occur on roads up to 200 m from the site. The major routes within 200 m of the site are Station Road, Church Road and Coopers Shaw Road. The sensitivity of the area has been classified and the results are provided in Table 4.3 below.

Table 4.3: Sensitivity of the surrounding area for trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Medium	1 – 10 residential/high sensitivity receptors located within 20 m of the roads (Table 2.10)
Human Health	Low	Background PM_{10} concentrations for the assessment = 19.4 µg.m^{-3} 1 – 10 residential/high sensitivity receptors located within 20 m of the roads and PM_{10} concentrations below 24 µg.m^{-3} (Table 2.11)
Ecological	Low	Low Street Pit and Broom Pit Local Wildlife Sites (low sensitivity receptors) are within 20 m of the roads. (Table 2.12)

Significance of effect

4.1.12 The dust emission magnitude has been considered in the context of the sensitivity of the area to give the risk of dust impacts. Table 4.4 summarises the risk of dust impacts for the three activities.

Table 4.4: Dust impact risk for earthworks, construction and trackout

Source	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium
Human Health	Low	Low	Low
Ecology	Low	Low	Low
Risk	Medium	Medium	Medium

4.1.13 Taking the site as a whole, the overall risk is deemed to be medium. The mitigation measures appropriate to a level of risk for the site as a whole and for each of the phases are set out in Table 2.20.

4.1.14 Provided this package of mitigation measures is implemented, the residual construction dust effects will not be significant. The IAQM dust guidance states that;

"For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'."

4.1.15 The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place.

4.1.16 Overall, it is predicted that the **large** impact on the **low and medium** sensitivity of the surrounding area would result in a **negligible** effect once the recommended IAQM mitigation measures are implemented, which is not significant in EIA terms.

Further mitigation or enhancement

4.1.17 No significant adverse effects have been predicted once the mitigation measures presented in Table 2.20 are implemented and therefore no further mitigation is considered to be required.

Residual effect

4.1.18 No further mitigation or enhancement is considered to be required so the residual effect would not be **significant** once the recommended IAQM mitigation measures are implemented.

Future monitoring

4.1.19 With the exception of dust monitoring set out in Table 2.20 and the outline CoCP, no other monitoring is considered necessary to test the predictions made within the construction phase impact assessment.

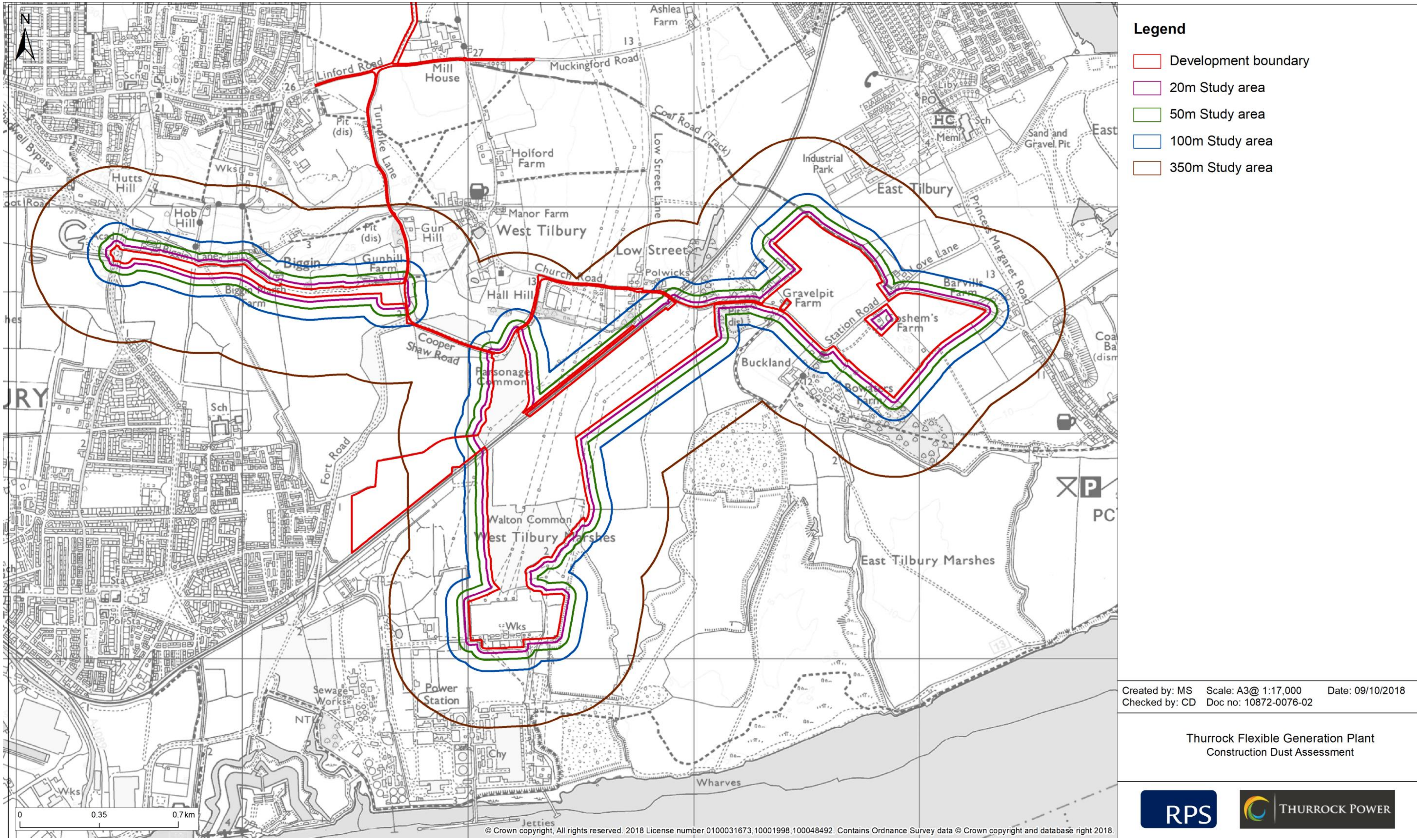

Figure 4.1: Construction Dust Assessment Buffers.

4.2 Operational and maintenance phase

4.2.1 As outlined in Table 2.18, four scenarios have been modelled. The results presented in this chapter are for scenario 1: 60 X 10.4 MW engines, each with its own stack (60 stacks) as the predicted concentrations for this scenario were highest. The results for the other three scenarios are presented in Volume 6, Appendix 12.5: Results of Other Scenarios.

Magnitude of impact

4.2.2 For the purposes of this assessment, the magnitude of impact is considered to be the change in concentration relative to the AQAL i.e. the PC as a % of AQAL column in Table 4.5 and Table 4.7.

Sensitivity of the receptor

4.2.3 For the purposes of this assessment, the sensitivity of the receptor is indicated by the long term average concentration at each receptor i.e. the Predicted Environmental Concentrations (PEC) as a % of the AQAL column in Table 4.5 and Table 4.7.

Significance of effect

Long-term Impacts

4.2.4 Table 4.5 summarise the long-term maximum PC and PEC values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 4.5: Long-term Predicted NO_2 Concentrations ($\mu g.m^{-3}$) at Sensitive Receptors.

Receptor ID	Receptor Name	AC ($\mu g.m^{-3}$)*	PC ($\mu g.m^{-3}$)	PC as % of AQAL	PEC ($\mu g.m^{-3}$)	PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	3.4	8	29.8	75	Slight
2	Sandhurst Road	26.4	2.4	6	28.8	72	Slight
3	School	34.7	1.2	3	35.9	90	Slight
4	Gateway Academy	29.6	0.5	1	30.0	75	Negligible
5	Gravel Pit Cottages	18.0	4.0	10	22.0	55	Slight
6	Princess Margaret Rd	18.0	2.2	6	20.3	51	Slight
7	Walnut Tree Farm	18.3	4.2	11	22.5	56	Moderate
8	The Green	18.3	1.3	3	19.7	49	Negligible
9	**West Street**	**42.7**	**0.6**	**2**	**43.3**	**108**	**Moderate**
10	Milton School	32.1	0.5	1	32.6	81	Negligible
11	Royal Pier Road	32.3	0.6	2	32.9	82	Slight
12	West Tilbury Hall	18.3	1.6	4	19.9	50	Negligible
13	Cooper Shore	18.3	2.4	6	20.7	52	Slight
14	R1	31.1	0.2	0	31.3	78	Negligible
15	R2	27.6	0.1	0	27.7	69	Negligible
16	R3	28.3	0.2	1	28.5	71	Negligible
17	R4	26.9	0.3	1	27.2	68	Negligible
18	R5	32.2	0.3	1	32.5	81	Negligible
19	R6	26.9	0.4	1	27.3	68	Negligible
20	R7	28.1	0.4	1	28.5	71	Negligible
21	R8	28.9	0.4	1	29.3	73	Negligible
22	R9	36.6	1.0	2	37.6	94	Slight
23	R10	30.6	1.2	3	31.8	79	Slight
24	R11	26.6	1.1	3	27.7	69	Negligible
25	R12	26.1	1.1	3	27.2	68	Negligible
26	R13	26.4	2.2	5	28.6	71	Negligible
27	R14	26.8	1.8	4	28.6	71	Negligible
28	R15	23.6	3.3	8	26.9	67	Slight
29	R16	25.8	1.3	3	27.1	68	Negligible
30	R17	26.2	1.2	3	27.4	68	Negligible
31	R18	24.1	0.3	1	24.4	61	Negligible
32	R19	31.6	1.3	3	32.9	82	Slight

Receptor ID	Receptor Name	AC ($\mu g.m^{-3}$)*	PC ($\mu g.m^{-3}$)	PC as % of AQAL	PEC ($\mu g.m^{-3}$)	PEC as % of AQAL	Impact Descriptor
33	R20	23.5	0.2	1	23.7	59	Negligible
34	R21	34.8	0.2	0	35.0	87	Negligible
35	R22	24.8	0.2	0	25.0	62	Negligible
36	R23	34.1	0.1	0	34.2	86	Negligible
37	R24	28.5	0.2	0	28.7	72	Negligible
38	R25	33.8	0.4	1	34.2	86	Negligible
39	R26	22.6	0.2	0	22.8	57	Negligible
40	R27	24.5	0.3	1	24.8	62	Negligible

*For receptors R1 to R27, the AC includes the PC from Tilbury2.

Receptors in bold exceed the AQAL.

4.2.5 Predicted annual-mean NO_2 at the facades of existing receptors are below the AQS objective for NO_2 for all but one receptor. At West Street (receptor 9) the predicted NO_2 concentration exceeds the AQS objective of 40 $\mu g.m^{-3}$ both with and without the development. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'moderate adverse' for all receptors.

4.2.6 There are two receptors where the impact is 'moderate adverse': Walnut Tree Farm (receptor 7) and West Street (receptor 9). As stated in the footnote to Table 2.17, the EPUK&IAQM guidance makes it clear that;

"a moderate adverse impact at one receptor may not mean that the overall impact has a significant effect."

4.2.7 With reference to the impacts at Walnut Tree Farm, the Environment Agency's on-line guidance states that;

"You don't need to take further action if your assessment has shown that both of the following apply:

- *Your proposed emissions comply with BAT associated emission levels (AELs) or the equivalent requirements where there is not BAT AEL*
- *… the resulting PECs won't exceed environmental standards".*

4.2.8 At Walnut Tree Farm the PEC is only 56% of the AQAL. This demonstrates that there is considerable headroom between the AQAL and the PEC.

4.2.9 At West Street, the PEC is 108% of the AQAL. This is in large part due to the Ambient Concentration (AC) which itself exceeds the AQAL. The AC is based on the average measured concentrations between 2012 and 2016 at the nearest monitoring location, GR13. The table below shows the measured concentrations at GR13 in the last five years.

Table 4.6: Annual-mean NO_2 Concentrations at GR13 ($\mu g.m^{-3}$).

	2012	2013	2014	2015	2016	Average
GR13	48.2	45.2	42.5	40.0	37.5	42.7

4.2.10 The results show that in the last five years at this location, measured concentrations have decreased every year. Therefore an AC of 42.7 $\mu g.m^{-3}$ is likely to be a conservative assumption and in reality the AC in the opening year is likely to be lower. This is in line with the view that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. The opening year of the proposed development is likely to be 2020 and so concentrations are expected to decrease even further.

4.2.11 If the AC at West Street is assumed to be 37.5 $\mu g.m^{-3}$, the PEC is only 95% of the AQAL and based on the Environment Agency's on-line guidance further action would not be required.

4.2.12 On that basis and using professional judgement, the overall significance of effect is considered to be minor adverse.

Short-term Impacts

4.2.13 Table 4.7 summarise the short-term maximum PC and PEC values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 4.7: Short-term Predicted NO_2 Concentrations ($\mu g.m^{-3}$) at Sensitive Receptors.

Receptor ID	Receptor Name	AC ($\mu g.m^{-3}$)*	PC ($\mu g.m^{-3}$)	PC as % of AQAL	PEC ($\mu g.m^{-3}$)	PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	48.1	24	101.0	50	Moderate
2	Sandhurst Road	52.9	41.8	21	94.7	47	Moderate

Receptor ID	Receptor Name	AC (µg.m-3)*	PC (µg.m-3)	PC as % of AQAL	PEC (µg.m-3)	PEC as % of AQAL	Impact Descriptor
3	School	69.4	27.3	14	96.7	48	Slight
4	Gateway Academy	59.2	24.5	12	83.7	42	Slight
5	Gravel Pit Cottages	36.0	40.6	20	76.7	38	Slight
6	Princess Margaret Rd	36.0	31.9	16	67.9	34	Slight
7	Walnut Tree Farm	36.7	62.2	31	98.8	49	Moderate
8	The Green	36.7	42.3	21	79.0	40	Moderate
9	West Street	85.4	24.5	12	109.9	55	Slight
10	Milton School	64.2	23.6	12	87.8	44	Slight
11	Royal Pier Road	64.6	25.3	13	90.0	45	Slight
12	West Tilbury Hall	36.7	50.2	25	86.8	43	Moderate
13	Cooper Shore	36.7	66.5	33	103.2	52	Moderate
14	R1	62.2	9.4	5	71.6	36	Negligible
15	R2	55.2	8.4	4	63.6	32	Negligible
16	R3	56.6	16.4	8	73.0	37	Negligible
17	R4	53.8	14.3	7	68.1	34	Negligible
18	R5	64.4	14.3	7	78.7	39	Negligible
19	R6	53.8	15.7	8	69.5	35	Negligible
20	R7	56.2	16.5	8	72.7	36	Negligible
21	R8	57.8	18.6	9	76.4	38	Negligible
22	R9	73.2	24.1	12	97.3	49	Slight
23	R10	61.2	27.1	14	88.3	44	Slight
24	R11	53.2	28.8	14	82.0	41	Slight
25	R12	52.2	29.4	15	81.6	41	Slight
26	R13	52.8	40.3	20	93.1	47	Slight
27	R14	53.6	37.0	18	90.6	45	Slight
28	R15	47.2	47.8	24	95.0	48	Moderate
29	R16	51.6	32.0	16	83.6	42	Slight
30	R17	52.4	30.6	15	83.0	41	Slight
31	R18	48.2	17.8	9	66.0	33	Negligible
32	R19	63.2	27.0	13	90.2	45	Slight
33	R20	47.0	11.4	6	58.4	29	Negligible
34	R21	69.6	10.6	5	80.2	40	Negligible
35	R22	49.6	9.2	5	58.8	29	Negligible
36	R23	68.2	8.7	4	76.9	38	Negligible
37	R24	57.0	11.8	6	68.8	34	Negligible
38	R25	67.6	12.6	6	80.2	40	Negligible
39	R26	45.2	12.3	6	57.5	29	Negligible
40	R27	49.0	16.2	8	65.2	33	Negligible

*The short-term AC is twice the long-term AC.

For receptors R1 to R27, the AC includes the PC from Tilbury2.

4.2.14 The results show that the highest PC as a percentage of the AQAL at any discrete receptor is 33% (at Cooper Shore). The EPUK & IAQM impact descriptor for an increase between 20% and 50% is 'moderate adverse'. There are six other receptors where the impact descriptor is 'moderate adverse'. As such, the impacts at these locations are considered to be potentially significant.

4.2.15 With reference to the impacts at these locations, the Environment Agency's on-line guidance referred to in turn by the EPUK&IAQM guidance states that where the PCs exceed 10% of the AQAL, the impacts are not considered significant if the PEC is below the AQAL. The Environment Agency's on-line guidance continues by stating that;

"When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration."

4.2.16 For all receptors, the PEC is less than 60% of the AQAL of 200 µg.m^{-3}. This demonstrates that there is considerable headroom between the short-term AQAL and the PEC.

4.2.17 On that basis and using professional judgement, the overall significance of effect is considered to be minor adverse.

Further mitigation or enhancement

4.2.18 At this stage the specifics of the engine types, layout and building dimensions are unknown. A number of worse-case scenarios have been modelled as outlined in Table 2.18. Further mitigation or enhancement could include the aggregation of stacks and the use of SCR technology. The results presented in this chapter assume that there is no aggregation of stacks and that no SCR is used.

Residual effect

4.2.19 Assuming that no further mitigation or enhancement was employed, the residual effects would be ‘not significant’.

Future monitoring

4.2.20 No future monitoring is considered to be required.

4.3 Decommissioning phase

Magnitude of impact

4.3.1 The magnitude of impact for the decommissioning phase is expected to be the same or lower than the magnitude of impact for the construction phase.

Sensitivity of the receptor

4.3.2 It is assumed that the sensitivity of surrounding area during the decommissioning phase is the same as the construction phase.

Significance of effect

4.3.3 Overall, it is predicted that the decommissioning phase would be similar to the construction phase and would result in a **negligible** effect once the recommended IAQM mitigation measures are implemented, which is not significant in EIA terms.

Further mitigation or enhancement

4.3.4 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Residual effect

4.3.5 No further mitigation or enhancement is considered to be required so the residual effect is predicted to be **negligible**, which is not significant in EIA terms.

Future monitoring

4.3.6 No future monitoring is considered to be required.

4.4 Transboundary effects

4.4.1 A screening of transboundary impacts has been carried out and is presented in Volume 5, Appendix 4.2: Transboundary Impacts Screening Note. This screening exercise identified that there was no potential for significant transboundary effects with regard to air quality from Thurrock Flexible Generation Plant upon the interests of other European Economic Area (EEA) States.

4.5 Inter-related effects

4.5.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the construction, operation or decommissioning of Thurrock Flexible Generation Plant on the same receptor. The following assessments have been made and a description of the likely inter-related effects on air quality is provided in Volume 4, Chapter 17: Summary of Inter-Related Effects.

Project lifetime effects

4.5.2 Assessment of the potential for effects that occur during more than one stage of the development’s lifetime (construction, operation or decommissioning) to interact such that they may create a more significant effect on a receptor than when assessed in isolation for each stage.

Receptor-led effects

4.5.3 Assessment of the potential for effects via multiple environmental or social pathways to interact, spatially and temporally, to create a greater inter-related effect on a receptor than is predicted for each pathway (in its respective topic chapter) individually.

5. Cumulative Effects Assessment

5.1 Introduction

5.1.1 The process of identifying other consented or proposed developments and screening to create a shortlist of those having potential for cumulative effects with Thurrock Flexible Generation Plant is described in Volume 2, Chapter 4: Environmental Impact Assessment Methodology and Volume 5, Appendix 4.1: Cumulative Developments and Cumulative Effects Screening Matrix. Appendix 4.1 lists the shortlisted cumulative developments and the tier they have been assigned (guiding the weight that the decision-maker may place on each development's likelihood of being realised) in accordance with PINS Guidance Note 17 (PINS, 2015).

5.1.2 Cumulative developments shortlisted are those that have potential to contribute impacts affecting receptors also affected by the proposed development (for example, contributing significant additional traffic to the same road links), or that introduce additional sensitive receptors (for example, new residences or school closer to the proposed development than existing), or both.

5.1.3 The cumulative effects assessment for air quality has been undertaken in two stages, reported as follows. In the first stage, cumulative effects of the proposed development have been considered in an overall scenario where the land surrounding the proposed development could be largely transformed by three adjacent NSIP developments and the possible expansion of nearby residential and employment uses to the east. This is referred to as the 'max development' scenario.

5.1.4 In the second stage, cumulative effects with specific individual development projects have been assessed where these would affect a particular environmental pathway or receptor for air quality. Only shortlisted developments with potential cumulative effects specific to air quality are assessed in this chapter.

5.2 Cumulative effects in 'max development' scenario

5.2.1 Three NSIP developments are proposed on land adjacent to and in some cases overlapping with the Thurrock Flexible Generation Plant application boundary. The Tilbury2 port expansion adjacent to the west is at examination stage (Tier 1). The Tilbury Energy Centre power station to the south and Lower Thames Crossing motorway and link road to the east and north are both at EIA scoping stage (Tier 2).

5.2.2 Outline planning permission has been granted for several residential and mixed-use developments expanding Linford and East Tilbury in the direction of Thurrock Flexible Generation Plant (Tier 1).

5.2.3 Should all of these developments proceed, Thurrock Flexible Generation Plant's main development site would be closely surrounded on all sides by the temporary or permanent works areas of the NSIPs. Its gas connection point to Feeder 18 could be adjacent to the expanded outskirts of Linford and also potentially to the Tilbury Energy Centre gas connection. Its cooling pipe route and intake/outfall could be under or adjacent to the Lower Thames Crossing and would cross the route of either of the Tilbury Energy Centre gas connection options.

5.2.4 The Thurrock Core Strategy (2015) allocates land for possible strategic employment provision and sustainable economic growth to the west of the proposed development and to the east where there is existing industry at East Tilbury. Thurrock Borough Council is drafting a new Local Plan to replace the Core Strategy. The Issues and Options (Stage 2) consultation document proposals map of July 2018 (withdrawn temporarily due to recent NPPF changes) suggested possible zones for residential and commercial/employment development in areas east of the proposed development, where this would be facilitated by the Lower Thames Crossing project. However, these Tier 3 development possibilities are afforded only limited weight due to the early stage of this local plan development process.

5.2.5 In the 'max development' scenario set out in paragraphs 5.2.1 to 5.2.3 above, the air quality cumulative effects of Thurrock Flexible Generation Plant has been considered in the section below.

5.3 Cumulative effects with specific developments

Construction phase

5.3.1 During the construction phase, there is the potential for cumulative effects where there are other sources of dust located within 700 metres of the proposed development (the IAQM indicative maximum radius of effects for an individual construction site being 350m).

Significance of effect

5.3.2 Large construction sites would typically implement mitigation measures, such as those recommended in the IAQM dust guidance. With the effective implementation of appropriate mitigation measures at other construction sites within 700 metres of the proposed development, the residual cumulative dust effects are unlikely to be significant.

Further mitigation or enhancement

5.3.3 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Residual effect

5.3.4 No further mitigation or enhancement is considered to be required so the residual effect is predicted to be **negligible**, which is not significant in EIA terms.

Operational and maintenance phase

5.3.5 As outlined in Table 2.18, four scenarios have been modelled. The results presented in this chapter are for scenario 1: 60 X 10.4 MW engines, each with its own stack (60 stacks) as the predicted concentrations for this scenario were highest. The results for the other three scenarios are presented in Volume 6, Appendix 12.5: Results of Other Scenarios.

Tilbury2

5.3.6 The PECs presented in Section 4.2 comprise the PCs from the Thurrock Flexible Generation Plant and the AC. The AC for R1 to R27 (receptors 14 to 40) also includes the PC for Tilbury2. Therefore the effects of Tilbury2 have been considered at these receptors. For receptors 1 to 3, the Tilbury2 PC has been considered by adding the PC from the nearest modelled receptor to the Thurrock Flexible Generation Plant PC and the AC. The Tilbury2 PC at receptors 3 to 13 is considered to be zero as they are more than 500m from the Tilbury2 receptors.

Lower Thames Crossing

5.3.7 The Lower Thames Crossing application is in the early stages and so there is limited information. The Lower Thames Crossing Post-Consultation Scheme Assessment Report Volume 7: Appraisal Summary and Recommendations report states on page 17 under the Air Quality heading:

"Generally levels of nitrogen dioxide at the properties closes to Routes 3 and 4 are in the order of 20 µg/m3 in the Without Scheme scenario and in the With Scheme scenario levels decrease or increase by only 1 µg/m3."

5.3.8 On that basis, for receptors within approximately 500 m of the Lower Thames Crossing route, a Lower Thames Crossing PC of 1 $\mu g.m^{-3}$ has been added.

Tilbury Energy Centre

5.3.9 As for the Lower Thames Crossing development, there is limited information regarding the air quality impacts for the Tilbury Energy Centre development. Due to its proximity to the Thurrock Flexible Generation Plant site, emissions data for a similar sized Closed Circuit Gas Turbine (CCGT) have been explicitly modelled at each of the receptors. Table 5.1 sets out the stack parameters and emissions data modelled to estimate a likely Tilbury Energy Centre PC. It was assumed that the CCGT will run continuously.

Table 5.1: Stack Emissions and Parameters Modelled for Tilbury Energy Centre.

Parameter	Unit	Value
Grid coordinates	x,y	566204,175965
Stack height	m	75
Internal diameter	m	15.7
Efflux velocity	$m.s^{-1}$	16
Efflux temperature	^{o}C	78
Actual Volumetric flow	$m^{3}.s^{-1}$	3079
NOx Mass Emission Rate	$g.s^{-1}$	82.5

Tilbury Green Power

5.3.10 The Tilbury Green Power biomass plant has also been considered when calculating the cumulative PEC. The biomass plant is now built and operational and has been included to an extent in the ACs for some of the receptors. At the time of the project-specific monitoring, the biomass plant was operational and so its PC is considered in the AC for some of the receptors. For receptors where the AC is based on the results of local authority monitoring which was undertaken before the biomass plant was operational, a PC of 1 $\mu g.m^{-3}$ was added to the cumulative PEC. This is consistent with the Tilbury2 air quality assessment, which assumed a PC of 1 $\mu g.m^{-3}$ at all receptors. This is likely to be an overestimate as the biomass plant is over 3.5 km from the Thurrock Flexible Generation Plant site.

Other Cumulative Projects

5.3.11 There are a number of other smaller cumulative projects in the area described in Volume 5, Appendix 4.1: Cumulative Developments and Screening that will generate traffic.

5.3.12 As the Thurrock Flexible Generation Plant development will not generate significant traffic, detailed modelling of traffic-related emissions was scoped out. As such, the cumulative traffic has not been explicitly modelled or included in the Cumulative PEC presented in this chapter. Instead the effects of cumulative traffic from the smaller cumulative developments have been considered qualitatively in paragraph 5.3.23.

Magnitude of impact

5.3.13 For the purposes of this assessment, the magnitude of impact is considered to be the change in concentration relative to the AQAL i.e. the PC as a % of AQAL column in Table 5.2 and Table 5.4.

Sensitivity of the receptor

5.3.14 For the purposes of this assessment, the sensitivity of the receptor is considered to be the long term average concentration at each receptor i.e. the Cumulative PEC as a % of the AQAL column in Table 5.2 and Table 5.4.

Significance of effect

Long-term Impacts

5.3.15 Table 5.2 summarise the long-term maximum PC and the Cumulative PEC values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 5.2: Long-term Cumulative Predicted NO_2 Concentrations ($\mu g.m^{-3}$) at Sensitive Receptors.

Receptor ID	Receptor Name	AC ($\mu g.m^{-3}$)*	Thurrock Flexible Generation Plant PC ($\mu g.m^{-3}$)	PC as % of AQAL	Tilbury2 PC ($\mu g.m^{-3}$)	Lower Thames Crossing PC ($\mu g.m^{-3}$)	Tilbury Energy Centre PC ($\mu g.m^{-3}$)	Tilbury Green Power PC ($\mu g.m^{-3}$)	Cumulative PEC ($\mu g.m^{-3}$)	Cumulative PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	3.4	8	0.6	-	0.04	-	30.5	76	Moderate
2	Sandhurst Road	26.4	2.4	6	3	-	0.05	-	31.9	80	Moderate
3	School	34.7	1.2	3	0.9	-	0.13	1	38.0	95	Moderate
4	Gateway Academy	29.6	0.5	1	-	1	0.03	-	31.1	78	Negligible
5	Gravel Pit Cottages	18.0	4.0	10	-	1	0.57	-	23.5	59	Slight
6	Princess Margaret Rd	18.0	2.2	6	-	1	0.39	-	21.6	54	Slight
7	Walnut Tree Farm	18.3	4.2	11	-	1	0.30	-	23.8	60	Moderate
8	The Green	18.3	1.3	3	-	1	0.14	-	20.8	52	Negligible
9	**West Street**	**42.7**	**0.6**	**2**	**-**	**-**	**0.15**	**1**	**44.4**	**111**	**Substantial**
10	Milton School	32.1	0.5	1	-	-	0.07	1	33.7	84	Negligible
11	Royal Pier Road	32.3	0.6	2	-	-	0.14	1	34.1	85	Slight
12	West Tilbury Hall	18.3	1.6	4	-	1	0.15	-	21.1	53	Negligible
13	Cooper Shore	18.3	2.4	6	-	1	0.21	-	21.9	55	Slight
14	R1	31.1	0.2	0	-	1	0.05	1	33.3	83	Negligible
15	R2	27.6	0.1	0	-	1	0.05	1	29.8	74	Negligible
16	R3	28.3	0.2	1	-	1	0.04	1	30.6	76	Negligible
17	R4	26.9	0.3	1	-	1	0.05	1	29.3	73	Negligible
18	R5	32.2	0.3	1	-	1	0.05	1	34.6	86	Negligible
19	R6	26.9	0.4	1	-	1	0.07	1	29.4	73	Negligible
20	R7	28.1	0.4	1	-	1	0.05	1	30.5	76	Negligible
21	R8	28.9	0.4	1	-	-	0.03	1	30.4	76	Negligible
22	R9	36.6	1.0	2	-	-	0.07	1	38.7	97	Moderate
23	R10	30.6	1.2	3	-	-	0.17	1	32.9	82	Slight
24	R11	26.6	1.1	3	-	-	0.27	1	28.9	72	Negligible
25	R12	26.1	1.1	3	-	-	0.29	1	28.5	71	Negligible
26	R13	26.4	2.2	5	-	-	0.07	1	29.6	74	Negligible

Receptor ID	Receptor Name	AC (µg.m^{-3})*	Thurrock Flexible Generation Plant PC (µg.m^{-3})	PC as % of AQAL	Tilbury2 PC (µg.m^{-3})	Lower Thames Crossing PC (µg.m^{-3})	Tilbury Energy Centre PC (µg.m^{-3})	Tilbury Green Power PC (µg.m^{-3})	Cumulative PEC (µg.m^{-3})	Cumulative PEC as % of AQAL	Impact Descriptor
27	R14	26.8	1.8	4	-	-	0.13	1	29.7	74	Negligible
28	R15	23.6	3.3	8	-	-	0.04	1	27.9	70	Slight
29	R16	25.8	1.3	3	-	-	0.26	1	28.4	71	Negligible
30	R17	26.2	1.2	3	-	-	0.29	1	28.7	72	Negligible
31	R18	24.1	0.3	1	-	1	0.04	1	26.4	66	Negligible
32	R19	31.6	1.3	3	-	-	0.13	1	34.0	85	Slight
33	R20	23.5	0.2	1	-	1	0.05	1	25.7	64	Negligible
34	R21	34.8	0.2	0	-	1	0.05	1	37.0	93	Negligible
35	R22	24.8	0.2	0	-	1	0.05	1	27.0	68	Negligible
36	R23	34.1	0.1	0	-	1	0.05	1	36.3	91	Negligible
37	R24	28.5	0.2	0	-	1	0.04	1	30.7	77	Negligible
38	R25	33.8	0.4	1	-	-	0.12	1	35.3	88	Negligible
39	R26	22.6	0.2	0	-	1	0.04	1	24.8	62	Negligible
40	R27	24.5	0.3	1	-	1	0.05	1	26.9	67	Negligible

*For receptors R1 to R27, the AC includes the PC from Tilbury2.

Receptors in bold exceed the AQAL.

5.3.16 Predicted annual-mean NO_2 at the facades of existing receptors are below the AQS objective for NO_2 for all but one receptor. At West Street (receptor 9) the predicted NO_2 concentration exceeds the AQS objective of 40 µg.m^{-3} both with and without the development. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'substantial adverse' for all receptors.

5.3.17 There are five receptors where the cumulative impact is 'moderate adverse' and one where the impact descriptor is 'substantial adverse'. At Fort Road (receptor 1), Sandhurst Road (receptor 2), School (receptor 3), Walnut Tree Farm (receptor 7) and R9 (receptor 22) the cumulative impact descriptor is moderate adverse.

5.3.18 With reference to the impacts at these five receptors, the Environment Agency's on-line guidance states that:

"You don't need to take further action if your assessment has shown that both of the following apply:

Your proposed emissions comply with BAT associated emission levels (AELs) or the equivalent requirements where there is not BAT AEL

… the resulting PECs won't exceed environmental standards".

5.3.19 At Walnut Tree Farm the PEC is only 60% of the AQAL. This demonstrates that there is considerable headroom between the AQAL and the PEC.

5.3.20 At West Street, the cumulative impact descriptor is 'substantial adverse' and the cumulative PEC is 111% of the AQAL. This is in large part due to the AC which itself exceeds the AQAL. The AC is based on the average measured concentrations between 2012 and 2016 at the nearest monitoring location, GR13. The table below shows the measured concentrations at GR13 in the last five years.

Table 5.3: Annual-mean NO_2 Concentrations at GR13 (µg.m^{-3}).

	2012	2013	2014	2015	2016	Average
GR13	48.2	45.2	42.5	40	37.5	42.7

5.3.21 The results show that in the last five years at this location, measured concentrations have decreased every year. Therefore an AC of 42.7 µg.m^{-3} is a conservative assumption and in reality the AC in the opening year is likely to be lower. This is in line with the view that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. The opening year of the proposed development is likely to be 2020 and so concentrations are expected to decrease even further.

5.3.22 If the AC at West Street is assumed to be 37.5 µg.m^{-3}, the PEC is only 98% of the AQAL and based on the Environment Agency's on-line guidance further action would not be required.

5.3.23 As discussed in paragraph 5.3.12, other smaller cumulative developments will generate traffic which could increase concentrations of NO_2.

5.3.24 There are five receptors where the Cumulative PEC as a % of the AQAL is greater than 90%; receptors 3, 9, 22, 34 and 36.

5.3.25 Section 2.5 provided an analysis of the sources of uncertainty in the results of the assessment. The conclusion of that analysis was that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

5.3.26 Similarly a number of maximum design parameters were assessed It should be noted that the results presented in this chapter are worst-case and based on a number of conservative assumptions. In reality, it is unlikely that all the maximum design parameters will be implemented.

5.3.27 On that basis and using professional judgement, the overall significance of the long-term cumulative effect is considered to be minor adverse.

Short-term Impacts

5.3.28 Table 5.4 summarises the short-term maximum PC and cumulative PEC values at the selected discrete sensitive receptors. The EPUK & IAQM impact descriptors are also shown. For the short-term Cumulative PEC, the Thurrock Flexible Generation Plant PC has been added to the Cumulative AC. The sum of the AC, Tilbury2 PC, Lower Thames Crossing PC, Tilbury Energy Centre PC and Tilbury Green Power PC which is then doubled to derive the Cumulative AC. multiplied by two. This follows the Environment Agency's on-line guidance which states that: *"When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration."*

Table 5.4: Short-term Cumulative Predicted NO_2 Concentrations ($\mu g.m^{-3}$) at Sensitive Receptors.

Receptor ID	Receptor Name	AC ($\mu g.m^{-3}$)*	PC ($\mu g.m^{-3}$)	PC as % of AQAL	Cumulative AC ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	48.1	24	54.2	102.2	51	Moderate
2	Sandhurst Road	52.9	41.8	21	59.0	100.8	50	Moderate
3	School	69.4	27.3	14	73.5	100.7	50	Slight
4	Gateway Academy	59.2	24.5	12	61.3	85.7	43	Slight
5	Gravel Pit Cottages	36.0	40.6	20	39.2	79.8	40	Slight
6	Princess Margaret Rd	36.0	31.9	16	38.8	70.7	35	Slight
7	Walnut Tree Farm	36.7	62.2	31	39.3	101.4	51	Moderate
8	The Green	36.7	42.3	21	38.9	81.3	41	Moderate
9	West Street	85.4	24.5	12	87.7	112.2	56	Slight
10	Milton School	64.2	23.6	12	66.3	89.9	45	Slight
11	Royal Pier Road	64.6	25.3	13	66.9	92.2	46	Slight
12	West Tilbury Hall	36.7	50.2	25	39.0	89.1	45	Moderate
13	Cooper Shore	36.7	66.5	33	39.1	105.6	53	Moderate
14	R1	62.2	9.4	5	66.5	75.9	38	Negligible
15	R2	55.2	8.4	4	59.3	67.7	34	Negligible
16	R3	56.6	16.4	8	61.5	77.9	39	Negligible
17	R4	53.8	14.3	7	58.9	73.2	37	Negligible
18	R5	64.4	14.3	7	69.1	83.4	42	Negligible
19	R6	53.8	15.7	8	58.1	73.9	37	Negligible
20	R7	56.2	16.5	8	61.9	78.4	39	Negligible
21	R8	57.8	18.6	9	61.5	80.1	40	Negligible
22	R9	73.2	24.1	12	79.1	103.2	52	Slight
23	R10	61.2	27.1	14	72.3	99.4	50	Slight
24	R11	53.2	28.8	14	59.1	87.9	44	Slight
25	R12	52.2	29.4	15	58.2	87.6	44	Slight
26	R13	52.8	40.3	20	60.9	101.3	51	Slight
27	R14	53.6	37.0	18	63.5	100.4	50	Slight
28	R15	47.2	47.8	24	50.5	98.3	49	Moderate

Receptor ID	Receptor Name	AC (µg.m^{-3})*	PC (µg.m^{-3})	PC as % of AQAL	Cumulative AC (µg.m^{-3})	PEC (µg.m^{-3})	PEC as % of AQAL	Impact Descriptor
29	R16	51.6	32.0	16	57.7	89.7	45	Slight
30	R17	52.4	30.6	15	59.2	89.7	45	Slight
31	R18	48.2	17.8	9	52.7	70.5	35	Negligible
32	R19	63.2	27.0	13	67.3	94.3	47	Slight
33	R20	47.0	11.4	6	51.3	62.7	31	Negligible
34	R21	69.6	10.6	5	74.7	85.3	43	Negligible
35	R22	49.6	9.2	5	53.7	62.9	31	Negligible
36	R23	68.2	8.7	4	72.5	81.2	41	Negligible
37	R24	57.0	11.8	6	61.3	73.1	37	Negligible
38	R25	67.6	12.6	6	70.0	82.7	41	Negligible
39	R26	45.2	12.3	6	49.3	61.6	31	Negligible
40	R27	49.0	16.2	8	53.7	69.9	35	Negligible

* The short-term AC is twice the long-term AC. For receptors R1 to R27, the AC includes the PC from Tilbury2.

5.3.29 For all receptors the cumulative PEC is less than 60% of the AQAL of 200 $\mu g.m^{-3}$. This demonstrates that there is considerable headroom between the short-term AQAL and the PEC. On that basis and using professional judgement, the short-term cumulative effect is considered to be minor adverse.

Further mitigation or enhancement

5.3.30 At this stage the specifics of the engine types, layout and building dimensions are unknown. A number of worse-case scenarios have been modelled as outlined in Table 2.18. Further mitigation or enhancement could include the aggregation of stacks and the use of SCR technology. The results presented in this chapter assume that there is no aggregation of stacks and that no SCR is used.

Residual effect

5.3.31 Assuming that no further mitigation or enhancement was employed, the residual effects would remain 'not significant'.

Decommissioning phase

5.3.32 During the decommissioning phase, there is the potential for cumulative effects where there are other sources of dust located within 700 metres of the proposed development (the IAQM indicative maximum radius of effects for an individual construction site being 350 m).

Magnitude of impact

5.3.33 It has been assumed that the magnitude of impact is the same as or lower than during the construction phase.

Sensitivity of the receptor

5.3.1 It has been assumed that the magnitude of impact is the same as or lower than during the construction phase.

Significance of effect

5.3.2 Large construction sites would typically implement mitigation measures, such as those recommended in the IAQM dust guidance. With the effective implementation of appropriate mitigation measures at other construction sites within 700 metres of the proposed development, the residual cumulative dust effects are unlikely to be significant.

Further mitigation or enhancement

5.3.3 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Residual effect

5.3.1 No further mitigation or enhancement is considered to be required so the residual effect would not result in a significant effect once the recommended IAQM mitigation measures are implemented.

Future monitoring

5.3.2 No future monitoring is considered to be required.

6. Conclusion and summary

6.1.1 Impacts during the construction of the proposed development, such as dust generation and plant vehicle emissions, are predicted to be of short duration and only relevant during the construction phase. The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance, indicates that before the implementation of mitigation and controls, the risk of dust impacts will be medium. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance should reduce the residual dust effects to a level categorised as “not significant”.

6.1.2 The number of vehicle movements generated by construction activities is below the threshold criteria for requiring an assessment. The impacts due to emissions from construction-related vehicle emissions are therefore considered to be “not significant”.

6.1.3 Emissions from the proposed development have been assessed through detailed dispersion modelling using best practice approaches. The assessment has been undertaken based on a number of conservative assumptions. This is likely to result in an over-estimate of the contributions that will arise in practice from the facility. The results of dispersion modelling reported in this assessment indicate that predicted contributions and resultant environmental impact for all pollutants considered are ‘negligible’ to ‘moderate adverse’.

6.1.4 Using professional judgement, the resulting air quality effect of the proposed development is considered to be ‘not significant’ overall.

6.1.5 The proposed development does not, in air quality terms, conflict with national or local policies. There are no constraints to the development in the context of air quality.

6.2 Next Steps

6.2.1 For the ES, the effects of ammonia emissions will be considered.

Table 6.1: Summary of potential environment effects, mitigation and monitoring.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction							
Increase in suspended particulate matter concentrations and deposited dust.	Best practice measures for a medium risk site as recommended in the IAQM dust guidance. The measures are listed in Table 2.20.	Large for Construction, Earthworks and Trackout	All low, medium and high sensitivity receptors within 350 m of the site boundary were considered. The sensitivity of the area was low or medium.	Negligible	None	Negligible	None
Operation							
Increase in NO_2 concentrations	None	Negligible to moderate adverse	Specific to each receptor	Minor Adverse	None	Minor Adverse	None
Decommissioning							
Increase in suspended particulate matter concentrations and deposited dust.	Assumed to be the same as for the Construction Phase	Large for Construction, Earthworks and Trackout (assumed to be the same as for the construction phase)	All low, medium and high sensitivity receptors within 350 m of the site boundary were considered.	Negligible	None	Negligible	None

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