5 Air Quality

5.1 Purpose of this Chapter

5.1.1 This chapter assesses the likely significant air quality effects resulting from the Proposed Development.

5.2 Regulatory and Policy Framework

5.2.1 There are three main aspects to the regulatory framework affecting potentially-polluting developments; the planning process determines whether and where the development can be located; building regulations control the design and construction of developments; and once built, regulation of pollution from the operation of certain prescribed processes is by the Environmental Permitting Regulations or by nuisance provisions for premises not operating prescribed processes. The relevant parts of the framework of pollution regulation, planning policy and relevant guidance is summarised below.

Industrial Emissions Directive Limits

5.2.2 The plant would be designed and operated in accordance with the requirements of the Industrial Emissions Directive (2010/75/EU) [Ref 5.1], known hereafter as the IED, which requires adherence to emission limits for a range of pollutants.

Air Quality Directive and Air Quality Standards Regulations

5.2.3 The 2008 Ambient Air Quality Directive (2008/50/EC) [Ref 5.2] 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 [Ref 5.3], which in addition incorporates the 4th Air Quality Daughter Directive (2004/107/EC) that sets targets for ambient air concentrations of certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). Member states must comply with the limit values (which are legally binding on the Secretary of State) and the Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

UK Air Quality Strategy

5.2.4 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 [Ref 5.4]. 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.

5.2.5 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.

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

5.2.7 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.

5.2.8 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.

5.2.9 The limit values and objectives relevant to this assessment are summarised in Table 5.1.

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}	-
Carbon Monoxide (CO)	Maximum daily running 8 hour mean	10,000 µg.m^{-3}	-
Particulate Matter (PM_{10})	Annual	40 µg.m^{-3}	-

Table 5.1 Summary of Relevant Air Quality Limit Values and Objectives

5.2.10 In July 2017, Defra published the 'UK plan for tackling roadside nitrogen dioxide concentrations'. 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.

Environmental Protection Legislation

Environmental Permitting

5.2.11 Certain industrial installations are regulated under the Environmental Permitting (England and Wales) Regulations 2016, which implement the EU Directive 2008/1/EC concerning Integrated Pollution Prevention and Control ("the IPPC Directive"). The Environmental Permitting Regulations (EPR) define activities that require the operator to obtain an Environmental Permit from the EA.

5.2.12 EPR is a regulatory system to control the environmental and health impacts across all environmental media (using an integrated approach) of certain listed industrial activities, via a single permitting process. To gain a permit, operators have to demonstrate in their applications, in a systematic way, that the techniques they are using or are proposing to use for their installation are the Best Available Techniques (BAT) to prevent or minimise the effects of the activity on air, land and water taking account of relevant local factors. The permitting process also places a duty on the regulating body to ensure that the requirements of the IPPC Directive are included for permitted sites to which these apply.

5.2.13 It is a mandatory requirement of EPR that the Agency ensures that no single industrial installation regulated is the sole cause of a breach of a UK air quality objective. Additionally, the Agency has committed to guarantee that no installation will contribute significantly to a breach of a UK air quality objective.

5.2.14 To do this the Agency will ensure that BAT is used to deliver the maximum improvements to air quality where UK air quality objectives are in danger of being breached.

Planning Policies

National Policy Statements (NPS)

5.2.15 Section 5.2 of the Overarching National Policy Statement for Energy (EN-1) *Air quality and emissions* sets out the potential impacts associated with infrastructure development, what should be included in an ES and the role of the IPC (now the Secretary of State) in decision making and mitigation. It states "*The ES should describe:*

- *any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;*
- *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."*

5.2.16 Section 2.5 of the National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2) follows a similar structure to EN-1 and refers to relevant sections of EN-1. The main difference is the Mitigation section which, for EN-3, will depend on the type and design of a generating station.

National Planning Policy Framework (NPPF)

5.2.17 The NPPF sets out 12 core land-use planning principles. The relevant core-principle in the context of this air quality assessment is that planning should *"contribute to conserving and enhancing the natural environment and reducing pollution"*. (Paragraph 17)

5.2.18 Under the heading 'Conserving and Enhancing the Natural Environment', the NPPF states:

> *"The planning system should contribute to and enhance the natural and local environment by:*
>
> …
>
> *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…* "(Paragraph 109)

National Planning Practice Guidance (NPPG)

5.2.19 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.

5.2.20 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).

5.2.21 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."*

5.2.22 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."*

Swale Borough Council's Development Plan

5.2.23 The Bearing Fruits 2031: The Swale Borough Local Plan was formally adopted by the council on 26 July 2017. In relation to air quality, paragraph 7.7.3 of the plan states that *"Transport and industry are the Borough's main air pollution emitters"*. It refers to the need for assessment where developments could have an impact on air quality levels within the AQMAs.

5.2.24 There are no specific policies in the plan guiding industrial development in relation to air quality impacts; the policies generally focus on managing and controlling the impacts of development arising from traffic emissions. In particular, in relation to managing traffic impacts, policy DM6 states that air quality management and environmental quality should be integrated *"into the location and design of, and access to, development and, in so doing, demonstrate that proposals do not worsen air quality to an unacceptable degree especially taking into account the cumulative impact of development schemes within or likely to impact on Air Quality Management Areas"*.

5.2.25 In this case, the key pollutants from the proposed development are oxides of nitrogen which are also a key concern for traffic emissions. While policy DM6 is not strictly relevant to this development, the assessment has regard for the cumulative impact of the development on the surrounding area including the designated AQMAs.

5.3 Assessment Methodology

Scoping and Consultation

5.3.1 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners 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:

> *"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."

5.3.2 It lists a number of areas that might be usefully agreed at the outset.

5.3.3 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 [Ref 5.6], the IAQM Guidance on the assessment of dust from demolition and construction [Ref 5.7] and, where relevant, Defra's Local Air Quality Management Technical Guidance: LAQM.TG16 [Ref 5.8]. 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.

5.3.4 The EPUK & IAQM guidance [Ref 5.6, paragraph 7.9] 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 20 years' experience. Appendix 1.1 provides CVs of those involved in this assessment.

5.3.5 The scope and methodology for the air quality assessment, as set out in this chapter, was agreed with the Environmental Protection Team Leader at Mid Kent Environmental Health. A copy of the consultation emails are shown in Appendix 5.1.

Establishing Baseline Conditions

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

5.3.7 The atmospheric pollutant concentrations depend not only on local sources, but also on regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources.

5.3.8 Background pollution levels have been derived from consideration of Air Quality Review & Assessment findings and assessment of existing local air quality through a review of available air quality monitoring and Defra background map data in the vicinity of the proposed site.

Assessment of Effects

Construction Phase

5.3.9 Regarding exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles), these are unlikely to have a significant impact on local air quality [Ref 5.6] except for large, long-term construction sites: the EPUK & IAQM *Land-Use Planning & Development Control: Planning For Air Quality* document [Ref 5.6] indicates in Table 6.2 that air quality assessments should include developments increasing annual average daily Heavy Duty Vehicle (HDV) traffic flows on the local road network by more than 25 within or adjacent to an AQMA and more than 100 elsewhere. Construction-related traffic is expected to access the Site via the A249 and the M2. Neither route is located within a designated AQMA. There will also be movements within the site, between the laydown/compound area and the footprint of K4; however, this internal road is located well away from sensitive receptors and so has not been assessed.

5.3.10 The average number of two-way HGV movements generated by construction activities is estimated at 60 per day. The indicative criterion of 100 vehicles outside an AQMA is therefore not exceeded. When the HGV movements are averaged across the year, taking into account non-working days, the increase in the annual average daily traffic is even lower.

5.3.11 The traffic flows are expected to be significantly lower on other routes other than the A249 and the M2 as the traffic redistributes. Therefore, the aforementioned EPUK & IAQM traffic-flow thresholds are not expected to be exceeded for any individual road during the construction phase of this project and the impacts of construction-vehicle exhaust emissions have not been assessed specifically and can be considered to be negligible.

5.3.12 Dust is the generic term used to describe particulate matter in the size range 1-75 μm in diameter [Ref 5.9]. Particles greater than 75 μm in diameter are termed grit rather than dust. 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.

5.3.13 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, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

5.3.14 The IAQM Guidance on the assessment of dust from demolition and construction sets out 350 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 500 m of the entrance, within which there could potentially be nuisance dust and PM_{10} effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases. (In this particular application. These distances are set to be deliberately conservative. These distances are set to be deliberately conservative.

5.3.15 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 dust annoyance 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.

5.3.16 The IAQM dust guidance aims to estimate the impacts of both PM_{10} and dust through a risk-based assessment procedure. The IAQM dust guidance document states on page 4: *"The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified."*

5.3.17 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: *"This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified."*

5.3.18 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, 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.

5.3.19 The detail of the dust assessment methodology is provided in Appendix 5.3.

5.3.20 The assessment methodology does not consider the air quality impacts of dust from any contaminated land or buildings; the issue of contamination is dealt with in Chapter 8: Ground Conditions.

Operational Phase

Summary of Key Pollutants Considered

5.3.21 As set out in paragraph 5.3.9, the EPUK & IAQM *Land-Use Planning & Development Control: Planning For Air Quality* document 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. Once completed, there will be 4 employees accessing the site on a daily basis and occasional maintenance vehicle movements. 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 K4.

5.3.22 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 and CO.

5.3.23 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. The assessment of operational impacts from K4 therefore focuses on changes in NO_2 and CO concentrations at ground level receptors. Emissions for CO_2 are considered in Chapter 6 Greenhouse Gases and Climate Change.

Dispersion Model Selection

5.3.24 A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources. Modelling for this study has been undertaken using ADMS 5, a version of the ADMS (Atmospheric Dispersion Modelling System) developed by Cambridge Environmental Research Consultants (CERC) that models a wide range of buoyant and passive releases to atmosphere either individually or in combination. The model calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings and deposition. Dispersion models predict atmospheric concentrations within a set level of confidence and there can be variations in results between models under certain conditions; the ADMS 5 model has been formally validated and is widely used in the UK and internationally for regulatory purposes.

5.3.25 ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. Amongst the features of ADMS are:

- An up-to-date dispersion model in which the boundary layer structure is characterised by the height of the boundary layer and the Monin-Obukhov length, a length scale dependent on the friction velocity and the heat flux at the surface. This approach allows the vertical structure of the boundary layer, and hence concentrations, to be calculated more accurately than does the use of Pasquill-Gifford stability categories, which were used in many previous models (e.g. ISCST3). The restriction implied by the Pasquill-Gifford approach that the dispersion parameters are independent of height is avoided. In ADMS the concentration distribution is Gaussian in stable and neutral conditions, but the vertical distribution is non-Gaussian in convective conditions, to take account of the skewed structure of the vertical component of turbulence;

- A number of complex modules including the effects of plume rise, complex terrain, coastlines, concentration fluctuations and buildings; and

- A facility to calculate long-term averages of hourly mean concentration, dry and wet deposition fluxes and radioactivity, and percentiles of hourly mean concentrations, from either statistical meteorological data or hourly average data.

Meteorological Data

5.3.26 The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability as described below:

- Wind direction determines the sector of the compass into which the plume is dispersed;

- Wind speed affects the distance that the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise; and

- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models, including ADMS, use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.

5.3.27 For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

5.3.28 The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. Dispersion model simulations have been performed using five years of data from Gravesend between 2012 and 2016.

5.3.29 Wind roses have been produced for each of the years of meteorological data used in this assessment and are presented in Figure 5.1.

Surface Roughness

5.3.30 The roughness of the terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length.

5.3.31 A surface roughness length of 0.5 m has been used within the model to represent the average surface characteristics across the study area.

Terrain

5.3.32 A complex terrain file has been included within the model to ensure that the relative height between receptors and the source of emissions is taken into account.

Building Wake Effects

5.3.33 The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are greater than about 30 - 40% of the stack height, downwash effects can be significant. Chapter 2 provides a site layout plan. The buildings associated with the Proposed Development that have been included within the model are provided in Table 5.2.

~~5.3.33~~5.3.34 During the examination of the application the required maximum height of the Gas Turbine building was increased to 14.5m, approximately 20% of the recommended 70 m minimum stack height for K4. Given the increase in the height of the Gas Turbine building is less than 30% of the stack it is unlikely to change the magnitude of the predicted concentrations with the building as assessed at 9.9 as set out in Table 5.2 below. Furthermore, the Gas Turbine building is adjacent to the HSRG building which, at a height of 35.2 m, will be the dominant building affecting the K4 plume. On that basis, the change in Gas Turbine building height is highly unlikely to change the conclusions of the air quality assessment presented herein.

	Building Name	Approx. location of centre (x,y)	Length (m)	Width (m)	Height (m)
K4	HRSG	591968,166308	30.8	16.5	35.2
	Turbine Hall	591970,166290	25.3	19.8	16.5
	Dump Condenser	591994, 166280	16.5	13.2	8.8
	Equipment Room	592029, 166314	23.1	13.75	9.9
	Gas Turbine	591991, 166312	16.5	8.8	9.9
	Fin Fan Cooler	592009, 166281	11.55	7.15	7.7
	Generator	592000, 166315	5.5	4.4	6.6
K1/K2	Deaerator	592033, 166422	25	9	25
	Control Block	592028, 166392	30	36	15
	Gas Turbine House 1	592003, 166384	22	8	16
	Gas Turbine House 2	591987, 166378	22	8	16
	Package boilers	591949, 166368	35	35	13
	PRW storage plant	591939, 166443	15	41	20
	FBC boiler house	591973, 166413	26	15	28

	Fabric filters	591922, 166421	10	4	18
	Ash hoppers	591930, 166411	12	5	25
K3	Air Cooled Condenser	592098, 166589	29	80	27
	Turbine Hall	592150, 166634	40	27	23
	Flue Gas Treatment	592166, 166599	16	44	23
	Flue Gas Treatment	592181, 166615	24	43	31
	Boiler Hall	592192, 166639	30	61	50
	Bunker Hall	592223, 166662	40	72	36
	Tipping Hall	592253, 166692	46	51	21
	Bottom Ash Hall	592193, 166697	16	32	21

Table 5.2 Proposed Buildings Included Within the Model

Stack Parameters and Emissions Rates Used in Model

5.3.345.3.35 Stack and emissions characteristics modelled are provided in Table 5.3. Two locations of the K4 CHP stack are currently under consideration. For the purposes of modelling, it has been assumed that pollutant emission concentrations are at the limit set in the IED. As this is the maximum concentration that could be permitted, this is a worst case assumption. The locations of the stacks are shown in Figure 5.2.

5.3.355.3.36 For the purposes of determining the cumulative impacts, K1, K2 and K3 have been included in the model and the resulting concentrations added to the measured background concentration. The assessment can be considered conservative as emissions from K1 and K2 are already included to an extent within the background concentration and, by including K1 and K2 explicitly within the model, there is potential for double-counting of the impacts. K4 will replace K1; however, the two plant may run simultaneously for a short period, likely to be a matter of months. The inclusion of both K4 and K1 operating continuously, all year round, in the model is therefore a worst case assumption.

Parameter	Unit	K4 – Proposed CHP	K1 – Existing CHP	K2 – Fluidised Bed Combustor	K3 – Sustainable Energy Plant
Grid coordinates	x,y	Stack Location 1: 591953.369,166305.606 Stack Location 2: 591968.661,166308.668	591975, 166347	591914, 166437	592135, 166569
Stack height	m	70	75	72	90
Internal diameter	m	4	3.6	1.4	3.25
Efflux velocity	$m.s^{-1}$	15	18.65	14.95	19.06
Efflux temperature	°C	100	100	160	140
Actual Volumetric flow	$m^3.s^{-1}$	158.64	190.0	23.0	158.42
O2	%	12.75	10	11	8.1
Water	%	8.01	20	26	17.8
NOx Emission Concentration Limit	$mg.Nm^{-3}$	50 (15% O_2)	90 (15% O_2)	200 (11% O_2)	200 (11% O_2)
CO Emission Concentration Limit	$mg.Nm^{-3}$	100 (15% O_2)	100 (15% O_2)	50 (11% O_2)	50 (11% O_2)
Normalised Volumetric Flow (0°C, dry)	$Nm^3.s^{-1}$	146.87 (15% O_2)	203.96 (15% O_2)	10.73 (11% O_2)	110.98 (11% O_2)
NOx Mass Emission Rate	$g.s^{-1}$	7.3	18.4	2.2	22.2
CO Mass Emission Rate	$g.s^{-1}$	14.7	20.4	0.5	5.6

Table 5.3 Stack and Emissions Characteristics – Main Stacks

~~5.3.36~~5.3.37 In addition, backup power will be provided by the existing K1 boilers and a new boiler. The backup boilers will not run when the K4 CHP is running. The inclusion of the boilers running at the same time as K4 and K1 in the model is a worst case assumption. It should be noted that the existing K1 boilers have been modelled using the existing emissions used within the modelling to support the K1 permit application. In reality, the existing K1 boilers will be upgraded and emissions should be lower than modelled in this assessment. For the purposes of the modelling, it has been assumed that the boilers will operate for 500 hours, distributed evenly across the year.

Parameter	Unit	K4 – Proposed Boiler	K1 – Existing Boilers
Grid coordinates	x,y	591950, 166317	591950, 166325 591977, 166282
Stack height	m	35	72
Internal diameter	m	0.8	1.7
Efflux velocity	$m.s^{-1}$	9	18.1
Efflux temperature	° C	145	215
Actual Volumetric flow	$m^3.s^{-1}$	6	41
O2	%	2	4.5
Water	%	5.5	5.5
NOx Emission Concentration Limit	$mg.Nm^{-3}$	100 (3% O_2)	200 (3% O_2)
CO Emission Concentration Limit	$mg.Nm^{-3}$	N/A	300 (3% O_2)
Normalised Volumetric Flow (0°C, dry)	$Nm^3.s^{-1}$	3.91	19.87
NOx Mass Emission Rate	$g.s^{-1}$	0.4	4.0
CO Mass Emission Rate	$g.s^{-1}$	N/A	6.0

Table 5.4 Stack and Emissions Characteristics – Package Boilers

Modelled Scenarios

~~5.3.37~~5.3.38 The modelled scenarios are summarised below:

- Proposed Development - K4 with the modelled K2 and K3 included in the ambient concentration;
- Package Boilers - Proposed K4 boiler and existing K1 boilers; and
- Simultaneous Operation of K1, K2, K3 and K4.

Stack Height Determination

~~5.3.38~~5.3.39 Gas is a clean-burning fuel; nevertheless there is a need to discharge the flue gases through an elevated stack to allow dispersion and dilution of the residual combustion emissions. The stack needs to be of sufficient height to ensure that pollutant concentrations are acceptable by the time they reach ground level. The stack also needs to be high enough to ensure that releases are not within the aerodynamic influence of nearby buildings, or else wake effects can quickly bring the undiluted plume down to the ground.

~~5.3.39~~5.3.40 A stack height determination has been undertaken to identify the stack height required to overcome the wake effects of nearby buildings and to establish the height at which there is minimal additional environmental benefit associated with the cost of further increasing the stack. The Environment Agency removed its detailed guidance, Horizontal Guidance Note EPR H1 [Ref 5.10], for undertaking risk assessments on 1 February 2016; however, the approach used here by RPS is consistent with that EA guidance which required the identification of *"an option that gives acceptable environmental performance but balances costs and benefits of implementing it."*

~~5.3.40~~5.3.41 The stack height determination involved running a series of atmospheric dispersion modelling simulations to predict the ground-level concentrations with the stack at different heights. The results of the stack height determination are provided in Appendix 5.4.

NO_x to NO_2 Assumptions for Annual-Mean Calculations

~~5.3.41~~5.3.42 Total conversion (i.e. 100%) of NO to NO_2 is sometimes used for the estimation of the absolute upper limit of the annual mean NO_2. This technique is based on the assumption that all NO emitted is converted to NO_2 before it reaches ground level. However, in reality the conversion is an equilibrium reaction and even at ambient concentrations a proportion of NO_x remains in the form of NO. Total conversion is, therefore, an unrealistic assumption, particularly in the near field [Ref 5.11, page 47]. While this approach is useful for screening assessments, it is not appropriate for detailed assessments.

~~5.3.42~~5.3.43 Historically, the Environment Agency has recommended that for a 'worse case scenario', a 70% conversion of NO to NO_2 should be considered for calculation of annual average concentrations. If a breach of the annual average NO_2 objective/limit value occurs, the Environment Agency requires a more detailed assessment to be carried out with operators asked to justify the use of percentages lower than 70%.

~~5.3.43~~5.3.44 Following the withdrawal of the Environment Agency's H1 guidance document, there is no longer an explicit recommendation; however, for the purposes of this detailed assessment, a 70% conversion of NO to NO_2 has been assumed for annual average NO_2 concentrations in line with the Environment Agency's historic recommendations.

NO_x to NO_2 Assumptions for Hourly-Mean Calculations

~~5.3.44~~5.3.45 An assumed conversion of 35% follows the Environment Agency's recommendations [Ref 5.12] for the calculation of 'worse case' scenario short-term NO_2 concentrations.

Modelling of Long-term and Short-term Emissions

~~5.3.45~~5.3.46 Long-term (annual-mean) NO_2 has been modelled for comparison with the relevant annual mean objectives.

~~5.3.46~~5.3.47 For short-term NO_2, the objective is for the hourly-mean concentration not to exceed 200 µg.m^{-3} more than 18 times per calendar year. As there are 8,760 hours in a non-leap year, the hourly-mean concentration would need to be below 200 µg.m^{-3} in 8,742 hours, i.e. 99.79% of the time. Therefore, the 99.79th percentile of hourly NO_2 has been modelled.

Significance Criteria

Construction Phase

~~5.3.47~~5.3.48 Dust impact risk categories have been determined for demolition, earthworks, construction and trackout. These have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be "not significant".

Operational Phase

~~5.3.48~~5.3.49 The EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document 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."*

~~5.3.49~~5.3.50 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 5.4 provides the EPUK & IAQM approach for describing the long- human-health air quality impacts on sensitive receptors in the surrounding area.

Long term average concentration at receptor in assessment year	% 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

Table 5.5 Annual-mean Descriptors for Individual Sensitive Receptors

~~5.3.50~~5.3.51 The following notes accompany Table 5.5:

(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.

~~5.3.51~~5.3.52 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."*

~~5.3.52~~5.3.53 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."

~~5.3.53~~5.3.54 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.

Limitations and Assumptions

~~5.3.54~~5.3.55 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).

~~5.3.55~~5.3.56 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.

~~5.3.56~~5.3.57 Each of the data inputs for the model, listed earlier, 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.

~~5.3.57~~5.3.58 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 5.6.

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 conservative value from a comparison of measured and Defra mapped concentration estimates.	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 met station and the development site, and between the historical met 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	The model has been run for a grid of receptors. In addition, receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	
Cumulative Effects	Sources	K4 will replace K1; however, the plant may need to run for a short period prior to the commissioning of K4. Both plant are included within the model, operating continuously throughout the year.	The modelled cumulative fraction is likely to contribute to the result being toward the top of the uncertainty range.

Table 5.6 Approaches to Dealing with Uncertainty in the Assessment

5.3.585.3.59 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.

5.4 Baseline Conditions

Overview

5.4.1 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. The 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 [Ref 5.8] 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"*.

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

- Defra maps [Ref 5.13], which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- Published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies.

5.4.3 A detailed description of how the baseline air quality has been derived for this Proposed Development is summarised in the following paragraphs.

Review and Assessment Process

5.4.4 Swale Borough Council (SBC), has designated four areas as AQMAs due to high levels of NO_2 attributable to road traffic:

- AQMA 1 – Newington AQMA, 6 km west of the Site.
- AQMA 2 – Ospinge Street, Faversham, 9.7 km southwest of the Site.
- AQMA 3 – East Street, Sittingbourne, 3 km south of the Site.
- AQMA 4 – St Pauls Street, Sittingbourne, 2.8 km south of the Site.

5.4.5 The Site is not located within a designated AQMA. As such, air quality at the Site is good.

Local Urban Background Monitoring

5.4.6 Monitors at urban background locations measure concentrations away from the local influence of emission sources. SBC does not operate any continuous automatic instruments in a background location. The nearest continuous automatic monitor in a background location is in the neighbouring borough of Maidstone, approximately 13 km from the Site; the urban background monitor at Chatham Luton was closed in 2014 and the urban background monitor at the Chaucer Technology School in Canterbury is approximately 23 km from the Site, considerably further away than the Maidstone site.

5.4.7 The most recent annual-mean concentrations measured at Maidstone are presented in Table 5.7. Values shown in italics have low data capture.

Monitor Name	Approx. Distance from the Site (km)	Pollutant	Concentration (µg.m^{-3})						
			2011	2012	2013	2014	2015	2016	Ave
Maidstone (Rural Background)	13	NO_2	12.5	13.7	13.5	12.3	12.6	12.0	12.8
		PM_{10}	15.8	17.5	18.8	25.3	*19.0*	20	19.4

Table 5.7 Automatically Monitored Urban Background Annual-Mean Concentrations

5.4.8 SBC manually monitors NO_2 concentrations at three urban background locations using passive diffusion tubes and the most recently measured annual-mean concentrations are presented in Table 5.8. All concentrations have been adjusted for bias in accordance with good practice.

Monitor Name	Approx. Distance from the Site (km)	x	y	Concentration (µg.m^{-3})					
				2011	2012	2013	2014	2015	Ave
SW34 - Hernehill Village Hall	15.5	606624	161110	14.9	13.1	11.9	10.0	10.2	12.0
SW77 - Kemsley Fields, Swale Way	0.4	591035	166521	32.3	31.3	34.5	30.9	29.7	31.7
SW88 - Sonara Way	2.5	589320	165047	-	27.2	*24.3*	*22.3*	19.5	23.3

Table 5.8 Passively Monitored Urban Background Annual-Mean NO_2 Concentrations

5.4.9 There has been no monitoring of carbon monoxide in the south-east in recent years.

Defra Mapped Concentration Estimates

5.4.10 Defra's total annual-mean NO_2 concentration estimates have been collected for the 1 km grid squares of the monitoring sites and the Site. Similarly, Defra's total annual-mean PM_{10} concentration estimates have been collected for the 1 km grid square of the Maidstone (rural) monitoring sites and the Site. The concentrations are summarised in Table 5.9 and Table 5.10.

Monitor Name	Approx. Distance to Site (km)	Concentration ($\mu g.m^{-3}$)	
		Range of Monitored	Estimated Defra Mapped
Maidstone	13.0	12.0 - 13.7	13.6
SW34 -Hernehill Village Hall	15.5	10.0 – 14.9	11.8
SW77 - Kemsley Fields, Swale Way	0.4	29.7 – 34.5	16.5
SW88 - Sonara Way	2.5	19.5 – 27.2	16.8
The Site	-	-	16.5

Table 5.9 Defra Mapped Annual-Mean NO_2 Concentration Estimates

Monitor Name	Approx. Distance to Site (km)	Concentration ($\mu g.m^{-3}$)	
		Range of Monitored	Estimated Defra Mapped
Maidstone	13.0	15.8 – 25.3	13.6
The Site	-	-	17.2

Table 5.10 Defra Mapped Annual-Mean PM_{10} Concentration Estimates

Appropriate Background Concentrations for the Development Site

5.4.11 For NO_2, the Defra mapped concentration estimates are within the range of the results from monitoring at the Maidstone continuous automatic monitor but below the range at the other monitoring sites. At the closest monitoring locations to the site, SW77 and SW88, Defra mapped concentration estimates are well below the bottom of the range. This suggests that the Defra mapped concentration estimate would not be conservative or representative of concentrations at the Site. On that basis, the average of the concentrations monitored at SW77 Kemsley Fields has been used as the background annual-mean concentration within the model.

5.4.12 For PM_{10}, the Defra mapped concentration estimate is below the range of the results from monitoring at the Maidstone continuous automatic monitor suggesting that the Defra mapped concentration estimate would not be conservative or representative of concentrations at the Site. On that basis, the average of the concentrations monitored at Maidstone has been used as the background annual-mean concentration within the model.

5.4.13 In the absence of local CO monitoring, the background annual-mean concentration has been extracted from the Defra mapped background concentration estimate and a maximum daily running 8-hour mean has been estimated as twice the annual-mean CO concentration [Ref 5.14].

5.5 Future baseline

5.5.1 Historically the view has been 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. However, the results of recent monitoring across the UK suggest that background annual-mean NO_2 concentrations have not decreased in line with expectations. Inspection of the results of local monitoring presented here indicates that there is no particular trend over time for concentrations of NO_2 or PM_{10} in the vicinity of the Site. To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years. Furthermore, should k4 not proceed, K1 would continue to operate but the CHP would be upgraded to meet IED emissions limits. Table 5.11 summarises the annual-mean background concentrations for NO_2, PM_{10} and CO used in this assessment. Where short-term background concentrations are required, the annual-mean concentrations have been doubled.

Pollutant	Data Source	Concentration (μg.m^{-3})	
		Long-term	Short-term
NO_2	SW77 - Kemsley Fields, Swale Way – diffusion tube	31.7	63.4
PM_{10}	Maidstone - continuous automatic monitor	19.4	-
CO	Defra Mapped Concentration Estimates (2001)	271	542

Table 5.11 Summary of Background Annual-Mean Concentrations used in the Assessment

Sensitive Receptors

5.5.2 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For human-health effects, 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 [Ref 5.8] provides examples of exposure locations and these are summarised in Table 5.11.

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 expect 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).	Kerbside sites where the public would not be expected to have regular access.

	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.	

Table 5.12: Examples of Where Air Quality Objectives Apply

5.5.3 The ground level concentrations have been modelled across a grid of 20 km by 20 km, with a spacing of 200 m, centred on the stack.

5.5.4 In addition, the effects of the proposed development have been assessed at the façades of a representative selection of discrete local existing receptors. All human receptors have been modelled at a height of 1.5 m, representative of typical head height. The locations of these discrete receptors are listed in Table 5.13 and illustrated in Figure 5.2.

Receptor ID	Receptor	Approx Distance to Site (m)	Grid Reference	
			x	y
R1	Recreation Way	670	591391	166087
R2	Premier Way	970	590967	166509
R3	Grovehurst Road	1,540	590404	166463
R4	Grovehurst Road	1,510	590746	165486
R5	Saffron Way	1,580	590924	165184
R6	Straymarsh Farm	4,200	592706	170419
R7	Wigeon Road	1,790	590368	167295
R8	Howt Green	2,250	589762	165887
R9	Lorimar Court	2,870	589256	165287
R10	Key Street	4,360	588127	164204
R11	Newlands Avenue	3,880	588855	163953
R12	East Street	2,870	591165	163568
R13	Frognam Gardens	4,900	595060	162529
R14	Hartlip Hill	7,600	584437	165225
R15	Rookery Close	6,500	588203	160829
R16	Wren's Hill	8,600	597167	159333
R17	Nunfield House	8,100	584481	163112
R18	Squirrels Farm	9,500	584146	160880

Table 5.13: Modelled Sensitive Receptors

5.5.5 The AQS NO_2 objectives for all the different averaging periods apply at the façades of the modelled sensitive receptors.

5.5.6 The receptor points selected for the assessment of sensitive ecological sites are described in Appendix 5.5.

5.6 Predicted Effects

Construction Effects

Construction Dust

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

5.6.2 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".

Risk of Dust Impacts

5.6.3 The IAQM dust guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and trackout. These example dust emission magnitudes are based on the site area, building volume, number of HDV movements generated by the activities and the materials used. These example magnitudes have been combined with details of the period of construction activities to provide the ranking for the source magnitude that is set out in Appendix 5. 3, **Error! Reference source not found.**~~Table A1~~.

Source

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

5.6.5 The total volume of the buildings to be constructed would be between 25,000 and 100,000 m^3, the dust emission magnitude for the construction phase is classified as medium.

5.6.6 The maximum number of deliveries to site in any one day is expected to be more than 50 HDVs. The dust emission magnitude for trackout would be classified as large.

5.6.7 The source magnitudes in each of the four phases are summarised in Table 5.14.

Earthworks	Construction	Trackout
Large	Medium	Large

Table 5.14: Dust Emission Magnitude for Earthworks, Construction and Trackout

Pathway and Receptor

5.6.8 All earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the site boundary have been identified. The sensitivity of the area has been classified and the results are provided in Table 5.15 below.

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Low	There are no highly sensitive receptors in the area. The closest residential properties are more than 350 m from the Site (Appendix 5.3, Table A4)
Human Health	Low	Background PM_{10} concentrations for the assessment is below 24 µg.m^{-3} (Appendix 5.3, Table A5)
Ecology	Low	Scrub and Marshland (low sensitivity receptor) within 50 m of site. (Appendix 5.3, Table A6)

Table 5.15: Sensitivity of the Surrounding Area for Demolition, Earthworks and Construction

5.6.9 The Dust Emission Magnitude for trackout is classified as large and trackout may occur on roads up to 500 m from the site. The sensitivity of the area has been classified and the results are provided in Table 5.16 below.

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Low	The nearest highly sensitive receptors are the residential properties to the west of Swale Way. These are more than 500 m from the Site (Appendix 5.3, Table A4)
Human Health	Low	Background PM_{10} concentrations for the assessment is below 24 µg.m^{-3} (Appendix 5.3, Table A5)
Ecology	Low	Scrub and Marshland (low sensitivity receptor) within 50 m of site. (Appendix 5.3, Table A6)

Table 5.16: Sensitivity of the Surrounding Area for Trackout

<u>Overall Dust Risk</u>

5.6.10 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area (Appendix 5.3, Tables A6 to A9) to give the Dust Impact Risk. Table 5.17 summarises the Dust Impact Risk for earthworks, construction and trackout without the implementation of mitigation.

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

Table 5.17 Dust Impact Risk for Earthworks, Construction and Trackout – Without Mitigation

5.6.11 Taking the site as a whole, the overall risk is deemed to be low. 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 Section 5.7.

5.6.12 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'." The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place. The agreed mitigation measures would be included in a CEMP.

Operational Effects

Short-term Impacts

5.6.13 As outlined in section 5.3, the EPUK/IAQM guidance has different impact descriptors for long-term and short-term concentrations. Table 5.18 summarises the highest predicted short-term PC for NO_2 and CO anywhere across the modelled grid. As two stack layouts for the CHP were modelled the results presented throughout this chapter are for stack location 1 with the results for stack location 2 shown in brackets. The PEC is the K4 PC added to the background AC and the modelled contributions from K2 and K3. As set out in Section 5.5, the AC is a conservative estimate as, if K4 does not proceed, K1 would be upgraded to meet IED emission limits.

Averaging period (Pollutant)	AQAL ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of AQAL	Max PEC ($\mu g.m^{-3}$)	Max PEC as % of AQAL	Impact Descriptor	Potentially Significant Yes/No
1 hour 99.79th percentile (NO_2)	200	3.6 (3.8)	2 (2)	73.3 (73.4)	37 (37)	Negligible	No
Maximum daily running 8 hour mean (CO)	10,000	18.9 (20.0)	2 (2)	564.0 (564.4)	6 (6)	Negligible	No

Table 5.18: Highest Predicted Short-term Process Contribution ($\mu g.m^{-3}$)

5.6.14 The results show that the maximum short-term PC anywhere across the modelling grid is 2% of the relevant AQAL for both stack locations. The EPUK & IAQM short-term impact descriptor for a 2% increase in concentration is 'negligible'. As such, the short-term NO_2 impacts based on modelling across the grid would not be considered to be potentially significant.

5.6.15 It is useful to see the geographical extent of the short-term impact: Figure 5.3 shows the contour plot of 99.79th percentile hourly-mean NO_2 PCs and Figure 5.4 shows the contour plot of maximum 8-hour running mean CO PCs. These illustrate that the highest predicted concentration is not at a location where the public would be exposed.

5.6.16 Dispersion modelling has also been undertaken to predict the PCs from the proposed facility at discrete receptors around the Site, as shown in Figure 5.2. Table 5.19 summarises the short-term, predicted NO_2 PCs at the discrete sensitive receptors.

Receptors	Process Contribution (1 hour 99.79th percentile) µg.m-3	Process Contribution as % of AQAL	Impact Descriptor
R1	3.08 (3.07)	2 (2)	Negligible
R2	2.54 (2.48)	1 (1)	Negligible
R3	1.67 (1.64)	1 (1)	Negligible
R4	1.79 (1.76)	1 (1)	Negligible
R5	1.78 (1.77)	1 (1)	Negligible
R6	0.69 (0.72)	0 (0)	Negligible
R7	1.36 (1.35)	1 (1)	Negligible
R8	1.21 (1.20)	1 (1)	Negligible
R9	1.11 (1.11)	1 (1)	Negligible
R10	0.75 (0.74)	0 (0)	Negligible
R11	0.81 (0.81)	0 (0)	Negligible
R12	1.00 (1.01)	0 (1)	Negligible
R13	0.72 (0.71)	0 (0)	Negligible
R14	0.52 (0.51)	0 (0)	Negligible
R15	0.46 (0.46)	0 (0)	Negligible
R16	0.43 (0.43)	0 (0)	Negligible
R17	0.41 (0.41)	0 (0)	Negligible
R18	0.33 (0.33)	0 (0)	Negligible
Maximum	3.08 (3.07)	2 (2)	

Table5.19: Short-term Predicted NO_2 Concentrations (µg.m-3) at Sensitive Receptors

5.6.17 The results show that the highest PC as a percentage of the AQAL at any discrete receptor is 2% at R1. The EPUK & IAQM impact descriptor for a 2% increase in concentration is 'negligible'. On that basis and using professional judgement, the short-term impacts are not considered to be significant.

5.6.18 Table 5.20 summarises the short-term, predicted CO PCs at the discrete sensitive receptors.

Receptors	Process Contribution (maximum 8-hour running mean) µg.m^{-3}	Process Contribution as % of AQAL	Impact Descriptor
R1	15.21 (15.36)	0 (0)	Negligible
R2	12.63 (12.47)	0 (0)	Negligible
R3	7.79 (7.71)	0 (0)	Negligible
R4	9.76 (9.78)	0 (0)	Negligible
R5	8.77 (8.66)	0 (0)	Negligible
R6	3.71 (3.80)	0 (0)	Negligible
R7	6.45 (6.42)	0 (0)	Negligible
R8	5.89 (5.84)	0 (0)	Negligible
R9	6.14 (6.11)	0 (0)	Negligible
R10	6.20 (6.17)	0 (0)	Negligible
R11	7.66 (7.65)	0 (0)	Negligible
R12	4.63 (4.58)	0 (0)	Negligible
R13	2.58 (2.57)	0 (0)	Negligible
R14	2.09 (2.09)	0 (0)	Negligible
R15	1.84 (1.85)	0 (0)	Negligible
R16	1.52 (1.52)	0 (0)	Negligible
R17	2.52 (2.52)	0 (0)	Negligible
R18	2.94 (2.94)	0 (0)	Negligible
Maximum	15.21 (15.36)	0 (0)	

Table5.20: Short-term Predicted CO Concentrations (µg.m^{-3}) at Sensitive Receptors

5.6.19 The results show that the highest PC as a percentage of the AQAL at any discrete receptor is 0% at R1 (for stack location 2). The EPUK & IAQM impact descriptor for a 0% increase in concentration is ‘negligible’. On that basis and using professional judgement, the short-term impacts are not considered to be significant.

Long-term NO_2 Impacts

5.6.20 Table 5.21 summarises the highest long-term PEC anywhere across the modelled grid. The PEC is the K4 PC added to the background AC and the modelled contributions from K2 and K3. The assessment can be considered conservative as emissions from K1 and K2 are already included to an extent within the background concentration and, by including K1 and K2 explicitly within the model, there is potential for double-counting of the impacts.

As set out in Section 5.5, the AC is a conservative estimate as, if K4 does not proceed, K1 would be upgraded to meet IED emission limits. The EPUK & IAQM long-term impact descriptor is also shown.

Averaging period (Pollutant)	AQAL ($\mu g.m^{-3}$)	PC ($\mu g.m^{-3}$)	PC as % of AQAL	Max PEC ($\mu g.m^{-3}$)	Max PEC as % of AQAL	Impact Descriptor	Potentially Significant Yes/No
Annual mean (NO_2)	40	0.58 (0.60)	1 (2)	33.0 (33.1)	83 (83)	Negligible (Slight)	No

Table 5.21: Highest Long-term Predicted Environmental Concentrations

5.6.21 At the point of the highest long-term impact across the grid, the impact descriptor is 'negligible' for stack location 1 and 'slight adverse' for stack location 2. As such, the long-term NO_2 impacts based on modelling across the grid would not be considered to be potentially significant. However, once again, relevant public exposure would not occur at the location of the grid maximum, as shown on Figure 5.5.

5.6.22 Table 5.22 summarises the long-term maximum PC and PEC values at the selected discrete sensitive receptors. The EPUK & IAQM impact descriptors are also shown.

Receptors	Process Contribution (Annual mean)	Process Contribution as % of AQAL	Predicted Environmental Concentration (µg.m^{-3})	Impact Descriptor
R1	0.24 (0.24)	1 (1)	32.4 (32.4)	Negligible
R2	0.17 (0.17)	0 (0)	32.5 (32.5)	Negligible
R3	0.16 (0.16)	0 (0)	32.4 (32.4)	Negligible
R4	0.14 (0.14)	0 (0)	32.1 (32.1)	Negligible
R5	0.13 (0.13)	0 (0)	32.1 (32.1)	Negligible
R6	0.05 (0.05)	0 (0)	31.9 (31.9)	Negligible
R7	0.05 (0.05)	0 (0)	31.9 (31.9)	Negligible
R8	0.14 (0.14)	0 (0)	32.2 (32.1)	Negligible
R9	0.08 (0.08)	0 (0)	32.0 (32.0)	Negligible
R10	0.04 (0.04)	0 (0)	31.8 (31.8)	Negligible
R11	0.04 (0.04)	0 (0)	31.9 (31.9)	Negligible
R12	0.05 (0.05)	0 (0)	31.9 (31.9)	Negligible
R13	0.03 (0.03)	0 (0)	31.8 (31.8)	Negligible
R14	0.04 (0.04)	0 (0)	31.8 (31.8)	Negligible
R15	0.02 (0.02)	0 (0)	31.8 (31.8)	Negligible
R16	0.02 (0.02)	0 (0)	31.8 (31.8)	Negligible
R17	0.02 (0.02)	0 (0)	31.8 (31.8)	Negligible
R18	0.01 (0.01)	0 (0)	31.8 (31.8)	Negligible
Maximum	0.24 (0.24)	1 (1)	32.5 (32.5)	

Table 5.22: Long-term Predicted NO_2 Concentrations (µg.m^{-3}) at Sensitive Receptors

5.6.23 The highest process contribution of 0.24 µg.m^{-3} at R1 represents 1% of the annual-mean limit value of 40 µg.m^{-3}. Adding this to the background concentration gives a total predicted environmental concentration of 32.4 µg.m^{-3}, well below the AQAL. On this basis, the long-term impacts fall into the 'negligible' category.

5.6.24 The impacts at ecological receptors are shown in Appendix 5.5 where, for all pollutants and habitat sites, the operational effects are insignificant. The designated habitats sites are considered further in Chapter 10 Ecology.

Package Boilers

5.6.25 The results set out in Tables 5.18 and 5.19 assume that the CHP operates in every hour of the year. Package boilers will provide back-up power and have been assumed to be operational for no more than 500 hours of operation per year. Additional modelling of the package boilers has been undertaken assuming that these operate at the maximum number of 500 hours per annum.

5.6.26 The maximum predicted annual-mean NO_2 PC for the package boilers alone (K1 and K4 package boilers) is 0.10 µg.m^{-3}. When this is added to the annual-mean PC for the CHP of 0.60 µg.m^{-3} in Table 5.21, the impact would be 'slight adverse'.

5.6.27 The maximum predicted 99.79th percentile of hourly-mean NO_2 PC for the package boilers alone (K1 and K4 package boilers) is 8.99 µg.m^{-3}. When this is added to the 99.79th percentile of hourly-mean NO_2 PC for the CHP of 3.8 µg.m^{-3} in Table 5.18, the impact would be 'slight adverse'.

5.6.28 In reality, emissions from the existing K1 package boilers are already accounted for to a degree in the background concentration assumed for the assessment. Furthermore, the package boilers will not run at the same time as the CHP; therefore the impact descriptors, that assume the CHP operates in every hour of the year and the package boilers operate for 500 hours per year, can be considered conservative.

5.6.29 On that basis and using professional judgement, the effect of the package boilers are not considered to be significant.

Other Scenarios Considered

5.6.30 K4 will replace K1; however, the two plant may run simultaneously for a short period, likely to be a matter of months during the commissioning of K4. For this scenario, K1 has explicitly been included as a point source within the model. In order to predict the annual-mean NO_2 concentration for this scenario, it has been assumed that K4 and K1 will operate simultaneously in every hour of the year.

5.6.31 The PECs have been calculated by adding the PC from modelling of K1, K2, K3 and K4 emissions to the background concentrations.

5.6.32 The maximum predicted annual-mean NO_2 PEC for K1, K2, K3 and K4 is 32.9 µg.m^{-3}, 82% of the AQAL.

5.6.33 The maximum predicted 99.79th percentile of hourly mean NO_2 PEC for K1, K2, K3 and K4 79.3 and 79.2 µg.m^{-3}, only 40% of the AQAL.

5.6.34 The maximum daily running 8 hour mean CO PEC is 578 µg.m^{-3}, only 6 % of the AQAL.

5.6.35 The PECs can be considered conservative as emissions from K1 are already included to an extent within the AC and, by including K1 explicitly within the model, there is potential for double-counting of the impacts. On that basis, the relevant AQALs are unlikely to be exceeded with K1 and K4 operating simultaneously.

5.6.36 If K1 is modified to be compliant with the IED emission limits, it is unlikely to be an improvement compared to K4. At this stage, no detailed design for an upgraded K1 is available so quantification of the improvement is not possible.

Significance of Effects

5.6.37 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.

5.6.38 Based on the predicted concentrations, the effects are deemed to be not significant, with no predicted exceedances of any objectives or standards at modelled discrete receptors.

Sensitivity and Uncertainty

5.6.39 Section 5.3 provided an analysis of the limitations 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.

5.6.40 The impacts at existing receptors are shown to be not significant even for this conservative scenario. Consequently, further sensitivity analysis has not been undertaken and, in practice, the impacts at sensitive receptors are likely to be lower than those reported in this conservative assessment.

5.7 Decommissioning

5.7.1 The risk of impacts during decommissioning will be the same or similar to the risk of impacts during the construction phase. With the effective implementation of the mitigation measures recommended for the construction phase, the residual effects are unlikely to be significant.

5.8 Mitigation

Mitigation of Construction Effects

5.8.1 The IAQM dust guidance lists mitigation measures for low, medium and high dust risks.

5.8.2 As summarised in Table 5.4, the predicted Dust Impact Risk is classified as low. The measures listed below are based on the IAQM dust guidance 'highly recommended' measures for low risk sites. The agreed mitigation measures would be included in a CEMP.

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.
- Avoid site runoff of water or mud.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.

Operations

- Use enclosed chutes and conveyors and covered skips.

Waste management

- Avoid bonfires and burning of waste materials.

Communications

- 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.

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.

Monitoring

- Carry out regular site inspections to monitor compliance with a Dust Management Plan, record inspection results, and make an inspection log available to the local authority when asked.

Mitigation of Operational Effects

5.8.3 Predicted concentrations of pollutants from the completed development have been demonstrated by the assessment to meet all relevant air quality standards and objectives. On that basis, no mitigation is proposed.

5.9 Residual Effects

5.9.1 Residual effects are those that are predicted to remain after implementation of the secondary mitigation measures described above. As no further mitigation is proposed for the Completed Development, the residual effects are the same as in section 5.6 and are not significant.

5.9.2 The residual construction dust effects will not be significant provided the mitigation measures described above are implemented.

5.10 Cumulative Effects

5.10.1 During the construction phase, there is the potential for cumulative effects where there are other sources of dust located within 700 metres of the project (the IAQM indicative maximum radius of effects for an individual construction site being 350m). 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 project, the residual cumulative dust effects are unlikely to be significant.

5.10.2 Once the proposed development is completed, there is the potential for cumulative effects where there are other sources of combustion-related pollutants in close proximity to the site.

5.10.3 The PECs presented in Section 5.6 include the PCs from the existing CHP K1, being replaced by K4, plus the PCs from K2 and K3 (SW/10/4444 and EN010083). These other developments have therefore been explicitly included within the modelling. This section considers the cumulative effects of the proposed development with other schemes that are operational /constructed, consented or for which planning permissions are currently being sought.

5.10.4 16/501228/FULL – 500 m northwest - Construction of a new baling plant building within an existing waste paper storage yard. The Environmental Aspects report accompanying the planning application identified the main likely sources of emissions to air as emissions from vehicle movements generated by the operation of the proposed development. The Environmental Aspects report concluded that the air quality effects were not significant. The impacts due to vehicle emissions would be limited to 200 m from the centre of roads used by the vehicles. The proposed development is expected to generate minimal vehicle movements once completed. The main area of impact from the K4 stack is to the north-east of the stack. Therefore there is unlikely to be any overlap in the air quality impacts from the proposed development and the new baling plant.

5.10.5 16/507687/COUNTY – 150 m northeast - Construction and operation of an Incinerator Bottom Ash recycling facility. The Planning Application Supporting Statement prepared in September 2016 by Wheelabrator Technologies states that *"A full Air Quality Assessment was scoped out at the pre application discussion as the predicted impact was considered to be negligible. The Facility is not considered to pose any significant risk upon NO_2 and PM_{10} concentrations in the locality."* On that basis, no significant cumulative air quality effects are expected.

5.10.6 16/501484/COUNTY – 1 km north - Construction of a gypsum recycling building on land at Ridham Dock. The Air Quality Assessment prepared by SLR dated January 2016 identifies the key emissions to air as dust during the operational phase. An assessment of vehicle-related emissions was scoped out as the number of vehicle movements generated by the proposed development was below the threshold requiring an assessment. On that basis, no significant cumulative air quality effects are expected.

5.10.7 14/500327/OUT – 250 m south - Development of Fulcrum Business Park and extension to Milton Creek Country Park. Air quality impacts were not considered for the planning application. Moreover, the Planning Statement prepared by Paul Sharpe Associates in June 2014 stated that the proposed development would generate fewer vehicle movements than the extant permission. On that basis, the proposed development is likely to be beneficial in air quality terms and no cumulative air quality effects are expected.

5.10.8 SW/12/0816 – 1.5 km west - Relocation of the Nicholls Transport Limited business from its existing depot at Lydbrook Close, London Road, Sittingbourne, to a site on the north side of Swale Way, Sittingbourne. The Planning Statement prepared by Paul Sharpe Associates in May 2012 indicates that air quality was not considered to be a concern for the proposed development and, in consultation with Swale Borough Council, an air quality assessment of air quality impacts was scoped out. On that basis, no significant cumulative air quality effects are expected.

5.10.9 SW/12/1211 – 2.2 km north - Construction of a new Materials Recycling Facility and Waste Transfer Station. The air quality assessment considered the dust, odour and traffic-related impacts. The assessment considered the air quality impacts on the Swale SPA due to vehicles using the Old Ferry Road and Barge Way. The maximum predicted annual-mean NO_x PC was 1.0 µg.m^{-3}. When this is added the PEC of 14.2 µg.m^{-3} shown in Appendix 5.5, the cumulative PEC is only 51% of the Critical Level of 30 µg.m^{-3}. On that basis, no significant cumulative air quality effects are expected.

5.10.10 15/510589/OUT – 2.2 km south- Development of a business park (Eurolink V) on land north of Northern Relief Road. The assessment considered the air quality impacts on the human-health receptors and the Swale SPA due to emissions from vehicle movements. The assessment predicted that the air quality impacts were negligible. On that basis, no significant cumulative air quality effects are expected.

5.10.11 SW/11/1291 – 700 m north - Construction of an anaerobic digestion (AD) plant at the Mill. Two scenarios were modelled for the assessment, with and without heat recovery, and the maximum PCs across the grid were higher for the with heat recovery scenario. The maximum PCs from Table 7.21 of the Kemsley AD application [Ref 5.15] have been added to the maximum PECs from Tables 5.18 and Table 5.21 of this chapter to give a cumulative PEC in Table 5.25.

5.10.12 18/500393/FULL – 1 km southeast - Erection of a natural gas fuelled reserve power plant with maximum export capacity of up to 12 MW. The maximum PCs at modelled discrete receptors from Tables 6.1, 6.3 and 6.5 of the air quality assessment [Ref 5.16] have been added to the cumulative PEC in Table 5.25. For CO, no maximum PC across the grid is included so the maximum PC at the modelled discrete receptors has been used instead.

5.10.13 15/500348/COUNTY – 800 m northwest - Land Off Kemsley Fields Business Park Barge Way Sittingbourne Kent. Installation of advance thermal conversion and energy facility at Kemsley Fields Business Park to produce energy and heat, including construction of new buildings to house thermal conversion and energy generation plant and equipment; construction of associated offices; erection of external plant including storage tanks; and erection of discharge stack (KCC planning application KCC/SW/0010/2015 refers). The maximum PCs from Table 19 of the air quality assessment [Ref 5.17] has been added to the cumulative PEC in Table 5.25.

Averaging period (Pollutant)	AQAL (µg.m^{-3})	PC – Kemsley AD (µg.m^{-3})	PC – Reserve Power Plant (µg.m^{-3})	PC – Garden of England Energy Facility (µg.m^{-3})	PEC (µg.m^{-3})	Cumulative PEC (µg.m^{-3})	Cumulative PEC as % of AQAL
1 hour 99.79th percentile (NO_2)	200	18.1	19.57	10.7	73.4	121.77	61

Maximum daily running 8 hour mean (CO)	10,000	131.3	116.43	6.97	564.4	819.10	8
Annual-mean (NO_2)	40	1.3	0.93	1.62	33.1	36.95	92

Table 5.25: Cumulative PECs

5.10.14 The cumulative PECs are all below the AQAL and no significant cumulative air quality effects are expected.

5.10.15 SW/14/0224 – 1.5 km southeast - Erection of solar arrays of photovoltaic panels, inverter and transformer sheds, fencing, site storage cabin, combined DNO and EPC switchgear housing, internal gravel access road, and associated equipment. There are no potential sources of emissions to air. As such, no cumulative effects are anticipated.

5.10.16 14/502737/EIASCO – 1.8 km north - Request for Scoping Opinion to determine the extent of an application for a combined heat and power plant at Ridham 'B', Ridham Docks, Ridham. This application was withdrawn in September 2014 and is not considered further.

5.10.17 16/506935/COUNTY – 200 m north - Planning Application for a Steam Pipeline connecting the existing Ridham Dock Biomass Facility to the Mill at Ridham Dock. The Planning Application Supporting Statement prepared in June 2016 by SLR did not identify air quality as environmental issue. As such, no significant cumulative effects are expected.

5.10.18 17/505073/FULL- 800 m south - Erection of a tile factory including service yard, storage yard and car parking area. The Planning Statement prepared in September 2017 by Cushman and Wakefield did not identify air quality as environmental issue. No emissions to air were identified in the application documents. The number of trips generated by the development was not considered significant to the extent that an air quality assessment was not undertaken. As such, no significant cumulative effects are expected.

5.10.19 16/506193/ENVSCR EIA Screening Opinion – 2.1 km northwest - Outline application for proposed residential development of 275 dwellings including affordable housing with open spaces, appropriate landscaping and minor alterations to the surrounding highway network (access). SBC's Screening Opinion dated 23 August 2016 states that the environmental effects are not considered to be sufficiently significant to warrant to Environmental Impact Assessment. Based on this and the information currently available, no significant cumulative effects are expected.

5.10.20 17/503713/ENSCR – 1.6 km northwest - Land East of Iwade Woodpecker Drive, Iwade, Kent, ME9 8ST. SBC's Screening Opinion dated 4 September 2017 states that the environmental effects are not considered to be sufficiently significant to warrant to Environmental Impact Assessment. Based on this and the information currently available, no significant cumulative effects are expected.

5.10.21 16/506014/EIASCO EIA Scoping Opinion – 1.5 km west - A sustainable urban extension comprising up to 1,100 new dwellings (of a range of sizes, types and tenures, including affordable housing), a site of 10.50 ha for a secondary and primary school, and public open and amenity space, together with associated landscaping, access, highways (including footpaths and cycle ways), parking, drainage (including a foul water pumping station), utilities and service infrastructure works. An additional 1,100 dwellings will increase NO_2 concentrations. A comparison of the annual-mean NO_2 PECs at discrete receptors shown in Table 5.22 and the AQAL shows that there is a large headroom, approximately 7.5 $\mu g.m^{-3}$, before the air quality objective of 40 $\mu g.m^{-3}$ is exceeded. The proposed cumulative development is unlikely to increase annual-mean NO_2 concentrations enough to exceed this AQAL. Based on this and the limited information currently available, no significant cumulative effects are expected.

5.10.22 18/500257/EIFUL – 2.4 km southwest - Proposed development of 155 dwellings. The air quality chapter assessed the cumulative effects of the development and the rest of the north-west Sittingbourne Allocation. It concluded that the impacts at all individual receptors modelled was negligible with no predicted exceedances of the AQS objectives. On that basis, no significant cumulative air quality effects are expected.

5.10.23 New boundary road to be built and finished in advance of any works on K4 and to include the breaking out of the concrete from the K4 site. There will be less than 100 HGVs AADT so no significant cumulative air quality effects are expected.

5.11 Summary

5.11.1 This assessment has considered the air quality impacts during the construction and operational phase of the proposed installation of a gas-fired CHP (K4) at the Mill.

5.11.2 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 low. 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*". The agreed mitigation measures would be included in a CEMP.

5.11.3 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".

5.11.4 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 concentrations of all pollutants considered are 'negligible' or 'slight adverse'.

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

5.11.6 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.

References

5.1 Council Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions

5.2 Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe

5.3 Defra, 2010, The Air Quality Standards (England) Regulations

5.4 Defra, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2.

5.5 Communities and Local Government, March 2012, National Planning Policy Framework

5.6 EPUK & IAQM (January 2017) Land-Use Planning & Development Control: Planning For Air Quality

5.7 IAQM (2014) Guidance on the assessment of dust from demolition and construction

5.8 Local Air Quality Management Technical Guidance, 2016 (LAQM.TG16)

5.9 British Standard Institute (1983) BS 6069:Part 2:1983, ISO 4225-1980 Characterization of air quality. Glossary

5.10 Environment Agency (2010) Environmental Permitting Regulations (EPR) – H1 Environmental Risk Assessment, Annex K

5.11 Environment Agency (2007) Review of methods for NO to NO_2 conversion in plumes at short ranges

5.12 Environment Agency (undated) Conversion Ratios for NO_x and NO_2

5.13 Drawn from Defra Maps at http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013

5.14 https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

5.15 DHA Environment (2011) Proposed Anaerobic Digestor Kemsley DCH/7471

5.16 wyg (2018) Proposed Standing Reserve Power Plant at Eurolink Industrial Estate, Castle Road, Sittingbourne, Kent

5.17 Environemntal Compliance Limited (2014) Air Quality Assessment of Emissions from the Proposed Garden of England Energy Facility