Great Grovehurst Farm
Air Quality Assessment

Project Number: 60549471

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Quality information

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1. Introduction

AECOM has been commissioned to provide an air quality assessment in support of an outline planning application for a residential development at Great Grovehurst Farm, Sittingbourne, Kent.

The application site is located within Swale District, at the junction of Grovehurst Road, Swale Way and the A249, north-west of Sittingbourne. Swale Borough Council has designated the application site for residential development within the Swale Borough Local Plan 2031. It is understood that brickearth currently on the site is to be extracted prior to development. The site is currently occupied by old farm buildings, which are due to be demolished.

The development has the potential to affect local air quality during its construction and operation. During the earthworks phase for brickearth extraction, mineral dust and emissions generated by activities relating to the extraction of minerals have the potential to impact upon dust-sensitive receptors and human health. A semi-quantitative assessment of the potential mineral dust impacts has been carried out in accordance with the IAQM's 2016 Mineral Dust Guidance.

Construction phase dust and emissions generated by construction activities and the operation of construction plant have the potential to impact upon dust-sensitive receptors and human health. A qualitative assessment of the potential construction dust impacts has been carried out in accordance with IAQM's Guidance on the Assessment of Dust from Demolition and Construction. Mitigation measures have been identified to minimise any potential impacts.

Operational phase impacts on air quality may arise due to additional vehicle emissions generated by road traffic associated with the development. These impacts have been assessed quantitatively, using a detailed dispersion model to predict pollutant concentrations at sensitive receptor locations.

The assessment methodologies used in this assessment have been agreed with Swale Borough Council.

2. Legislative Framework and Planning

2.1 National and European Air Quality Legislation and Policy

2.1.1 Local Air Quality Management

The provisions of Part IV of the Environment Act 1995 establish a national framework for air quality management, which requires all local authorities in England, Scotland and Wales to conduct local air quality reviews. Section 82(1) of the Act requires these reviews to include an assessment of the current air quality in the area and the predicted air quality in future years. Should the reviews indicate that the objectives prescribed in the UK Air Quality Strategy[1] and the Air Quality (England) Regulations[2,3] will not be met, the local authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level to ensure that air quality in the area improves. This process is known as 'local air quality management' or LAQM.

2.1.2 UK Air Quality Strategy

The UK Air Quality Strategy (AQS) identifies nine ambient air pollutants that have the potential to cause harm to human health and two for the protection of vegetation and ecosystems. The Strategy defines objectives for these pollutants that aim to reduce the impacts of these pollutants to negligible levels. The objectives are not mandatory but rather targets that local authorities should try to achieve.

2.1.3 European Air Quality Directives

The Air Quality Framework Directive (96/62/EC) on ambient air quality assessment and management defines the policy framework for 12 air pollutants known to have a harmful effect on human health and the environment. The limit values for the specific pollutants are set through a series of Daughter Directives. The limit values have been transposed into The Air Quality Standards Regulations 2010 (SI 2010 No. 1001) and are a legal requirement that the UK Government is required to meet.

2.1.4 Air Quality Criteria

The pollutants of concern for this assessment are NO_2 and particulate matter (PM_{10} and $PM_{2.5}$). The Government's Air Quality Strategy objectives and EU limit values for NO_2 are:

- an annual mean concentration of 40 µg/m^3; and
- a one-hour mean concentration of 200 µg/m^3, not to be exceeded more than eighteen times per year

The Government's Air Quality Strategy objectives and the EU limit value for PM_{10} are:

- an annual mean concentration of 40 µg/m^3 (gravimetric); and
- a 24-hour mean concentration of 50 µg/m^3 (gravimetric) to be exceeded no more than 35 times per year.

The Government's Air Quality Strategy objective and the EU limit value for $PM_{2.5}$ is:

- an annual mean concentration of 25 µg/m^3 for the EU limit value; and
- an objective and EU exposure reduction target to reduce emissions / concentrations of $PM_{2.5}$

[1] Defra (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland
[2] Defra (2000). The Air Quality (England) Regulations, 2000 (SI 2000/928).
[3] Defra (2002). The Air Quality (England) (Amendment) Regulations, 2002 (SI 2002/3043).

2.2 Planning Policy

2.2.1 National Planning Policy Framework

The following National Planning Policy Framework[4] (NPPF) paragraphs / policies are considered relevant to this assessment:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

The NPPF was supplemented by Planning Practice Guidance [4] in March 2014. With reference to air quality the guidance states:

"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)."

and

"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."

The Planning Practice Guidance also indicates that with regard to the development management process, should a development (following mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations, then consideration should be given to how the proposal could be amended to make it acceptable, or where not practicable, to whether planning permission should be refused.

In relation to mineral extraction, the Planning Practice Guidance states that:

"Where dust emissions are likely to arise, mineral operators are expected to prepare a dust assessment study, which should be undertaken by a competent person / organisation with acknowledged experience of undertaking this type of work."

[4] Department for Communities and Local Government (2014), National Planning Policy Framework and Air Quality Planning Practice Guidance. Available at http://planningguidance.planningportal.gov.uk/blog/policy/

2.2.2 Local Planning Policy

Swale Borough Council adopted a new Local Plan (Bearing Fruits 2031) on 26th July 2017. Policy ST 5 'The Sittingbourne area strategy' states that development proposals should be:

"consistent with local air quality action plans for Newington High Street, Teynham Greenstreet, St. Paul's and East Street and bring forward innovative proposals for mitigation of adverse impacts"

Policy DM 6, Managing transport demand and impact, states:

"In assessing impacts on the highway network, development proposals will:

… integrate air quality management and environmental quality 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"

Policy MU 1 covers the land at north-west Sittingbourne. Swale Borough Council notes that planning matters related to Air Quality in Swale will be dealt with via reference to the NPPF and Planning Practice Guidance (see section 2.2.1) and the above policies.

Swale Borough Council requests *"Developers should also refer to The Kent and Medway Air Quality Partnership's document, Air Quality and Planning Technical Guidance, July 2011 and any updated versions of this document."*

The Kent and Medway Air Quality Partnership updated the Air Quality Planning Guidance in December 2015[5].

This guidance states:

"*An air quality assessment should clearly establish the likely change in pollutant concentrations at relevant receptors resulting from the proposed development during both the construction and operational phases. It must take into account the cumulative air quality impacts of committed developments (i.e. those with planning permission).*"

Following this guidance, prior to this assessment being undertaken, consultation was undertaken with Steve Wilcock, Environmental Protection Team Manager, at Swale Borough Council in order to ensure the scope and methodology of the assessment was acceptable.

[5] Kent & Medway Air Quality Partnership, Air Quality Guidance, Dec 2015, available at http://www.kentair.org.uk/

3. Baseline Conditions

3.1 Summary of Local Air Quality Management in Swale Borough Council

Swale Borough Council (Swale BC) has declared six Air Quality Management Areas (AQMAs) for exceedances of the annual mean NO_2 objective (40 µg/m^3), as follows:

- Newington (AQMA 1), declared in 2009
- Ospringe Street (AQMA 2) declared in June 2011, extended to the Mount in May 2016 (AQMA 6);
- St Paul's Street, Milton, Sittingbourne (AQMA 3), declared in January 2013;
- East Street/Canterbury Road, Sittingbourne (AQMA 4), declared January 2013; and
- Teynham (AQMA 5), declared December 2015.

The application site is not situated in any of these AQMAs. The closest AQMA to the site is AQMA 3, St Pauls Street, which is located approximately 2 km south of the development. A small amount of road traffic associated with the proposed development may pass through the St Paul's Street AQMA, hence the potential of the proposed development to affect air quality in this AQMA has been considered in this assessment.

3.2 Local Authority Air Quality Monitoring

Swale BC carries out continuous NO_2 monitoring at four continuous monitoring stations within the Borough, and PM_{10} monitoring at one location. Recent years' monitoring results from these locations are summarised in Table 1.

Table 1: Results of Automatic Monitoring Sites within the Borough

Site Name	OS Grid Ref (X,Y)	Site Type	Distance to site (km)	Annual Mean NO_2 Concentration ($\mu g/m^3$) / Number of Hourly Means > 200 $\mu g/m^3$ in Parentheses, 99.8th percentile				
				2012	2013	2014	2015	2016
Newington	(585861,164817)	Roadside	4.9	30.4 (0)	34.8 (1)	32.9 (1)	29.7 (0)	28.1 (1)
Ospringe Roadside	(600360,160869)	Roadside	11.2	34.8 (0)	36.9 (0)	34.4 (0) 121	32.6 (0)	33.2 (0)* 103
Canterbury Road	(591483,163472)	Roadside	3.2	37.4 (0)	**42.5** (7) 176	34.3 (2) 137	35.9 (0) 107	-
St Paul's Street	(590264,164396)	Roadside	2.1	-	33.6 (0)	35.1 (0)	37.7 (1) 120	35.2 (0)
Site Name	**OS Grid Ref (X,Y)**	**Site Type**	**Distance to site (km)**	**Annual Mean PM_{10} Concentration ($\mu g/m^3$) / Number of Daily Means > 50 $\mu g/m^3$ in Parentheses**				
				2012	**2013**	**2014**	**2015**	**2016**
Ospringe Roadside	(600360,160869)	Roadside	11.2	26.4 (12)	29.4 (19)	27.2 (9)	28.5 (15)	20.5 (0)

Notes: 1) Figures in bold indicate exceedances of the UK objective and EU limit value for annual mean NO_2 set at 40 µg/m^3; 2) Results obtained from the Council's 2016 Air Quality Annual Status Report and for 2016 from http://www.kentair.org.uk *Data capture <75%

The annual mean NO_2 objective was achieved at all locations and in all years from 2012 to 2016 inclusive, except for Canterbury Road in 2013. Annual mean NO_2 concentrations in recent years ranged from 28.1 µg/m^3 at Newington in 2016 to 42.5 µg/m^3 at Canterbury Road in 2013.

The annual mean PM_{10} objective was achieved at Ospringe Roadside for all years between 2012 and 2016. Annual mean PM_{10} concentrations ranged from 20.5 µg/m^3 in 2016 to 29.4 µg/m^3 in 2013. There were exceedances of the 24-hour mean PM_{10} standard of 50 µg/m^3 recorded in almost all years, although the number of exceedances per year did not surpass 35 days between 2012 and 2016, and therefore compliance with the 24-hour mean PM_{10} objective / limit value was achieved in all these years.

Swale BC also operates a network of 57 NO_2 diffusion tubes, including 13 locations within 2.5 km of the application site. Details of each monitoring location within 2.5 km of the application site and recent years' results are presented in Table 2.

Table 2: Annual Mean Results of Non-Automatic NO_2 Monitoring Sites within 2.5 km of the site

Site Name	OS Grid Ref (X,Y)	Site Type	Distance to site (km)	Annual Mean NO_2 Concentration (µg/m^3)				
				2012	2013	2014	2015	2016
SW77 – Kemsley Fields, Swale Way	(591035, 166521)	Urban Background	0.4	31.3	34.5	30.9	29.7	32.2
SW88 – Sonara Way	(589320, 165047)	Urban Background	1.9	27.2	24.3	22.3	19.5	24.4
SW39 x 3 Giles Young Court, Milton	(590359, 164408)	Roadside	2.1	31.9	38.1	27.1	26.9	27.5
SW50, Church Street, Milton	(590200, 164386)	Roadside	2.1	24.8	-	-	-	-
SW51, 14/16 St Pauls Street, Milton	(590235, 164408)	Roadside	2.1	**42.2**	**43.7**	38.1	**40.5**	39.7
SW52, 20/22 St Pauls Street, Milton	(590203, 164409)	Roadside	2.1	**41.7**	30.4	33.3	35.2	37.7
SW65, 5 Crown Road, Milton	(590341, 164558)	Roadside	1.9	30.9	27.1	26.5	27.3	26.3
SW70, Stumble Inn, St Pauls Street, Sittingbourne	(590142, 164425)	Roadside	2.1	30.8	29.6	27.8	26.8	26.1
SW71, o/s 8 Staple Close, Staplehurst Road	(590096, 164455)	Roadside	2.1	37.0	31.3	32.5	32.7	38.8
SW72, o/s 1 Alexander Court, Chalkwell Road	(590094, 164397)	Roadside	2.1	32.7	32.5	26.6	25.8	23.8
SW73, Adj to 14 Chalkwell Road, Sittingbourne	(590122, 164405)	Roadside	2.1	37.2	35.9	32.4	31.1	32.6
SW82 x 3, Conservative Club, St Pauls Street	(590228, 164396)	Roadside	2.1	**62.3**	**56.4**	**57.4**	**55.5**	**55.9**
SW89 x 3, St Paul's Air Quality Station, Milton	(590264, 164396)	Roadside	2.1	-	**44**	**40.3**	**41.8**	**44.9**

Notes: 1) Figures in bold indicate exceedances of the UK objective and EU limit value for annual mean NO_2 set at 40 µg/m^3; 2) Figures underlined indicate possible exceedances of the UK objective and EU limit value for 1-hour mean NO_2 set at 200 µg/m^3 not to be exceeded 18 times in a year. 3) 2012-2015 Results obtained from the Council's 2016 Air Quality Annual Status Report 4) Data for 2016 downloaded from kentair. Note the raw 2016 annual averages have been annualised where data capture was less than 75% and all results were bias adjusted using the national factor (0.78).

The closest diffusion tube to the site is SW77 Kemsley Fields, Swale Way, situated 0.4 km east of the site. The tube is an urban background site and annual mean concentrations between 2012 and 2016 are within the objective, ranging between 29.7 µg/m^3 in 2015 and 34.5 µg/m^3 in 2013.

3.3 Defra Mapped Background Pollutant Concentrations

A large number of small sources of air pollutants exist, which individually may not be significant, but collectively, over a large area, need to be considered in the modelling process. Pollutant emissions from these sources contribute to background air quality, which when added to modelled emissions allow estimates of total ambient pollutant concentrations to be made.

Defra has produced maps of background pollutant concentrations covering the whole of the UK for use by local authorities and consultants in the completion of LAQM reports and Air Quality Assessments where local background monitoring is unavailable or inappropriate for use. The maps provide background pollutant concentrations for each 1-km grid square within the UK for all years between 2011 and 2030[6].

The application site is located within OS grid square centred upon 590500, 166500. The background mapped concentrations for this grid square are given in Table 3 for 2016. These are well within the air quality objectives and limit values.

Table 3: Defra Mapped Background Pollutant Concentrations (µg/m^3) at the Application Site in 2016

Pollutant	Annual Mean Concentrations (µg/m^3)
NO_2	14.7
PM_{10}	16.5
$PM_{2.5}$	11.7

[6] Defra Background Pollutant Concentration Maps, available online at: http://uk-air.defra.gov.uk/

4. Methodology

4.1 Minerals Dust Assessment

A semi-quantitative/ qualitative dust risk assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM) 2016 Minerals Dust Guidance[7], based on a Source-Pathway-Receptor (S-P-R) methodology for assessing the risk of dust impacts. The guidance has been used to assess the risk and significance of any impacts associated with earthworks on a minerals site and to identify appropriate mitigation measures to be adopted to reduce any potential impacts.

4.2 Construction Phase Assessment

A qualitative construction dust assessment has been undertaken in accordance with the IAQM guidance on the Assessment of Dust from Demolition and Construction[8] for the application site.

Activities on construction sites with the potential to generate dust and emissions can be categorised into four types of activities, which are:

- Demolition – any activities associated with the removal of existing structures on site;
- Earthworks – includes the processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction – any activities relating to the provision of new structures on site; and
- Trackout – the transport of dust and dirt from the construction site onto the public road network where it may be deposited and resuspended by traffic using the network.

The potential for dust emissions has been assessed for each activity that is likely to take place. The guidance has been used to assess the risk and significance of any impacts associated with the construction phase and to identify appropriate mitigation measures to be adopted to reduce any potential impacts.

4.3 Local Air Quality Operational Phase Assessment

Local air quality may be affected during the operational phase of the proposed development as a result of increased road traffic on local roads.

Detailed dispersion modelling was carried out to determine the local air quality impacts associated with pollutant emissions from local traffic changes. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at sensitive receptor locations within the proposed development and at existing receptors close to the proposed development for the following scenarios:

- Opening Year 2023 Do-Minimum scenario i.e. without the proposed Great Grovehurst Farm development; and
- Opening Year 2023 Do-Something scenario i.e. with the proposed Great Grovehurst Farm development

In both scenarios cumulative air quality impacts of committed developments are taken into account for the following nearby developments, i.e. those others allocated by Policy MU1:

- Persimmon and Schools development
- Redrow development
- Pheasant Farm development

[7] IAQM (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning, V1.1
[8] IAQM (2014) Guidance on the Assessment of Dust from Demolition and Construction, V1.1

4.3.1 Road Traffic Data

This assessment has used the latest version dispersion modelling software 'ADMS- Roads'. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies.

Vehicle emission rates for NO_x, PM_{10} and $PM_{2.5}$ were taken from Defra's Emission Factor Toolkit version 7.0, for the "England (urban)" area with a basic split traffic format. As a pessimistic assumption, emission factors for 2016 were used for all assessment years. Detailed dispersion modelling of traffic emissions was carried out using ADMS-Roads v4.1.1.0.

NO_2 concentrations were estimated from the modelled NO_x concentrations. For roads, Defra's NO_x to NO_2 calculator was used with the 'All UK traffic' mix assumed.

Traffic data for the major roads within the study area were provided by PFA Consulting. Annual Average Daily Traffic (AADT) and heavy-duty vehicle (HDV) percentage were provided for the years 2015 and 2023. Traffic data for 2015 was used for the 2016 verification year.

Vehicle speeds were based on local speed limits and reduced at junctions. Speeds were kept constant between the Do-Minimum and Do-Something scenarios except on Grovehurst Road near the site access, where speeds were reduced as part of the Do-Something scenario. The speed at the site access location is presently subject to the National Speed Limit of 60mph, but the introduction of the site access is expected to reduce speeds to 30mph.

The net change in traffic flows at the site access, presented in Table 4, shows an increase of 837 AADT in total vehicles, when compared to existing traffic flows. This is more than the indicative threshold for an air quality assessment of a change in LDV flows of greater than 500 AADT for areas outside an AQMA provided by the IAQM.

Changes in traffic flows are also shown in for Grovehurst Road north of the site access and the maximum change for St Pauls Street through the AQMA. The LDV flow change in the AQMA is less than the 100 AADT threshold for areas inside or adjacent to an AQMA provided by the IAQM.

Table 4 Traffic Flows for selected links

Link	2015 AADT	2023 AADT (Do Minimum Scenario)	2023 AADT (Do Something Scenario)	AADT change
Grovehurst Road East of A249 (north of access)	13,734	19,103	19,765	662
Great Grovehurst Farm access	0	0	837	837
B2006 St Pauls Street (through AQMA)	24,728	25,224	25,236	12

4.3.2 Meteorological Data

A meteorological dataset was compiled using data from Gravesend, which is located approximately 25 km to the west-north-west, and is considered to be representative of the study area. Modelling was performed using data for 2016 to allow ratification of the model with the latest local monitoring data.

4.3.3 Sensitive Receptors

Pollutant concentrations were predicted at existing properties near the application site that could be affected by increased traffic flows and at selected proposed receptors on the application site to assess site suitability. The locations of receptors assessed are shown in Figure 3 and receptor details are provided in Table 5 below.

Table 5: Modelled Sensitive Receptors

ID	Receptor Location	Type	Grid Ref (X)	Grid Ref (Y)	Height (m)
R1	Great Grovehurst Farmhouse	Residential	590452	166534	1.5
R2	152 Grovehurst Road	Residential	590435	166471	1.5
R3	13 Archer Close	Residential	590720	166572	1.5
R4	Grovehurst GP surgery	Medical	590519	166155	1.5
R5	Pond Farm House	Residential	590248	167134	1.5
R6	Pheasant Cottage	Residential	589974	166639	1.5
R7	Bobbing Village School	School	588805	165046	1.5
R8	Activeplay Nursery	Nursery	590359	164426	1.5
R9	4 St Pauls Street	Residential	590259	164413	1.5
R10	Chalkwell Road	Residential	590120	164402	1.5
R11	Crown Road	Residential	590378	164585	1.5
R12	60 North Street	Residential	590561	165224	1.5
R13	B2006	Residential	589192	164736	1.5
R14	Quinton Road	Residential	589445	165184	1.5
R15	Balmoral, Sheppey Way	Residential	589199	165702	1.5
R16	St Michaels Road	Residential	590904	163704	1.5
R17	Grovehurst Road	Residential	590484	166330	1.5
R18	Proposed GGF	Proposed Residential	590434	166668	1.5
R19	Proposed GGF	Proposed Residential	590565	166695	1.5
R20	Proposed GGF	Proposed Residential	590649	166607	1.5

There are also several receptors in close proximity to the site boundary that are potentially sensitive to mineral dust impacts. Six representative receptor locations have been assessed (MR1- MR6). The locations of the receptors assessed are shown in Figure 4 and details are provided in Table 14. Receptors MR1 - MR5 are within 100 m of a dust source. Receptor MR6 is located at the Swale SSSI and is greater than 400 m from a dust source.

4.3.4 Significance of Local Air Quality Impacts

Air quality impacts are considered to be significant if a development leads to significant impacts at existing sensitive receptors or if air quality objectives / EU limit values are predicted to be exceeded at proposed sensitive

receptors. Guidance on land-use planning and development control[9] suggests that a two-stage approach should be adopted to determine whether or not a proposed development has a significant impact on local air quality. Firstly, qualitative descriptions are applied to the predicted impacts on local air quality at individual receptors, which is then supplemented by professional judgement about the overall significance of the effects of any identified impacts.

In order to assess the potential impacts of a proposed development on local air quality, a description of the impact is given based on the magnitude of change as a percentage of a relevant Air Quality Assessment Level (AQAL). Account must also be taken of predicted pollutant concentrations and their relationship to the Air Quality Objective / EU limit value for the pollutants of concern. Table 6 summarises the impact descriptors for annual mean NO_2 and PM_{10} concentrations. The impact descriptors may be adverse or beneficial depending upon whether concentrations are predicted to increase or decrease. The impacts for short-term concentrations are described in Table 7.

Table 6: Air quality impact descriptors for annual mean NO_2 and PM_{10} concentrations

		% change in concentration relative to AQAL[a]				
Annual mean concentration at receptor in assessment year		**0**	**1**	**2 – 5**	**6 – 10**	**>10**
As % of AQAL	**NO_2 / PM_{10} ($\mu g/m^3$)[b]**	<0.2	0.2 – <0.6	0.6 – <2.2	2.2 – ≤4.0	>4.0
≤75%	**≤30.2**	Negligible	Negligible	Negligible	Slight	Moderate
76% - 94%	**30.2 – 37.8**	Negligible	Negligible	Slight	Moderate	Moderate
95% - 102%	**37.8 – 41.0**	Negligible	Slight	Moderate	Moderate	Substantial
103% - 109%	**41.0 – 43.8**	Negligible	Moderate	Moderate	Substantial	Substantial
≥110%	**≥43.8**	Negligible	Moderate	Substantial	Substantial	Substantial

Notes:

a The percentage change in pollutant concentration is calculated and rounded to the nearest whole number to make it clearer which column the impacts fall within. Changes of less than 0.5% are rounded down to zero and therefore described as negligible.

b Concentrations quoted were obtained from IAQM.

Table 7: Short-term impact effects descriptor

Impact in relation to criterion	Effect descriptor
<10%	Negligible
10 – 20%	Slight
20 – 50%	Moderate
>50%	Substantial

The descriptors presented in Table 6 and Table 7 are ascribed to impacts at individual sensitive receptor locations, however they are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. The Guidance makes it clear that the assessment of significance of the overall effect should be based on professional judgement. Whilst it may be that there are 'slight', 'moderate' or 'substantial' impacts at

[9] Environmental Protection UK and the Institute of Air Quality Management (2017) Land-Use Planning & Development Control: Planning For Air Quality, Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. January 2017 (v1.2)

one or more receptors, the overall effect may not necessarily therefore be judged as being significant in some circumstances. A ‘moderate’ or ‘substantial’ impact may not have a significant effect if it is confined to a very small area.

Where a single development can be judged in isolation, it is likely that a ‘moderate’ or ‘substantial’ impact will give rise to a significant effect and a ‘negligible’ or ‘slight’ impact will not have a significant effect, but such judgements are always more likely to be valid at the two extremes of impact severity. It also advises that for new occupants of a proposed development, the impacts are best described in relation to whether or not an air quality objective / limit value will be not be met, or is at risk of not being met. An exceedence of the objective / limit value is likely to be considered as being significant.

5. Assessment Results

5.1 Minerals Dust Assessment

A disamenity dust impact assessment can generally be screened out if there are no sensitive receptors within either 250m or 400m of a minerals site, depending on whether the underlying rock type is soft (sand, gravel, clay) or hard, respectively. Given the close proximity of several sensitive residential receptors to the site boundary, as shown in Figure 4, a disamenity dust impact assessment has been carried out for the Proposed Development.

A PM_{10} assessment can be screened out if there are no sensitive receptors within 1 km of the operation. As there are receptors within 100 m, this cannot be screened out at this stage.

5.1.1 Step 1: Site Characteristics and Baseline Conditions

A site visit was made on 20th July 2017 to understand the site and its locality.

Swale Borough Council carries out continuous PM_{10} monitoring at one location, Ospringe Road in Faversham, which is a roadside site and is located over 10 km away from the site. Therefore, to obtain an estimate of the background PM_{10} concentration at the site, Defra's mapped background concentrations tool has been used, which in 2016 was 16.5 µg/m^3 for the 1km grid square containing the site (centred on 590500, 166500).

The guidance advises that a PM_{10} assessment can be screened out if the long term background PM_{10} concentration is less than 17 µg/m^3 as there is little risk that the Process Contribution (PC) would lead to an exceedance of the annual mean objective.

Several highly sensitive receptors (residential properties) lie adjacent to the southern boundary of the site, and also near to the eastern boundary of the site. Six receptor locations have been assessed (MR1- MR6) (see Appendix A Figure 4).

Potential dust sources at the minerals site consist mainly of the brickearth extraction and potentially also from bare soil due to the clearing of land prior to the start of the brickearth extraction phase. The quantity of brickearth to be extracted will be approximately 68,467 tonnes (51,095 m^3). The duration of works to extract the brickearth will last approximately 19 weeks, and the method used for extraction will be using one excavator to directly load HGVs.

Existing natural mitigation for dust emissions include thick vegetation (trees and hedgerows) present around much of the boundary of the site. However, there is no vegetation barrier present adjacent to the southern boundary of the site where several residential receptors are located. A ~2m high fence instead separates these receptors and the site boundary.

5.1.2 Step 2: Estimation of dust impact risk

The Dust Impact Risk was determined for each of the main operational activities:

a) Site preparation and restoration – due to an area of approximately 45,000 m^2 (4.5 ha), relatively fine-grained and friable material (sand/silt/clay), and the extraction and movement of approximately 50,000 m^3 of material, the potential dust magnitude is prescribed as "medium".

b) Mineral extraction – as the working area for brickearth extraction is much less than 20 ha, and an assumed extraction rate much less than 200,000 tpa based on a total extraction volume of approx. 50,000 m^3, a "small" potential dust magnitude has been prescribed.

c) Materials handling – assumed to be "small" potential dust magnitude, as just one excavator is likely to be used to load one 20-tonne tipper truck as yet at any one time.

d) On-site transportation – assumed to be "small" potential dust magnitude, based on approximately 36 daily HDV movements, and a small total length of haul roads likely to be less than 500 m.

e) Mineral processing – assumed to be "small" potential dust magnitude, based on a material extraction rate of much less than 200,000 tpa.

f) Stockpiles and other exposed surfaces – likely to be “medium” potential dust magnitude based the occurrence of an acoustic soil mound much less than 50 m from the southern site boundary, for likely greater than 1 month duration. This assumes the soil mound is exposed to air and not covered, otherwise, a “small” potential dust emission magnitude can be prescribed.

g) Off-site transportation (track-out) – likely “medium” potential dust magnitude as a conservative estimate, based on 36 daily HDV movements, and unknown provision of wheel washing/cleaning facilities. It should be noted that brickearth can be extracted only during fair weather conditions and so the risk of track-out is limited.

More than one of these activities may occur on the site at any one time, and this was taken into consideration in the assessment.

The Residual Source Emissions was based on the scale of the anticipated operations and was classified as Small, Medium, or Large for each relevant operational activity for each zone, taking into account the designed-in mitigation. The Residual Source Emissions for each activity in this example are summarised in Table 8 below

Table 8. Residual Source Emissions Classification

Activity	Residual Source Emissions
Site Preparation and Restoration	Medium
Mineral Extraction	Small
Materials Handling	Small
On-site transportation	Small
Mineral Processing	Small
Stockpiles and Exposed Surfaces	Medium/Small
Off-site transportation	Medium

The site-specific factors considered to determine the Effectiveness of the Pathway were the distance and direction of receptors relative to the prevailing wind directions. There are many receptors – mainly high sensitivity residential – within 250 m of the site and therefore a selection of representative receptors were selected. These receptors are given in Table 14 and are shown in Appendix A Figure 4. The site is reasonably flat, with an acoustic mound proposed near the southern boundary of the site, which may provide a level of mitigation against dust blowing towards sensitive receptors to the south of the site.

For each receptor within 250 m of the site boundary, the wind directions for each source were calculated. The frequencies of wind in each direction were then calculated based on hourly meteorological data for 2016 from a nearby meteorological station representative of local conditions (Gravesend, approx. 25 km WNW of the site). Only hours with no precipitation were considered when determining the directional frequency of wind.

The resulting frequency of moderate to high wind speeds with the potential of carrying airborne dust towards receptors were then assigned to the categories in Table 9 based on 12 x 30^{o} wind direction sectors.

Receptors MR1 to MR4 were found to have a potentially dusty wind category of “moderately frequent”, while Receptors MR5 and MR6 were assigned the category “Infrequent”.

Table 9. Categorisation of Frequency of Potentially Dusty Winds

Frequency Category	Criteria
Infrequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are less than 5%
Moderately frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 5% and 12%

Frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 12% and 20%
Very frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are greater than 20%

The categorisation shown in Table 9 was applied to the distance from each receptor to the source, with categories of distance shown in Table 10 below.

Table 10. Categorisation of Receptor Distance from Source

Category	Criteria
Distant	Receptor is between 200 m and 400 m from the dust source
Intermediate	Receptor is between 100 m and 200 m from the dust source
Close	Receptor is less than 100 m from the dust source

The pathway effectiveness was classified using the Frequency of Potentially Dusty Winds from Table 9 and the Receptor Distance from Source from Table 10, as shown in Table 11.

All receptors MR1 - MR5 are within 100 m of a dust source, and so each receptor is categorised as having a "close" distance from source. Receptor MR6 is greater than 400 m from a dust source and so is classified as "distant".

Table 11. Pathway Effectiveness

		Frequency of potentially dusty winds			
		Infrequent	Moderately frequent	Frequent	Very frequent
Receptor Distance Category	Close	Ineffective	Moderately effective	Highly effective	Highly effective
	Intermediate	Ineffective	Moderately effective	Moderately effective	Highly effective
	Distant	Ineffective	Ineffective	Moderately effective	Moderately effective

Receptors MR1 – MR4 are all "close" in terms of distance from the dust source, with a "moderately frequent" frequency of potentially dusty winds, and therefore were given a "moderately effective" pathway effectiveness classification. Receptor MR5 is also "close" to the dust source, however with an "infrequent" potentially dusty wind frequency, and so it has an "ineffective" pathway effectiveness. Receptor MR6 (The Swale SSSI) is "distant" from any dust sources and also has an "ineffective" pathway effectiveness.

The Residual Source Emissions and the Pathway effectiveness were combined to predict the Dust Impact Risk as shown in Table 12. The Residual Source Emissions were predicted to be "small" or "medium" at all receptors based on the results in Table 8.

Table 12. Estimation of Dust Impact Risk

		Residual Source Emissions		
		Small	Medium	Large
Pathway Effectiveness	Highly effective pathway	Low Risk	Medium Risk	High Risk

	Moderately effective pathway	Negligible Risk	Low Risk	Medium Risk
	Ineffective pathway	Negligible Risk	Negligible Risk	Low Risk

Based on Table 12, the dust impact risk at all receptors is either “low” or “negligible”.

These low levels of risk confirm that a PM_{10} assessment is not required due to the low background concentrations and the small scale of activity taking place on-site.

5.1.3 Step 3: Estimate Likely Magnitude of Disamenity Effects

The southwestern extent of a SSSI designated site (The Swale, additionally a RAMSAR site) is located approximately 0.8 km from the mineral site boundary, and has therefore been taken into account in this assessment. The sensitivity of a SSSI site is generally considered to be “medium”. This receptor has been taken into account for this assessment.

The likely disamenity effect at each receptor was determined from the Dust Impact Risk (Table 12) and the Receptor Sensitivity, as shown in Table 13.

Table 13. Descriptors for magnitude of dust effects

		Receptor Sensitivity		
		Low	Medium	High
Dust Impact Risk	High Risk	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
	Medium Risk	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
	Low Risk	Negligible Effect	Negligible Effect	Slight Adverse Effect
	Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

The dust disamenity effects predicted at each receptor around the minerals development was summarised in a table setting out the risks of impacts for each zone/activity being assessed; as illustrated in the example in Table 14. The locations of these receptors are shown in Appendix A Figure 4, although receptor MR6 has not been shown due to its distance from the site.

Table 14. Example of Summary of Dust Disamenity Effects at Specific Receptors

Ref	Receptor details and location	Location relative to nearest dust source	Residual Source Emissions	Pathway Effective-ness	Dust Impact Risk	Receptor Sensitivity	Magnitude of Dust Effect
MR1	House at end of Danes Mead	20m from acoustic soil mound	Medium	Moderately effective	Low	High	Slight Adverse Effect
MR2	House at end of Godwin Close	20m from acoustic soil mound	Medium	Moderately effective	Low	High	Slight Adverse Effect
MR3	Archer Court	60 m from eastern boundary	Medium	Moderately effective	Low	High	Slight Adverse Effect
MR4	Great G Farm House	50 m from acoustic soil mound	Medium	Moderately effective	Low	High	Slight Adverse Effect
MR5	Featherbed House	80 m from western site boundary	Medium	Ineffective	Negligible	High	Negligible Effect
MR6	The Swale	0.8 km from northern	Small	Ineffective	Negligible	Medium	Negligible

SSSI	site boundary	Effect

Overall, the proposed development is considered to have a slight adverse effect on the surrounding area. This effect is considered to be 'not significant'. This is based on a consideration of the different magnitude of effects at individual receptors, and the number of receptors that would experience these different effects.

There are a number of mitigation measures that can be adopted to reduce the production and/or dispersal of dust to lessen the nuisance and human-health impacts of the dust and PM_{10} generated during mineral extraction activities. These should be implemented through a Dust Management Plan.

5.2 Construction Dust Assessment Results

The construction phase of the proposed development has the potential to generate emissions of dust and PM_{10} within the boundaries of the construction areas. Whilst the majority of this dust would be contained within the boundaries, some will be transported in the air to sites outside the construction areas, potentially giving rise to adverse impacts.

Construction phase activities with the potential to generate dust and emissions include:

- Site preparation and establishment;
- Demolition of existing infrastructure[10];
- Storage/use of cement or other fine particulate materials;
- Windblown material from areas with no vegetation cover;
- Material transfer to and from trucks/lorries;
- Material spills during transportation and handling;
- Vehicle/plant movements on unpaved haul routes and over construction sites; and
- Concrete batching and finishing.

5.2.1 Screening and Sensitivity of the Area

There are between 10 - 100 high sensitivity receptors (residential) within 50 m of the site boundary, and along anticipated trackout routes. These are predominantly situated to the south east of the application site. To the north east of the site there are some commercial and industrial receptors of medium sensitivity between 50 – 350m in distance from the site.

Based on the number of sensitive receptors and the distance between the site and sensitive receptors, the overall sensitivity of the area to dust soiling due to construction phase activities is considered to be Medium.

Receptors are greater than 50m from any demolition works and hence the sensitivity of receptors to dust soiling from this activity is considered to be low.

The PM_{10} concentration predicted at sensitive receptors in the area, considering the DEFRA mapped background concentrations is 16.5 $\mu g/m^3$. The overall sensitivity of the area to human health impacts is therefore considered to be Low for all construction activities.

No sensitive or designated sites have been identified within close proximity to the application site (<500m). A Ramsar & SSSI site (The Swale) exists to the northeast of the proposed development, however this is over 0.8km away and unlikely to be affected by construction phase activities. However, Great Crested Newts which is a European protected species are present on site. Although these are not considered to be particularly sensitive to dust, the overall sensitivity of the area to ecological impacts is considered to be Medium. A mitigation corridor

[10] Note demolition activities are limited in this case as only one of the smaller buildings will remain for demolition as part of the site works.

is to be created along the complete length of the southern boundary before commencement of the brickearth extraction and the exclusion fencing will remain in place until after the completion of the housing development. .

The sensitivity of the area to impacts due to the different construction activities is summarized in Table 15.

Table 15: Summary of Area Sensitivity to Construction Phase Activities

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Medium	Medium	Medium
Human Health (PM_{10} effects)	Low	Low	Low	Low
Ecological Impacts	Low	Medium	Medium	Medium

5.2.2 Assessment of the Risk of Dust Impacts

The site is currently occupied by old farm buildings, which are currently being demolished, as such only 1 of the smaller buildings will remain for demolition as part of the site works. The total building volume to be demolished is there less than 20,000m^3 consisting predominantly of construction material with low potential for dust release. Therefore the dust emission magnitude for demolition is considered to be small.

The application site area is greater than 10,000 m^2. As a conservative approach the dust emission magnitude for earthworks is therefore considered to be Large.

The proposed development will involve the construction of c.120 new residential properties. The dust emission class for construction is considered to be Medium.

The number of vehicle movements associated with the construction of the development is not currently known but based on the size of the site, it is expected that there would be between 10 - 50 HDV outward movements in any one day during the busiest period so the track out emission class associated with the Proposed Development is considered to be Medium.

The potential dust emission magnitudes for each construction phase activity are summarised in Table 16.

Table 16: Summary of Potential Dust Emission Magnitudes for Construction Phase Activities

Activity	Potential Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction	Medium
Trackout	Medium

The results of the assessment of risk of dust events associated with construction phase activities without mitigation are summarised in Table 17.

Table 17: Summary of Risk of Dust Impacts for Construction Phase Activities on Human Receptors without Mitigation

Potential Impact	Risk of Dust Impacts			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	Medium Risk	Medium Risk	Low Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk
Ecological	Negligible	Medium Risk	Medium Risk	Low Risk

5.2.3 Construction Vehicle and Plant Exhaust Emissions

Exhaust emissions from construction vehicles and machinery also have the potential to impact upon air quality during the construction phase. However, the number of construction vehicles using the local road network is likely to be small in comparison to existing traffic flows. Any local air quality impacts that may result are, therefore, considered likely to be of Negligible significance.

5.2.4 Mitigation Measures and Residual Effects

There are a number of mitigation measures that can be adopted to reduce the production and/or dispersal of dust to lessen the nuisance and human-health impacts of the dust and PM_{10} generated during construction activities. Identifying potential dust generating activities and good site planning is essential to prevent unnecessary dust production and should be conducted prior to commencing work. Where appropriate, dust generating activities should be undertaken off-site, however, where this is not possible these activities should be located away from sensitive receptors. Dust should be controlled at source by the use of appropriate plant handling techniques, good maintenance and housekeeping. The potential risks for each construction phase activity shown in Table 17 have been used to define appropriate site-specific mitigation measures, with reference to the IAQM guidance as shown in Appendix A.

Should effective mitigation measures be enforced and implemented within a Dust Management Plan and/or CEMP then the residual impact of the construction phase will be 'Not Significant' for all the activities, with respect to dust soiling and PM_{10} effects.

5.3 Local Air Quality Operational Phase Assessment Results

5.3.1 Model verification

Model verification was carried out to check whether predicted NO_2 concentrations at monitoring locations agreed with the monitored concentrations.

Five diffusion tube monitoring sites with data for 2016 have been used; SW77, SW52, SW51, SW65 and SW39. These were chosen as the closest suitable locations to the site, with SW77 the closest diffusion tube to the application site and the other tube locations within close proximity to the St Paul's Street AQMA.

Traffic flows for model verification were obtained from the 2015 traffic data provided as discussed in section 4.3.1.

The background NO_2 concentration for tube SW77 (15.3 $\mu g/m^3$) was obtained from the Defra Background Maps for 2016. A slightly different background (15.8 $\mu g/m^3$) was used for modelling the other tube locations as this was considered to be more representative of the AQMA area where the tubes are located. The background concentration was also determined from Defra Background Maps for 2016.

The measured annual mean road NO_x contribution (Table 18) was plotted against the modelled annual mean road NO_x contribution and the gradient of the best fit line calculated as 2.7. This value has been applied to adjust all model output values of NO_x and the annual mean concentrations of NO_2 at the monitoring locations recalculated.

Table 18: Summary of Model Performance

Monitoring Site	Measured annual mean road NO_X contribution ($\mu g/m^3$)	Modelled annual mean road NO_X contribution ($\mu g/m^3$)	Adjusted annual mean road NO_X contribution ($\mu g/m^3$)	Measured annual mean NO_2 concentration ($\mu g/m^3$)	Predicted annual mean NO_2 concentration ($\mu g/m^3$)
SW77	34.3	10.8	29.0	32.2	29.8
SW52	45.8	15.6	42.2	37.7	36.2
SW51	50.5	18.1	48.9	39.7	39.1

Monitoring Site	Measured annual mean road NO_X contribution ($\mu g/m^3$)	Modelled annual mean road NO_X contribution ($\mu g/m^3$)	Adjusted annual mean road NO_X contribution ($\mu g/m^3$)	Measured annual mean NO_2 concentration ($\mu g/m^3$)	Predicted annual mean NO_2 concentration ($\mu g/m^3$)
SW65	20.7	6.9	18.5	26.3	25.2
SW39	23.3	13.1	35.3	27.5	33.1

After adjustment, modelled concentrations at all 5 diffusion tube locations were within 20% of the concentrations.

The accuracy of the adjusted model was also considered via the calculation of the Root Mean Square Error (RMSE). The RMSE is used to define the average error or uncertainty of the model. The RMSE value for this model was 2.85 µg/m^3, which is considered an acceptable level as given in Defra's technical guidance LAQM.TG16 which sets an acceptable level as 4 µg/m^3 which is 10% of the objective.

Due to a lack of PM_{10} and $PM_{2.5}$ monitoring at suitable locations close to the site the NO_x verification factor of 2.7 will also be used for PM_{10} and $PM_{2.5}$.

5.3.2 Model results

Concentrations of NO_2, PM_{10} and $PM_{2.5}$ in the opening year of 2023 have been predicted at 20 receptor locations.

5.3.2.1 Predicted Annual Mean NO_2 concentrations

The predicted results in Table 19 show the annual mean NO_2 concentrations with and without the proposed development in 2023. NO_2 concentrations have been modelled at individual receptors at heights of relevant exposure using emission factors for 2016.

Two different NO_2 background concentrations were used to represent the difference in background concentrations at receptors near the application site and receptors close to the St Paul's Street AQMA. This approach was taken to ensure a conservative approach was taken when modelling concentrations close to and with the St Paul's Street AQMA.

Table 19 Predicted Annual Mean NO_2 concentrations

Receptor	Background ($\mu g/m^3$)	Do Minimum ($\mu g/m^3$)	Do Something ($\mu g/m^3$)	Impact	Impact Descriptor
R1	13.4	24.7	24.8	0.1	Negligible
R2	13.4	32.4	32.5	0.1	Negligible
R3	13.4	24.8	24.9	0.0	Negligible
R4	13.4	23.5	23.6	0.1	Negligible
R5	13.4	33.7	33.8	0.0	Negligible
R6	13.4	24.7	24.7	0.0	Negligible
R7	13.4	32.9	33.1	0.1	Negligible
R8	15.8	34.2	34.3	0.0	Negligible
R9	15.8	**43.1**	**43.1**	0.0	Negligible

Receptor	Background ($\mu g/m^3$)	Do Minimum ($\mu g/m^3$)	Do Something ($\mu g/m^3$)	Impact	Impact Descriptor
R10	15.8	**41.6**	**41.6**	0.0	Negligible
R11	15.8	27.4	27.4	0.0	Negligible
R12	13.4	26.6	26.6	0.0	Negligible
R13	13.4	35.3	35.3	0.0	Negligible
R14	13.4	24.7	24.7	0.0	Negligible
R15	13.4	22.6	22.6	0.0	Negligible
R16	15.8	31.3	31.3	0.0	Negligible
R17	13.4	28.2	28.3	0.1	Negligible
R18	13.4	-	32.0		No exceedance
R19	13.4	-	28.3		No exceedance
R20	13.4	-	25.1		No exceedance

All of the predicted concentrations are less than the UK annual mean objective of 40µg/m^3 except for at R9 and R10. These two receptors are located in close proximity to the St Paul's Street AQMA, where monitored concentrations are currently above the UK annual mean objective. Impacts at these locations are negligible.

The largest impact (0.1µg/m^3) is predicted at location R17 which is considered to be Negligible. The proposed receptors introduced in this area as part of the proposed development will be exposed to NO_2 concentrations well within the UK annual mean objective of 40µg/m^3.

Overall, the impact of the proposed development is considered to be not significant at all locations.

5.3.2.2 Predicted Annual Mean PM_{10} concentrations

The predicted results in Table 20 show the annual mean PM_{10} concentrations with and without the proposed development in 2023.

Table 20: Predicted Annual Mean PM_{10} concentrations

Receptor	Background ($\mu g/m^3$)	Do Minimum ($\mu g/m^3$)	Do Something ($\mu g/m^3$)	Impact	Impact Descriptor
R1	16.4	18.6	18.6	0.0	Negligible
R2	16.4	20.3	20.3	0.0	Negligible
R3	16.4	18.5	18.5	0.0	Negligible
R4	16.4	18.4	18.4	0.0	Negligible
R5	16.4	20.5	20.5	0.0	Negligible
R6	16.4	18.5	18.5	0.0	Negligible
R7	16.4	20.2	20.3	0.0	Negligible

Receptor	Background ($\mu g/m^3$)	Do Minimum ($\mu g/m^3$)	Do Something ($\mu g/m^3$)	Impact	Impact Descriptor
R8	16.9	20.7	20.7	0.0	Negligible
R9	16.9	22.6	22.6	0.0	Negligible
R10	16.9	22.1	22.2	0.0	Negligible
R11	16.9	19.2	19.2	0.0	Negligible
R12	16.4	19.0	19.1	0.0	Negligible
R13	16.4	21.0	21.0	0.0	Negligible
R14	16.4	18.6	18.6	0.0	Negligible
R15	16.4	18.1	18.1	0.0	Negligible
R16	16.9	19.9	19.9	0.0	Negligible
R17	16.4	19.4	19.4	0.0	Negligible
R18	16.4	-	20.1		No exceedance
R19	16.4	-	19.2		No exceedance
R20	16.4	-	18.6		No exceedance

Predicted concentrations at all receptors are considerably less than the UK annual mean PM_{10} objective of $40\mu g/m^3$. All impacts are considered negligible and therefore not significant.

5.3.2.3 Predicted Annual Mean $PM_{2.5}$ concentrations

The predicted results in Table 21 show the annual mean $PM_{2.5}$ concentrations with and without the proposed development in 2023.

Table 21: Predicted Annual Mean $PM_{2.5}$ concentrations

Receptor	Background ($\mu g/m^3$)	Do Minimum ($\mu g/m^3$)	Do Something ($\mu g/m^3$)	Impact	Impact Descriptor
R1	11.6	12.9	12.9	0.0	Negligible
R2	11.6	13.9	13.9	0.0	Negligible
R3	11.6	12.9	12.9	0.0	Negligible
R4	11.6	12.8	12.8	0.0	Negligible
R5	11.6	14.1	14.1	0.0	Negligible
R6	11.6	12.9	12.9	0.0	Negligible
R7	11.6	13.9	13.9	0.0	Negligible
R8	12.3	14.5	14.5	0.0	Negligible

Receptor	Background ($\mu g/m^3$)	Do Minimum ($\mu g/m^3$)	Do Something ($\mu g/m^3$)	Impact	Impact Descriptor
R9	12.3	15.7	15.7	0.0	Negligible
R10	12.3	15.4	15.4	0.0	Negligible
R11	12.3	13.7	13.7	0.0	Negligible
R12	11.6	13.2	13.2	0.0	Negligible
R13	11.6	14.3	14.3	0.0	Negligible
R14	11.6	12.9	12.9	0.0	Negligible
R15	11.6	12.6	12.6	0.0	Negligible
R16	12.3	14.1	14.1	0.0	Negligible
R17	11.6	13.4	13.4	0.0	Negligible
R18	11.6	-	13.8		No exceedance
R19	11.6	-	13.3		No exceedance
R20	11.6	-	12.9		No exceedance

Predicted concentrations at all receptors are considerably less than the EU limit value annual mean $PM_{2.5}$ of 25µg/m^3. All impacts are considered negligible and therefore not significant.

6. Summary

An air quality assessment has been undertaken in order to assess the potential air quality impacts associated with the proposed residential development at Great Grovehurst Farm, Sittingbourne, Kent.

Swale Borough Council has designated the application site for residential development within the Swale Borough Local Plan 2031. It is understood that brickearth currently on the site is to be extracted prior to development.

Swale Borough Council (Swale BC) has declared six Air Quality Management Areas (AQMAs) due to predicted exceedances of the annual mean national air quality objective for nitrogen dioxide (NO_2). The nearest of these AQMAs to the proposed development site is located along St Paul's Street, which is located approximately 2km southeast of the proposed development site.

A semi-quantitative/ qualitative dust risk assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM) 2016 Minerals Dust Guidance, based on a Source-Pathway-Receptor (S-P-R) methodology for assessing the risk of dust impacts. Overall, the proposed development is considered to have a slight adverse effect on the surrounding area. This effect is considered to be 'not significant'. This is based on a consideration of the different magnitude of effects at individual receptors, and the number of receptors that would experience these different effects.

The results of the construction assessment indicate that, in the absence of mitigation, construction phase impacts associated with the proposed redevelopment such as demolition, earthworks and construction and track-out can be described as medium or low risk with regard to dust soiling, and low risk to human health. There are a range of mitigation measures which can be followed to lessen the nuisance and human-health impacts of the dust and PM_{10} which if effectively implemented can reduce impacts to not being significant. Appropriate mitigation measures will be implemented through a Dust Management Plan or Construction Environmental Management Plan.

The operational impact of the development on local air quality was assessed at 20 receptor locations, including receptors both at the site and at locations in close proximity to the St Paul's Street AQMA. The Great Grovehurst Farm development is predicted to generate a traffic flow change of 837 average daily movements on the site access road. Based on the anticipated travel routes to and from the site, only 12 additional daily vehicle movements are anticipated to occur within the St Paul's Street AQMA.

Predicted NO_2 concentrations at the application site were all below the annual mean NO_2 air quality objective of 40µg/m^3. Two receptors close to the St Paul's Street exceeded the objective both with and without the proposed development. The impact of the scheme at these receptors was negligible. Overall the proposed development is predicted to have a negligible impact at existing receptors and all impacts are considered to be not significant.

Appendix A Dust Mitigation Measures

The following mitigation measures detailed in Table 22 are recommended in the IAQM Guidance and are based on the level of risk identified in the Dust Risk Assessment. These measures are intended to be effective and deliverable and in-line with best practice. The measures that will be implemented for this project will be set out in a Dust Management Plan which will be submitted prior to works commencing on-site.

Table 22: Best Practice Construction Phase Mitigation Measures for Medium Risk Site

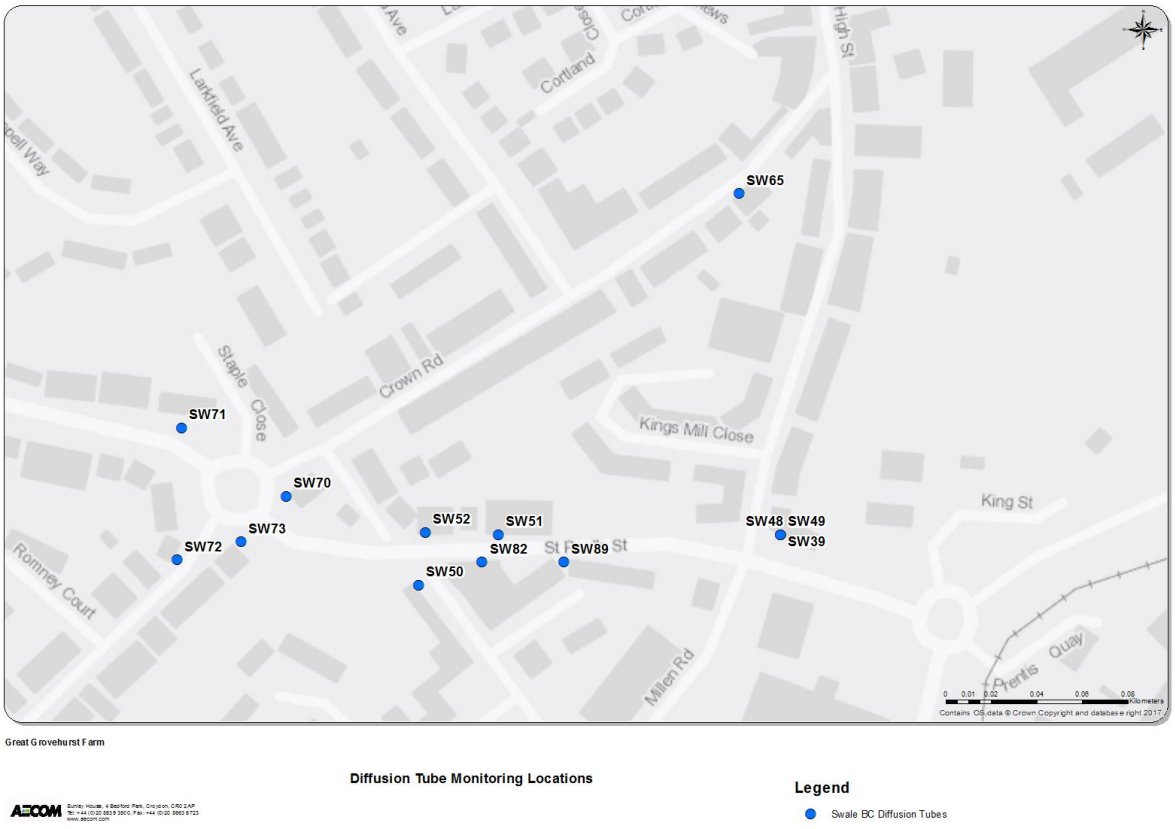
Activity	Mitigation Measures	
Site Management	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	Highly Recommended
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.	Highly Recommended
	Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	Highly Recommended
	Display the head or regional office contact information.	Highly Recommended
	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.	Highly Recommended
	Make the complaints log available to the local authority when asked.	Highly Recommended
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.	Highly Recommended
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	Highly Recommended
	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.	Highly Recommended
	Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are coordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.	Not Required
	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.	Desirable
	Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences.	Highly Recommended

Activity	Mitigation Measures	
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.	Highly Recommended
	Erect solid screens or barriers around dusty activities or the site boundary that are, at least, as high as any stockpiles on site.	Highly Recommended
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	Highly Recommended
	Avoid site runoff of water or mud.	Highly Recommended
	Keep site fencing, barriers and scaffolding clean using wet methods.	Highly Recommended
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	Highly Recommended
	Cover, seed or fence stockpiles to prevent wind whipping.	Highly Recommended
Operating vehicle/machinery and sustainable travel	Ensure all vehicles switch off engines when stationary - no idling vehicles	Highly Recommended
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	Highly Recommended
	Impose and signpost a maximum – speed-limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).	Desirable
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	Highly Recommended
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	Desirable
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	Highly Recommended
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	Highly Recommended
	Use enclosed chutes and conveyors and covered skips.	Highly Recommended
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Highly Recommended
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	Highly Recommended
Waste Management	Avoid bonfires and burning of waste materials.	Highly Recommended
Demolition	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	Desirable
	Ensure water suppression is used during demolition operations. . Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. . In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	Highly Recommended

Activity	Mitigation Measures	
	Avoid explosive blasting, using appropriate manual or mechanical alternatives.	Highly Recommended
	Bag and remove any biological debris or damp down such material before demolition.	Highly Recommended
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	Desirable
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	Desirable
	Only remove the cover in small areas during work and not all at once	Desirable
Construction	Avoid scabbling (roughening of concrete surfaces) if possible	Desirable
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	Highly Recommended
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	Desirable
	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	Desirable
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	Highly Recommended
	Avoid dry sweeping of large areas.	Highly Recommended
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Highly Recommended
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	Highly Recommended
	Record all inspections of haul routes and any subsequent action in a site log book.	Highly Recommended
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	Highly Recommended
	Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable	Highly Recommended
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	Highly Recommended
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	Highly Recommended
	Access gates to be located at least 10m from receptors where possible.	Highly Recommended

Appendix B Figures

Figure 1. Air Quality Monitoring Locations (1)



Great Grovehurst Farm

Diffusion Tube Monitoring Locations

Legend

Swale BC Diffusion Tubes

Figure 2. Air Quality Monitoring Locations (2)

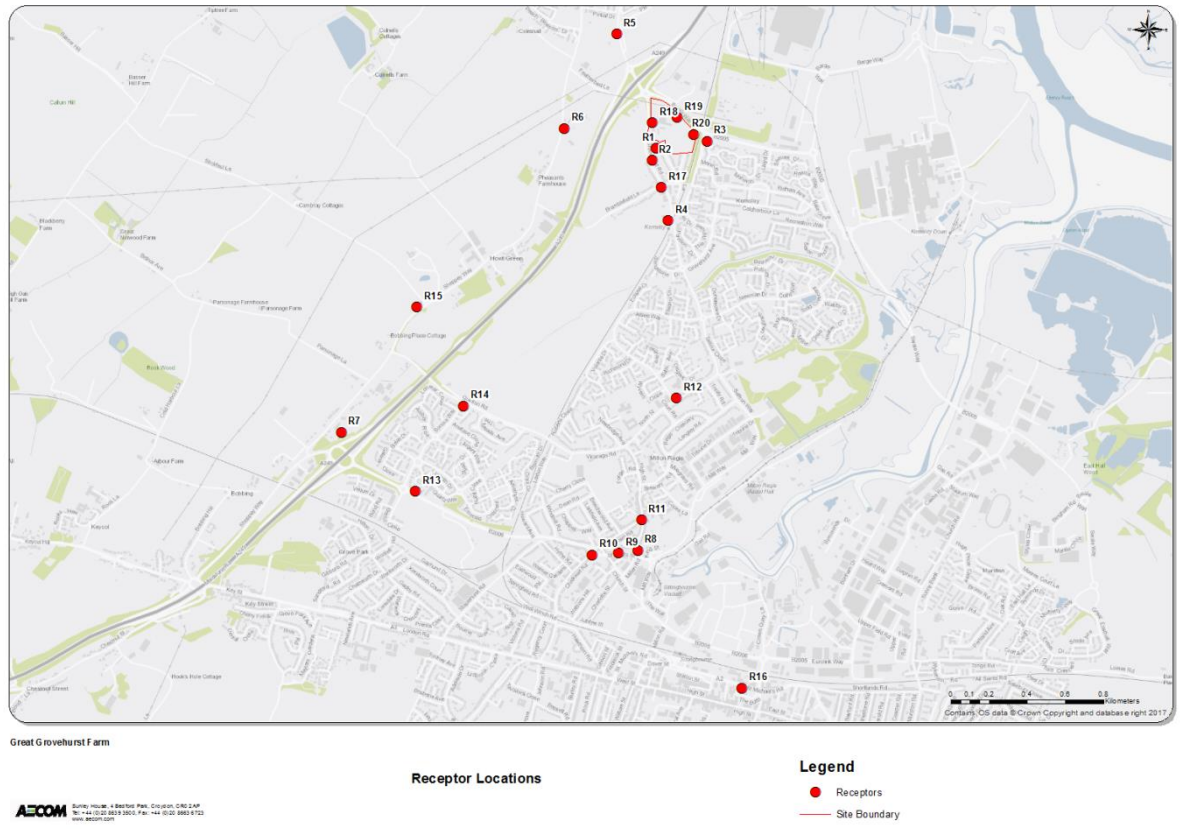


Figure 3. Receptor Locations

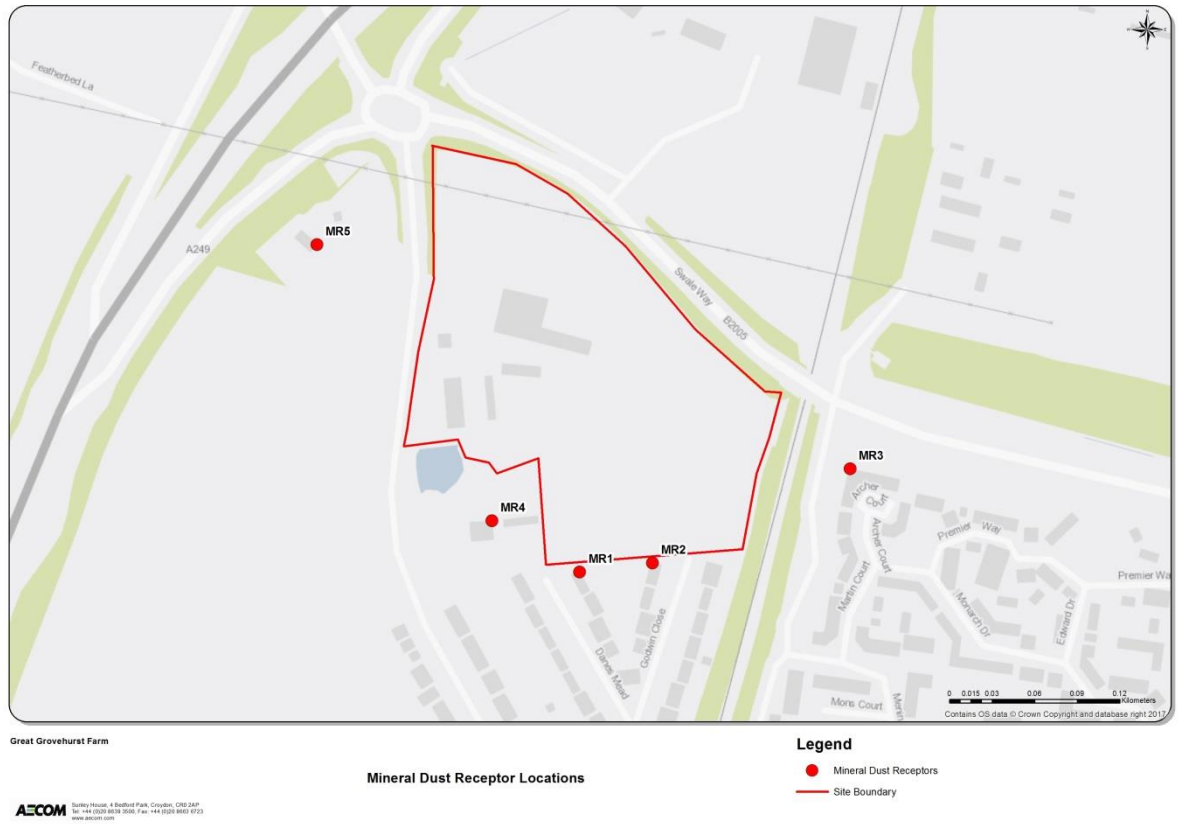


Figure 4. Mineral Dust Receptor Locations

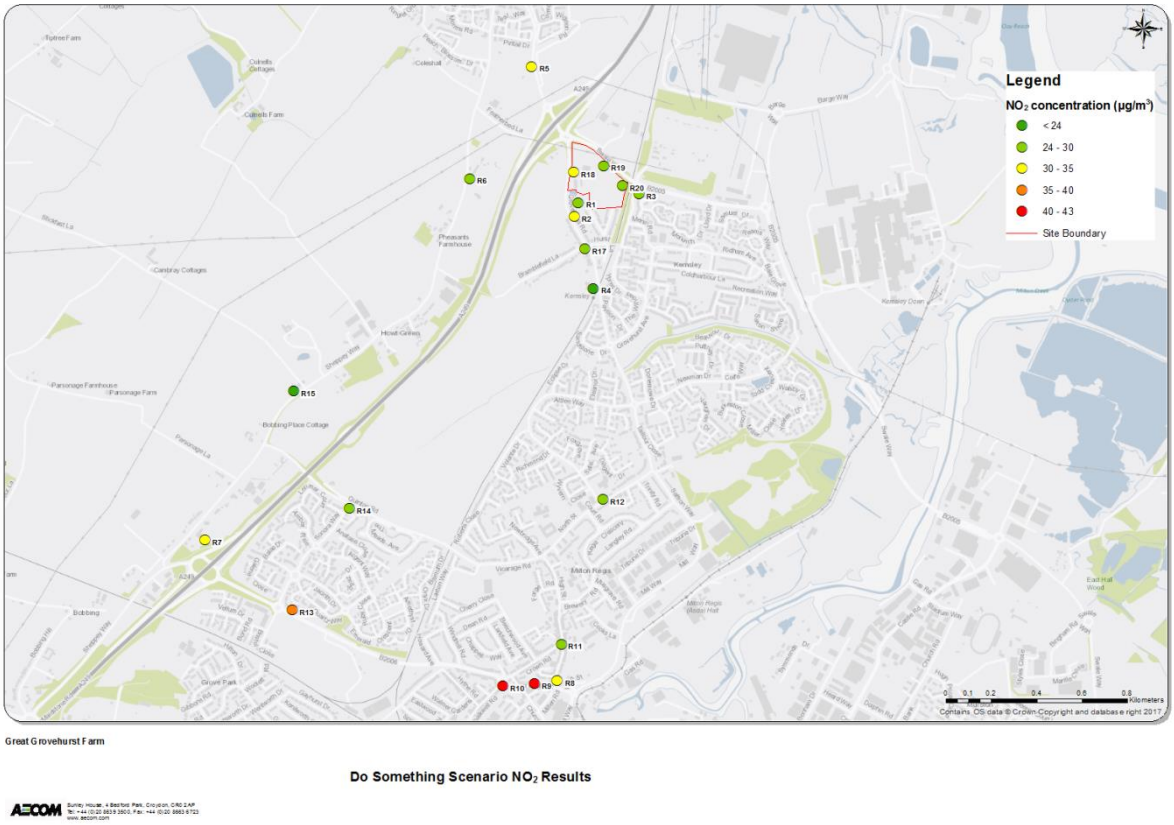


Figure 5. NO_2 concentrations (Do-Something Scenario)

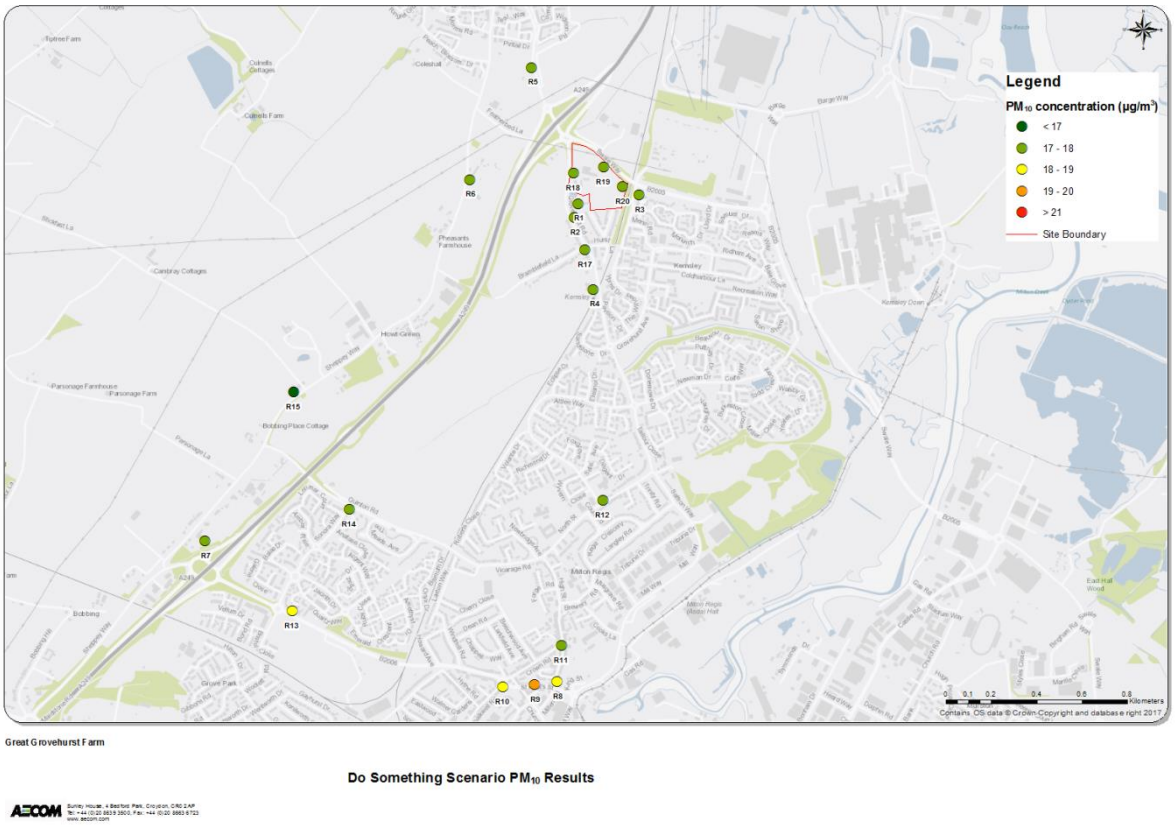


Figure 6. PM_{10} concentrations (Do-Something Scenario)

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