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FORD ENERGY RECOVERY FACILITY AND WASTE SORTING AND TRANSFER FACILITY, FORD CIRCULAR TECHNOLOGY PARK

ENVIRONMENTAL STATEMENT

CHAPTER 6

AIR QUALITY
ODOUR AND DUST

Viridor GRUNDON

6 Air quality, odour and dust

Introduction

6.1 This chapter considers the potential impacts of the proposed development on local air quality, odour and dust. The main focus of the chapter is the process emissions from the operation of the proposed ERF, however, impacts from fugitive emissions of dust during the construction phase, the emissions from traffic associated with the import and export of materials during the construction and operational phases, and potential fugitive emissions of dust and odour during the operational phase of all of the components of the proposed development have also been assessed.

6.2 This chapter is supported by Technical Appendix C: Air quality, which comprises: Appendix C1 – Baseline analysis, Appendix C2 – Construction phase dust assessment methodology and Appendix C3 – Emissions modelling. Technical Appendix E - Human health risk assessment is also referred to in the chapter.

6.3 The data sources and references used in the assessment are shown in table 6.1. The potential for effects on human health as a result of inhalation and ingestion of pollutants that accumulate in the environment is assessed in chapter 8 of the ES.

APIS website: www.apis.ac.uk
Defra, 2019, Clean Air Strategy 2019
Defra, 2018, Local Air Quality Management – Technical Guidance (TG)16
Defra, 2018, National Atmospheric Emissions Inventory: Air Pollution Inventories for England, Scotland, Wales and Northern Ireland: 1990-2016
Defra, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland
Environment Agency, 2016, Air Emissions Risk Assessment for your Environmental Permit
Environment Agency, 2016, Guidance on assessing group 3 metals stack emissions from incinerators – V.4
Environment Agency, 2013, AQTAG 17 – Guidance on in combination assessments for aerial emissions from Environmental Permitting Regulations (EPR) permits
Environment Agency, 2012, Operational Instruction 67_12: Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation
Environment Agency, 2012, Operational Instruction 66_12: Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation
Environment Agency, 2003, Horizontal Guidance Note IPPC H1 Integrated Pollution Prevention and Control (IPPC) Environmental Assessment and Appraisal of BAT
Environmental Protection UK (EPUK) and Institute of Air Quality Management, 2017, Land-Use Planning & Development Control: Planning for Air Quality
Expert Panel on Air Quality Standards (EPAQS), 2006, Guidelines for Halogens and Hydrogen Halides in Ambient Air for Protecting Human Health against Acute Irritancy Effects
Institute of Air Quality Management, 2016, Guidance on the Assessment of Dust from Demolition and Construction v1.1
Institute of Air Quality Management, 2019, A guide to the assessment of air quality impacts on designated nature conservations sites

Table 6.1: References and data sources

Legislation and policy

Ambient air quality legislation

6.4 European air quality legislation is consolidated under the Ambient Air Quality Directive (Directive 2008/50/EC) which came into force on 11th June 2008. This directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides Ambient Air Directive (AAD) limit values for sulphur dioxide, nitrogen dioxide, benzene, carbon monoxide, lead and particulate matter with a diameter of less than 10µm (PM_{10}) and a new AAD target value and limit value for fine particulates (those with a diameter of less than 2.5µm ($PM_{2.5}$). The fourth daughter Directive, 2004/107/EC, was not included within the consolidation. It sets health-based target values for polycyclic aromatic hydrocarbons (PAHs), cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable. Directives 2008/50/EC and 2004/107/EC are transposed into UK law, into the Air Quality Standards Regulations (2010) and subsequent amendments.

6.5 The UK government and the devolved administrations are required under the Environment Act (1995) to produce a national air quality strategy (AQS). This was last reviewed and published in 2007. The AQS sets out the UK's air quality objectives and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. This includes additional targets and limits for 15-minute sulphur dioxide and 1,3-butadiene and more stringent requirements for benzene and PAHs, known as AQS Objectives. Environmental assessment levels (EALs) for other pollutants are presented on the gov.uk website as part of the Environment Agency's (EA) *Environmental Management Guidance (Air emissions risk assessment for your environmental permit)* which was last updated on 2nd August 2016 and is referred to here as the Air Emissions Guidance. AAD target and limit values, AQS Objectives, and EALs are set at levels well below those at which significant adverse health effects have been observed in the general population and in particularly sensitive groups. For the remainder of this chapter these are collectively referred to as Air Quality Assessment Levels (AQALs).

6.6 The UK government published the *Clean Air Strategy* (CAS) in January 2019. This sets out the methods by which air pollution from all sectors will be reduced. The CAS has not introduced any new air quality limits.

6.7 When considering the impact against the AQALs it is important to note that these apply at areas of relevant exposure. *Local Air Quality Management Technical Guidance (2016)* referred to as LAQM.TG(16), outlines that the AQALs apply in the following locations:

- Annual mean - all locations where members of the public might be regularly exposed - i.e. building facades of residential properties, schools, hospitals, care homes etc.
- 24-hour mean and 8-hour mean - all locations where the annual mean objective would apply together with hotels and gardens of residential properties

- 1-hour mean - all locations where the annual mean, 24-hour and 8-hour mean apply together with kerbside sites and any areas where members of the public might be reasonably expected to spend one hour or more
- 15-minute mean - all locations where members of the public might reasonably be exposed for a period of 15 minutes or more

6.8 The AQALs relevant to the proposed development are detailed in Technical Appendix C3 - Emissions modelling and are summarised in the following tables.

Pollutant	AQAL (µg/m³)	Averaging Period	Frequency of exceedance	Source
Nitrogen dioxide	200	1 hour	18 times per year (99.79th percentile)	AAD Limit Value
	40	Annual	-	AAD Limit Value
Sulphur dioxide	266	15 minutes	35 times per year (99.9th percentile)	AQS Objective
	350	1 hour	24 times per year (99.73rd percentile)	AAD Limit Value
	125	24 hours	3 times per year (99.18th percentile)	AAD Limit Value
Particulate matter (PM_{10})	50	24 hours	35 times per year (90.41st percentile)	AAD Limit Value
	40	Annual	-	AAD Limit Value
Particulate matter ($PM_{2.5}$)	25	Annual	-	AAD Limit Value
Carbon monoxide	10,000	8 hours, running	-	AAD Limit Value
	30,000	1 hour		Air Emissions Guidance
Hydrogen chloride	750	1 hour	-	Air Emissions Guidance
Hydrogen fluoride	160	1 hour	-	Air Emissions Guidance
	16	Annual	-	Air Emissions Guidance
Ammonia	2,500	1 hour	-	Air Emissions Guidance
	180	Annual	-	Air Emissions Guidance
Benzene	195	1-hour	-	Air Emissions Guidance
	5	Annual	-	AQS Objective
1,3 butadiene	2.25	Annual, running	-	AQS Objective
PCBs	6	1-hour	-	Air Emissions Guidance
	0.2	Annual	-	Air Emissions Guidance
PAHs – benzo(a)pyrene	0.00025	Annual	-	AQS Objective

Table 6.2 Air quality assessment levels

Pollutant	AAD Target – Long Term (µg/m³)	Long Term Air Emissions Guidance (µg/m³)	Short Term Air Emissions Guidance (µg/m³)
Cadmium	0.005	0.005	-
Thallium	-	-	-
Mercury	-	0.25	7.5
Antimony	-	5	150
Arsenic	0.006	0.003	-
Cadmium	0.005	0.005	-
Chromium (II & III)	-	5	150
Chromium (VI)	-	0.0002	-
Cobalt	-	-	-
Copper	-	10	200
Lead	-	0.25	-
Manganese	-	0.15	1500
Nickel	0.020	0.020	-
Vanadium	-	5	1

Table 6.3 Air quality assessment levels for metals

6.9 Critical levels for the protection of sensitive ecosystems and habitats are also outlined within the Air Quality Standards Regulations for oxides of nitrogen and sulphur dioxide. Limits for ammonia and hydrogen fluoride are contained in the Air Emissions Guidance. The critical levels relevant to this project are presented in the following table.

Pollutant	Conc. (µg/m3)	Measured as	Source
Nitrogen oxides (as nitrogen dioxide)	75	Daily mean	Air Emissions Guidance
	30	Annual mean	AAD
Sulphur dioxide	10	Annual mean for sensitive lichen communities and bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystems integrity	Air Emissions Guidance
	20	Annual mean for all higher plants	AAD
Hydrogen fluoride	<5	Daily mean	Air Emissions Guidance
	<0.5	Weekly mean	Air Emissions Guidance
Ammonia	1	Annual mean for sensitive lichen communities and bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystems integrity	Air Emissions Guidance
	3	Annual mean for all higher plants	Air Emissions Guidance

Table 6.4 Critical levels for the protection of ecosystems

6.10 In addition to the critical levels set out in the table above, the Air Pollution Information System (APIS) provides habitat specific critical loads for nitrogen and acid deposition. Full details of the habitat specific critical loads can be found in Technical Appendix C3 – Emissions modelling.

Industrial pollution regulation

6.11 Atmospheric emissions from industrial processes are controlled in the UK through the Environmental Permitting (England and Wales) Regulations (2010), and subsequent amendments. The proposed development will be regulated by the EA and so will need an environmental permit to operate. The environmental permit will include conditions to prevent fugitive emissions of dust and odour beyond the boundary of the installation. The environmental permit will also include limits on emissions to air.

6.12 The Industrial Emissions Directive (IED) (Directive 2010/75/EU), was adopted on 7th January 2013 and is the key European directive which covers almost all regulation of industrial processes in the EU. Within the IED, the requirements of the relevant sector reference document on Best Available Techniques (known as the BREF) become binding, as follows:

- Article 15, paragraph 2, of the IED requires that emission limit values (ELVs) are based on best available techniques, referred to as BAT
- Article 13 of the IED, requires that the Commission develops BAT guidance documents, referred to as BREFs

6.13 The Waste Incineration BREF was published by the European Integrated Pollution Prevention and Control (IPPC) Bureau in December 2019. The BREF introduces BAT-AELs (BAT Associated Emission Levels) which are more stringent than those currently set out in the exist IED for some pollutants. The ERF will need to comply with the requirements for a new plant. For the remainder of this assessment the anticipated emission limits, which are a combination of BAT-AELs and emission limits from the IED, are referred to as emission limit values (ELVs).

Local air quality management

6.14 Under Section 82 of the Environment Act (1995) (Part IV), local authorities are required to periodically review and assess air quality within their area of jurisdiction, under the system of local air quality management (LAQM). This review and assessment of air quality involves assessing present and likely future ambient pollutant concentrations against AQALs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, then the local authority is required to declare an air quality management area (AQMA). For each AQMA, the local authority is required to produce an air quality action plan (AQAP), the objective of which is to reduce pollutant levels in pursuit of the relevant AQALs.

6.15 A review of the local area shows that the closest AQMA is the Chichester (St Pancras) AQMA, located approximately 13 km from the proposed development. At this distance it is unlikely that the proposed development would have a measurable impact on the AQMA and therefore the impact of the proposed development on AQMAs has been scoped out of the assessment.

National Planning Policy Framework

6.16 The National Planning Policy Framework (NPPF) published in July 2018 and updated in February 2019 notes that planning policies should sustain

compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of AQMAs, Clean Air Zones and the cumulative impacts on air quality from individual sites in local areas. It also states that planning decisions should ensure that any new development in an AQMA is consistent with the local AQAP.

6.17 In terms of planning decisions and air quality, the NPPF in paragraphs 180 and 181 states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.

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

National Planning Practice Guidance

6.18 National Planning Practice Guidance (NPPG) Air Quality published in March 2014 has been developed in order to support the NPPF. The guidance provides a concise outline as to how air quality should be considered in order to comply with the NPPF and states when air quality is considered relevant to a planning application, which includes when the proposals:

- 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
- 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

Arun District Council Local Plan 2018

6.19 The Arun Local Plan 2011 – 2031 was formally adopted on 18th July 2018. The plan comprises of a number of policies developed to help guide decisions on planning, development and delivering infrastructure projects to the local community.

6.20 Policy QE DM3 of the Arun Local Plan (2018) sets out the following requirements for air pollution stating that:

"All major development proposals will be required to assess the likely impacts of the development on air quality and mitigate any negative impacts by:

a) Ensuring the development is located within easy reach of established public transport services
b) Maximising provision for cycling and pedestrian facilities
c) Encouraging the use of cleaner transport fuels on site, through the inclusion of electric car charging points
d) Contributing towards improvement of the highway networks where the development is predicted to result in increased congestion on the highway network

Development proposed nearby any AQMA declared within the District within the Plan period, will require an air quality assessment to identify likely impacts of development upon the designated area. Developers will be required to ensure delivery of the actions set out within any Air Quality Action Plan.

Industrial development which is regulated by environmental permits (that creates or results in dust, smell, fumes, smoke, heat , radiation, gases, steam or other forms of pollution) must be located in such position which ensures that the health, safety and amenity of users of the site or surrounding land is not put at risk and the quality of the environment would not be damaged or put at risk".

Sussex Air Quality Partnership

6.21 All local authorities across West Sussex are part of the Sussex Air Quality Partnership, designed to ensure a strategic and consistent approach in dealing with air quality. The Sussex Air Quality Partnership has produced a guidance document *Air Quality and Emissions Mitigation Guidance for Sussex* (2020).

6.22 This guidance deals with the pollutants from transport which are regulated under the LAQM regime and the assessment and control of dust during construction and demolition. The main purpose of the document is to:

- Provide clarity to how authorities intend interpreting relevant local plan policies
- Provide advice for developers and their consultants on how to assess and mintage the impact that new developments may have on local air quality
- Detail a consistent approach by developers and local planning authorities (LPAs) to:
    - Address impacts on local air quality

- Ensure optimum scheme design to reduce emissions and/or exposure and
- Avoid unnecessary delays in the planning process

6.23 For major developments (as defined by Town and Country Planning (Development Management Procedure) Order (England) 2015 (as the proposed development) an air quality assessment and emission mitigation assessment is needed. This application is being supported by this air quality assessment which has been undertaken in line with guidance from the IAQM and EA to comply with the requirements of the guidance. An emissions mitigation assessment has also been produced in line with the guidance which calculates the additional transport emissions associated with the development and determines the appropriate level of mitigation required to help avoid, minimise and/or off-set the impact on air quality.

6.24 Details of the Emission Mitigation Statement has been provided with the planning application.

Methodology

Construction phase dust generating activities

6.25 There is the potential for dust to be released into the atmosphere as a result of construction activities. Within this EIA these fugitive dust emissions have been assessed on a qualitative basis in accordance with the methodology outlined within the 2014 IAQM guidance document *Guidance on the assessment of dust from demolition and construction*.

6.26 The guidance is structured to determine the risk of dust effects arising from four types of construction phase activities. These are:

- Demolition
- Earthworks
- Construction
- Trackout (defined as the transport of dust and dirt from the construction / demolition site onto the public road network)

6.27 A site is allocated to a risk category for dust emissions for each of the activities above based on two factors; dust emission magnitude and the sensitivity of the area. These factors are combined to give the risk of dust impacts.

6.28 The highest risk category identified is used to define appropriate, site-specific, mitigation measures. The final stage is to determine whether significant effects are likely. For almost all construction phase activities, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience has shown that this is normally possible.

6.29 A detailed description of the assessment criteria for the assessment of construction phase dust impacts is presented in Technical Appendix C2 - Construction dust assessment methodology.

Vehicle emissions

6.30 The IAQM document *Land-Use Planning & Development Control: Planning for Air Quality* (2017) states that an air quality assessment is required where a development would cause a significant change in light duty vehicles (LDVs) or heavy goods vehicles (HGVs). The indicative criteria to proceed to an assessment are:

- A change in LDV flows of:
    - More than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA; or
    - more than 500 AADT elsewhere
- A change in HGV flows of:
    - More than 25 AADT within or adjacent to an AQMA; or
    - more than 100 AADT elsewhere

6.31 The IAQM guidance does not clearly state the level of assessment which is required. However, if the change in LDV and HGV flows does not exceed the above criteria, the development is not expected to cause a significant change and the significance of effect is deemed to be negligible and further detailed analysis of the impact is not necessary. If the above criteria are not met detailed modelling of road traffic emissions is required to determine the impact.

Operational phase process emissions

6.32 This assessment has been undertaken using the ADMS 5.2 dispersion model, using five years of weather data (2014 – 2018) from the Shoreham/Brighton Airport meteorological station. Full details of the dispersion modelling methodology and inputs can be found in Technical Appendix C3 - Emissions modelling. The model has been used to predict the ground level concentration of pollutants on a long and short-term basis across a grid of points. It has also been used to predict the concentration at nominated points to represent sensitive receptors.

6.33 For the ERF to operate it will need to satisfy industrial permitting requirements set out and monitored by the EA. However, EA guidance has not been developed for conducting an assessment to accompany a planning application. Consequently, the IAQM guidance document *Land-Use Planning & Development Control: Planning for Air Quality* (2017) has been developed for professionals operating within the planning system. It provides planning officers and developers with a means of reaching sound decisions, having regard to the air quality implications of development proposals. The IAQM (2017) guidance states that it may be adapted using professional judgement. Therefore, where appropriate, EA guidance has been incorporated which is considered appropriate given that the ERF will need to satisfy the industrial permitting requirements set out by the EA.

6.34 The IAQM (2017) guidance includes the following matrix which is used to describe the impact based on the change in concentration relative to the AQAL and the overall predicted concentration from the scheme - i.e. the future baseline plus the process contribution.

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

Table 6.5 IAQM magnitude of change descriptors

6.35 It is intended that the change in concentration relative to the AQAL (the process contribution) is rounded to the nearest whole number. Therefore, any impact which is between 0.5% and 1.5% would be classified as a 1% change in concentration. An impact of less than 0.5% is described as negligible, irrespective of the total concentration.

6.36 The above matrix is only designed to be used with annual mean concentrations. The approach for assessing the impact of short-term emissions has been carried out in line with the IAQM (2017) guidance. This does not take into account the background concentrations as it is noted that background concentrations are less important in determining the severity of impact for short term concentrations.

6.37 Consequently, for short term concentrations (i.e. those averaged over a period of an hour or less), the following descriptors of change are used to describe the impact:

- < 10% - negligible
- 10 - 20% - slight
- 20 - 50% - moderate
- > 50% - substantial

6.38 The IAQM (2017) states that, in relation to the significance of short-term impacts:

> *"In most cases, the assessment of impact severity for a proposed development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-term concentrations is approached through the presence of the new source, taking into account the contribution of other prominent local sources."*

6.39 Therefore, if a short-term impact cannot be screened out as negligible or insignificant, consideration will be given to the risk of exceeding the short-term AQAL when determining the significance of effect.

6.40 The IAQM (2017) guidance does not provide any descriptors for averaging periods of between 1 hour and a year. Therefore, for these periods the EA's

guidance *Air Emissions Risk Assessment for your Environmental Permit,* referred to as the Air Emissions Guidance criteria have been used, which state that process contributions can be considered insignificant if:

- The long term process contribution is <1% of the long term environmental standard
- The short term process contribution is <10% of the short term environmental standard

6.41 Where an impact cannot be screened out as insignificant based on the outputs of the initial screening and modelling, the significance of the effect has been determined based on professional scientific judgement of the likelihood of emissions causing an exceedance of an AQAL. This is a standard approach which allows the risk and likelihood of exceedance to be investigated and assessed in detail, following the first stage assessment.

6.42 In addition, the EA guidance document *Guidance on assessing group 3 metals stack emissions from incinerators - V.4* June (2016) for assessing the impact of emissions of metals relative to their respective AQALs, states that where the process contribution for any metal exceeds 1% of the long term or 10% of the short term environmental standard (in this case the AQAL) this is considered to have potential for significant pollution. Where the process contribution exceeds these criteria, the predicted environmental concentration (PEC) should be compared to the environmental standard. The PEC can be screened out where the PEC is less than the environmental standard. Where the impact is within these parameters, it can be concluded that there is no risk of exceeding the AQAL and as such, the magnitude of change and significance of effect is considered negligible.

6.43 For some pollutants which accumulate in the environment such as dioxins and dioxin-like PCBs, inhalation is only one of the potential exposure routes. Therefore, other exposure routes have been considered. An assessment has been carried out using the Industrial Risk Assessment Program - Human Health (IRAP-h View - Version 5.0). The programme, created by Lakes Environmental, is based on the United States Environment Protection Agency (USEPA) Human Health Risk Assessment Protocol. This protocol is a development of the approach defined by Her Majesty's Inspectorate for Pollution (HMIP) in 1996, taking account of further research since that date. Full details of the modelling methodology and inputs can be found in Technical Appendix E - Human health risk assessment.

6.44 In June 2019 the IAQM released the guidance document *A guide to the assessment of air quality impacts on designated nature conservation sites* (the IAQM (2019) guidance). This guidance draws on the EA's Air Emissions Guidance, which states that to screen out impacts as insignificant at European and UK statutory designated sites:

- the long-term process contribution must be less than 1% of the long-term environmental standard (i.e. the critical level or load); and
- the short-term process contribution must be less than 10% of the short-term environmental standard

6.45 If the above criteria are met, no further assessment is required. If the long-term process contribution exceeds 1% of the long-term environmental standard, the PEC must be calculated and compared to the standard. If the resulting PEC is less than 70% of the long-term environmental standard, the Air Emissions Guidance states that the emissions are insignificant and further assessment is not required. In accordance with the guidance, calculation of the PEC for short-term standards is not required.

6.46 The Air Emissions Guidance states further that to screen out impacts as insignificant at local nature sites:

- The long-term process contribution must be less than 100% of the long-term environmental standard; and
- The short-term process contribution must be less than 100% of the short-term environmental standard

6.47 In accordance with the Air Emissions Guidance, calculation of the PEC for local nature sites is not required. However, with regard to locally designated sites, the IAQM (2019) guidance states:

"For local wildlife sites and ancient woodlands, the Environment Agency uses less stringent criteria in its permitting decisions. Environment Agency policy for its permitting process is that if either the short-term or long-term PC is less than 100% of the critical level or load, they do not require further assessment to support a permit application. In ecological impact assessments of projects and plans, it is, however, normal practice to treat such sites in the same manner as SSSIs and European Sites, although the determination of the significance of an effect may be different. It is difficult to understand how the Environment Agency's approach can provide adequate protection."

6.48 As such, it is considered appropriate to apply the screening criteria for SSSIs and European sites to locally designated sites to screen out the requirement for further consideration of the significance of effect for planning.

Plume visibility

6.49 There is the potential for the ERF's plume to be visible under certain circumstances, caused by water vapour in the exhaust gases condensing as the gases cool. The water vapour in the gases mixes with the ambient air as the plume disperses, so that it ceases to be visible once the vapour content is low enough. If the gases are hot and dry, or weather conditions promote rapid dispersion and slow cooling, the plume may not be visible at all.

6.50 ADMS 5.2 includes a plume visibility module, which models the dispersion and cooling of water vapour and predicts whether the plume will be visible, based on its liquid water content. This module has been used to quantify the number of visible plumes likely to occur during the operation of the ERF. The results of this have been fed into the landscape and visual effects assessment.

Fugitive dust and odour

6.51 There is the potential for fugitive emissions of dust and odour to be released from the proposed development during the operational phase, especially during the delivery, unloading and storing of materials. The impact of fugitive odour emissions has been assessed on a qualitative basis in accordance with the methodology outlined within the IAQM guidance document '*Guidance on the Assessment of Odour for Planning* (the IAQM (2018) guidance). This guidance sets out a methodology for assessing the effects of odour on amenity. The scale of the exposure is determined by the parameters collectively known as FIDOL factors (Frequency, Intensity, Duration, Odour unpleasantness and Location). There is no specific guidance for assessing the impact of dust from operational sites like the proposed development. Therefore, we have applied the principals of the construction phase dust assessment methodology to determine the impact of fugitive dust emissions which could arise during operation of the proposed development.

6.52 As with the dust assessment the likely magnitude of effect is a combination of the risk of exposure and the sensitivity of the receptors. The risk of exposure is determined based on the source odour potential and the pathway effectiveness.

6.53 When determining the risk of exposure, the first stage is to categorise the source odour potential using the following risk ranking:

Pathway Effectiveness	Description
Large	• Larger permitted processes of odorous nature or large sewage treatment works (STWs) • Highly odorous compounds with very low detection thresholds with unpleasant to very unpleasant odours • Open air operation with no containment
Medium	• Smaller permitted processes or small STWs • Moderately odorous compounds with neutral to unpleasant odours • Some mitigation measures in place, but significant residual odour remains
Small	• Smaller permitted processes or small STWs • Processes classed as “Less offensive • Effective, tangible mitigation measures in place (e.g. Best Available Techniques (BAT), Best Practicable Means (BPM) leading to little or no residual odour

Table 6.7 Source odour potential criteria

6.54 The next stage is to determine the pathway effectiveness as a transport mechanism for odour. This includes consideration of the distance, whether the receptors are down wind of the odour source, the effectiveness of the release, the topography and terrain between the source and receptor. Using the following risk ranking the pathway effectiveness can be categorised as ineffective, moderately effective or highly effective.

Pathway Effectiveness	Description
Highly Effective	• Receptor is adjacent to the source/site • Direction – high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind)
Moderately Effective	• Receptor is local to the source
Ineffective	• Receptor is remote from the source • Direction – low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind)

Table 6.8 Pathway effectiveness criteria

6.55 The risk of odour at receptor locations is then determined using the following matrix considering the pathway effectiveness and source odour potential.

Pathway Effectiveness	Source Odour Potential		
	Small	**Medium**	**Large**
Highly Effective	Low Risk	Medium Risk	High Risk
Moderately Effective	Negligible Risk	Low Risk	Medium Risk
Ineffective	Negligible Risk	Negligible Risk	Negligible Risk

Table 6.9 Risk of odour exposure criteria

6.56 The next step is to estimate the effect of that odour impact on the exposed receptor, taking into account its sensitivity, as shown by the following matrix.

Risk of Odour Exposure	Receptor Sensitivity		
	Low	**Medium**	**High**
High	Slight Adverse	Moderate Adverse	Substantial Adverse
Medium	Negligible	Slight Adverse	Moderate Adverse
Low	Negligible	Negligible	Slight Adverse
Negligible	Negligible	Negligible	Negligible

Table 6.10 Odour Impact Criteria

6.57 Where the overall effect is greater than slight adverse the effect is likely to be considered significant. Although not specifically developed for assessing fugitive dust from operational sites the approach for construction dust has been applied when determining the impact of fugitive dust release from the site in lieu of any other specific guidance.

Limitations and uncertainties

6.58 Limitations of the assessment have been taken into account wherever possible. For instance:

- The assessment has been undertaken using standard methods outlined in guidance produced by the EA and the IAQM. Standard assessment criteria, developed by nationally recognised institutions, minimise any uncertainty on the applicability of the approach used
- Baseline data has been collected from site-specific, local and national monitoring networks. Where site-specific monitoring is not available, worst-case assumptions have been made and if impacts cannot be screened out as negligible irrespective of the baseline concentration or insignificant when determining the significance of effect, then the choice of background concentrations has been considered in greater detail
- The impact of process emissions from the ERF has been determined based on operation at the ELVs. For short term impacts, it has been assumed that the ERF operates for the entire year at the short-term emission limit so that periods of operation coincide with the worst-case meteorological conditions for dispersion. In practice the ERF will operate below the ELVs and will be offline for periods of maintenance
- The assessment has used five years of meteorological data to ensure inter-annual variability is taken into account and considered the predicted concentrations at the point of maximum impact and receptor locations.
- A range of sensitivities of model inputs have been analysed in line with best practice. Where assumptions have been made, these are conservative yet realistic

Baseline

6.59 A detailed review of baseline conditions is provided in Technical Appendix C1 - Baseline analysis. This has included a review of site-specific, local and national monitoring networks.

Pollutant	Annual Mean Concentration	Units	Justification
Nitrogen dioxide	20.71	µg/m3	Maximum monitored concentration from site specific monitoring.
Oxides of nitrogen	18.13	µg/m3	Maximum mapped background concentration from across the modelling domain – DEFRA 2017 dataset.
Sulphur dioxide	6.89	µg/m3	Maximum mapped background concentration from across the modelling domain – DEFRA 2001 dataset.
Particulate matter (as PM10)	16.11	µg/m3	Maximum mapped background concentration from across the modelling domain – DEFRA 2017 dataset.
Particulate matter (as PM2.5)	10.89	µg/m3	Maximum mapped background concentration from across the modelling domain – DEFRA 2017 dataset.
Carbon monoxide	265	µg/m3	Maximum mapped background concentration from across the modelling domain – DEFRA 2001 dataset.

Benzene	0.36	µg/m3	Maximum mapped background concentration from across the modelling domain – DEFRA 2001 dataset
1,3-butadiene	0.15	µg/m3	Maximum mapped background concentration from across the modelling domain – DEFRA 2001 dataset
Ammonia	3.41	µg/m3	Maximum monitored concentration from DEFRA (CEH) 2014 dataset.
Hydrogen chloride	0.71	µg/m3	Maximum monitored concentration across the UK 2012 to 2015
Hydrogen fluoride	2.35	µg/m3	Maximum measured concentration from EPAQS report
Mercury	3.69	ng/m3	Maximum annual concentration averaged across all urban background sites across the UK 2014 to 2018
Cadmium	0.26	ng/m3	
Arsenic	0.81	ng/m3	
Antimony	0.38	ng/m3	Average across all UK monitoring sites 2014 to 2018
Chromium	13.16	ng/m3	Maximum annual concentration averaged across all urban background sites across the UK 2014 to 2018
Cobalt	0.32	ng/m3	
Copper	11.10	ng/m3	
Lead	11.06	ng/m3	
Manganese	10.90	ng/m3	
Nickel	6.61	ng/m3	
Vanadium	1.55	ng/m3	
Dioxins and Furans	33.00	fg/m3	Maximum monitored concentration across all UK sites 2012 to 2016
Dioxin-like PCBs	127.46	pg/m3	
PaHs	0.33	ng/m3	Maximum annual concentration averaged across all urban background sites across the UK 2015 to 2018

Table 6.11 Summary of baseline concentrations

6.60 Where representative local monitoring is not available, concentrations obtained from DEFRA mapped background datasets have been used as the baseline concentrations in the assessment. However, for some pollutants there are no mapped background datasets. In these instances, the maximum concentration from national monitoring datasets for sites in a similar setting to the proposed development has been used as the baseline concentration.

6.61 Trends in national monitoring dataset has shown that generally pollutant concentrations have been decreasing and are projected to continue to decrease. The only local monitoring available is for nitrogen dioxide. The analysis has shown that the monitored concentrations are fairly low and there are no exceedances of the AQAL.

6.62 The site is adjacent to the Viridor Waste Management Facility and Southern Water site. The baseline odour in the local area has the potential to be impacted by the Existing Viridor Waste Management Facility and Southern Water site. No other significant sources of odour or other waste sites have been identified in the local area.

6.63 The Viridor Waste Management Facility is required to have a procedure for registering complaints as a condition of the Environmental Permit. However, the complaints log for the Viridor Waste Management Facility is currently not

available. However, odour impacts generally occur when the wind is blowing from a source towards the residential properties. The wind roses from Shoreham for 2014 to 2018 show that there is a distinct peak in frequency of winds from the south west, with winds from the north also occurring relatively frequent. When considering wind direction, receptors located downwind of the peak wind direction frequency (to the north east and south) have the most effective odour pathway. The closest residential properties downwind of the Viridor Waste Management Facility are located along Horsemere Green Lane, approximately 500m away. At this distance it is likely that the odour baseline at all high sensitive receptor locations is likely to be low.

Sensitive receptors

Dust sensitive receptors

6.64 It is anticipated that construction activities will take place at various locations across the site. However, as a worst-case assumption, it has been assumed that dust generating activities will occur at the boundary of the site, with the exception of demolition activities which will only occur in the vicinity of the existing buildings to be demolished. Figure 6.1 Construction dust screening zones illustrates the screening distances for dust sensitive receptors from the boundary of the site.

6.65 The following table outlines how many sensitive human receptor locations have been identified in the relevant distance bands from the site. For clarity, the IAQM methodology states that one residential unit is one high sensitivity receptor.

Distance from the source (m)	Estimated number of Human Receptors			
	From Site Boundary		From Site Access Routes*	
	High Sensitivity	Medium Sensitivity	High Sensitivity	Medium Sensitivity
<20	0	0	0	0
<50	0	0	0	0
<100	0	5	-	-
<200	0	12	-	-
<350	61	30	-	-

Notes: *Distance from site access routes is used in the assessment of trackout and only receptors within 50 m of the edge of the road (up to 500 m from the site entrance) need to be considered.

Table 6.12 Dust sensitive receptors – number of human receptors

6.66 The closest high sensitivity receptor identified is a residential property located off Ford Lane, which lies just under 220 m to the north east of the site boundary.

6.67 The medium sensitivity receptors identified are places of work and outbuildings used for farming and industrial purposes, the closest being the Viridor Waste Management Facility located approximately 90 m to the south of the site.

6.68 Although there are residential receptors within 50 m of the route used by construction vehicles within 500 m of the junction with Ford Road, which is covered by the application site boundary, the road from the site to Ford Lane is tarmacked and used by vehicles of the neighbouring Viridor and Southern Water

sites. The intention of the IAQM guidance is that 500 m is the distance from the area of muddy ground where dust could be deposited by vehicles leaving the site and re-suspended by vehicles using the road network. The vehicles travel along the tarmacked access road before accessing Ford Lane, therefore the distance should be that from the area of potentially muddy ground. As a worst-case this is assumed to be the boundary of the site onto the access road. There are no residential receptors within 50 m of the route used by construction vehicles, up to 500 m from this area. In addition, there are no designated ecological receptors within 50 m of the site boundary or the route used by construction vehicles on the public highway, up to 500 m from the site entrance. Therefore, it is not necessary to consider the effect of trackout or the effect on ecological receptors in this assessment.

Human sensitive receptors

6.69 The general approach to the assessment is to evaluate the highest predicted process contribution to ground level concentrations. In addition, the predicted process contribution at a number of sensitive receptor locations have been evaluated.

6.70 There is potential for the proposed development to impact upon other projects in the vicinity of proposed development. Therefore, a number of additional human sensitive receptors have been included to represent the proposed residential developments identified during the scoping process.

6.71 The receptor locations are displayed in figure 6.2: Human sensitive receptor locations and listed in the following table:

ID	Receptor Name	Location		Distance from the Stacks (m)
		X	Y	
R1	Ford Lane 1	499101	103893	727
R2	Ford Lane 2	499246	103908	669
R3	Ford Lane 3	499674	103662	399
R4	Rodney Crescent	499962	103515	498
R5	Ford Road	500100	103236	588
R6	Ford Open Prison 1	500137	102865	757
R7	Horsemere Green Lane 1	500109	102385	1,088
R8	Horsemere Green Lane 2	499847	102322	1,029
R9	Beagle Drive	499015	102981	591
R10	Yapton Primary School	497788	103647	1,762
R11	Proposed Ford Airfield Residential 1	499218	103340	300
R12	Proposed Ford Airfield Residential 2	499319	102906	436
R13	Proposed Ford Airfield Residential 3	499249	103576	386
R14	Proposed Ford Airfield Residential 4	498952	103288	563
R15	Proposed Ford Airfield Residential 5	499156	103056	432
R16	Proposed Landings Residential Development 1	499593	103313	80
R17	Proposed Landings Residential Development 2	499744	103175	259
R18	Proposed Landings Residential Development 3	499660	103040	294
R19	Proposed Landings Residential Development 4	499470	103463	173

R20	Proposed Allocation of Arun DC Secondary School	498749	103383	771
R21	Proposed Residential Development Climping	499851	102072	981
R22	Proposed Residential Development Bilsham Road	497709	102995	1,831
R23	Proposed Residential Development Drove Lane	497575	103238	1,941
R24	Proposed Residential Development Walberton	497446	106017	3,418
R25	Proposed Residential Development Littlehampton	502954	103875	3,487

Table 6.13 Process emissions human sensitive receptors

6.72 This is not an exhaustive list of all sensitive receptor locations, but a series of points chosen to represent areas sensitive to impacts from the proposed development. Where necessary additional analysis of dispersion contour plots has been undertaken to understand the spatial distribution of impacts.

Ecological sensitive receptors

6.73 The following sites of ecological importance have been considered in line with the Air Emissions Guidance:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs), or Ramsar sites within 10 km of the proposed development
- Sites of Special Scientific Interest (SSSIs) within 2 km of the proposed development
- National Nature Reserves (NNR), Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs) and ancient woodlands within 2 km of the proposed development

6.74 The locations of these sensitive ecological receptors are listed in the following table and displayed in figure 6.3: Ecological sensitive receptors. A review of the citation and APIS website for each site has been undertaken to determine if lichens are an important part of the ecosystem's integrity, for the purposes of determining the relevant critical level for the habitat.

Site	Distance from the ERF at Closest Point (km)	Lichens identified as present
European and UK designated sites (within 10km)		
Duncton to Bignor Escarpment (SAC and SSSI)	9.9	Yes
Locally designated sites (within 2km)		
Ford Ancient Woodland	1.3	Yes

Table 6.14 Sensitive ecological receptors

6.75 Reference should be made to Technical Appendix C3 - Emissions modelling for full details of the discrete receptor points used to assess the impact on these ecological sites, the habitats present at each site and the habitat-specific critical loads.

Future baseline

6.76 Generally, in the UK atmospheric pollutant concentrations are either remaining constant or decreasing with time. However, as detailed in Appendix C1 - Baseline analysis in the local area the monitored concentrations are fairly low and as such the decreases in background concentrations observed in the UK are not specifically demonstrated in the local area. Whilst not a natural change, government projections indicate that atmospheric pollutant concentrations are likely to reduce in future as a result of national policies to reduce emissions over time. As such, it is likely that pollutant concentrations in the vicinity of the site may decrease slightly over time if the proposed development is not built. This decrease in baseline concentrations would also occur if the proposed development is built. However, there is considerable uncertainty as to how pollutant concentrations will change in the future. Therefore, as a conservative assumption, the concentrations identified in the baseline analysis have been assumed to be constant in future years.

Effects during construction

6.77 Potential air quality impacts during the construction phase have been identified as:

- Generation of dust from construction activities on site, which has been assessed on a qualitative basis
- Generation of dust from construction and earthworks activities from the construction of the grid connection route
- Generation of exhaust pollutants from construction phase traffic.

Construction dust

6.78 The risk of dust emissions from a construction site causing loss of amenity and / or health or ecological effects is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc.)
- The duration of these activities
- The size of the site
- The meteorological conditions (wind speed, direction and rainfall)
- The proximity of receptors to the activity
- The adequacy of the mitigation measures applied to reduce or eliminate dust
- The sensitivity of the receptors to dust

6.79 The quantity of dust emitted is related to the area of land being worked on and the level of construction activities, in terms of the nature, magnitude and duration of those activities. The wind direction, wind speed and rainfall at the time when a construction activity is taking place will also influence whether there is likely to be a dust impact. Atmospheric conditions which promote adverse impacts can occur in any direction from the proposed development. However, adverse impacts are more likely to occur downwind of the prevailing wind

direction and / or close to the worked areas. Impacts are also more likely to occur during drier periods as rainfall acts as a natural dust suppressant.

6.80 The dust emission magnitude has been classified for each type of activity using the dust magnitude criteria outlined in table 1 of Technical Appendix C2 - Construction phase assessment methodology and summarised below:

- Demolition – A number of existing buildings within the site require clearing. The total volume of buildings to be demolished is > 50,000m^3. On this basis, the dust emission magnitude is deemed to be large
- Earthworks - The total area of the site is >10,000 m^2, and the quantity of material to be moved is yet to be determined. However, there will be substantial earthworks involved in the construction of the development platform and the bunker. On this basis, the dust emission magnitude is deemed to be large
- Construction - The total building volume is likely to be >100,000m^3 and involves potentially dusty activities. As a conservative assumption, the dust emission magnitude is deemed to be large

6.81 The sensitivity of the area to dust effects is defined in the following table, taking into account the number of receptors and proximity to the source of potential dust emissions using the criteria outlined in tables 5 to 8 of Technical Appendix C2 - Construction phase assessment methodology.

Potential Impact	Demolition	Earthworks	Construction
Dust Soiling	Low	Low	Low
Human Health	Low	Low	Low

Table 6.15 Sensitivity of the surrounding area

6.82 The risk of dust impacts from construction activities is summarised in the following table using the criteria outlined in Table 8 of Appendix C2 - Construction phase assessment methodology. This is based on the dust emission magnitude and the sensitivity of the area.

Potential Impact	Demolition	Earthworks	Construction
Dust Soiling	Medium Risk	Low Risk	Low Risk
Human Health	Medium Risk	Low Risk	Low Risk

Table 6.16 Summary of dust risk to define site specific mitigation

6.83 In summary, the site has been assessed to be a medium risk site for both dust soiling and human health effects associated with demolition activities. It should be recognised that demolition activities will be restricted to the area of the existing buildings and there are no residential receptors within 280 m of the demolition areas. Any impacts would be temporary in nature, short-term in duration and would only occur during the construction period.

Construction dust exhaust pollutants

6.84 Information on the number of vehicle movements is contained within the Transport Assessment (TA). The peak number of HGVs during the construction period is expected to be 102 two-way trips. Construction operations would generally be limited from Monday to Saturday, with no construction work on Sundays or bank holidays, apart from during the commissioning stage when work could take place 24 hours a day, 7 days a week. When averaging the peak HGV movements and LDV movements for the entire construction phase, the peak vehicle movements are likely to be no higher than those from the operational phase of the proposed development. Therefore, the change in impact associated with the road traffic emissions during the construction phase is likely to be no worse than traffic emissions associated with the operational phase of the proposed development. Therefore, the impact is considered to be negligible.

Grid connection

6.85 As part of the grid connection works a new cable will need to be laid which will include minor earthworks which have the potential to be dusty. The work will take place within existing roads and pathways. Works will be restricted to short sections along the connection route. Due to the limited level of earthworks needed the dust emission magnitude is considered to be small. The sensitivity of the area is likely to be low as there are limited properties along the route and in any case the works will be carried out in short sections at a time. Therefore, the dust risk is considered to be negligible.

Effects post-construction

Process emissions assessment – human receptors

6.86 It should be noted that the first stage of the assessment is considered highly conservative as it assumes that:

- The ERF operates at the long term ELVs for the entire year or the short term ELV for the entire averaging period, as appropriate
- The worst-case conversion of oxides of nitrogen to nitrogen dioxide has been applied
- The entire dust emissions are assumed to consist of either PM_{10} or $PM_{2.5}$
- The entire VOC emissions are assumed to consist of either benzene or 1,3-buitadiene
- Cadmium is released at the combined ELV for cadmium and thallium

6.87 The first stage analysis has shown that the annual mean impact is less than 0.5% of the AQAL and the short-term impact is less than 10% of the AQAL at the point of maximum impact for all pollutants except for the following annual mean impacts:

- Nitrogen dioxide
- VOCs as benzene

- VOCs as 1,3-butadiene
- Cadmium

6.88 Therefore, the magnitude of change is described as negligible irrespective of the baseline concentration for all pollutants and averaging periods, with the exception of those listed above.

6.89 Where the magnitude of change at the point of maximum impact cannot be described as negligible irrespective of the baseline concentration, further analysis has been undertaken. Tables of results at the identified receptor locations are presented in Technical Appendix C3 - Emissions modelling and are discussed below as follows.

Annual mean nitrogen dioxide

6.90 For annual mean nitrogen dioxide, the process contribution at the point of maximum impact is 1.88% of the AQAL. Therefore, consideration needs to be given to baseline concentrations in order to determine the PEC. Figure 6.4: Annual mean nitrogen dioxide, shows the spatial distribution of annual mean nitrogen dioxide impacts as a percentage of the annual mean AQAL. As shown, the point of maximum impact occurs in a small field to the north east of the proposed development off Station Road (i.e. an area where the annual mean AQAL does not apply). A review of site specific and local air quality monitoring shows that baseline concentrations in the area where the point of maximum impact occurs are likely to be no more than 18.5 µg/m^3 (maximum monitored concentration at the Ford 08 diffusion tube). Applying this baseline concentration, the PEC at the point of maximum impact would be 48.13% of the AQAL. Therefore, using IAQM guidance the magnitude of change is described as negligible as the process contribution is less than 5.5% of the AQAL and the PEC is less than 75% of the AQAL.

6.91 The impact at local residential receptors has also been investigated. Under the IAQM guidance, the impact at all but four (R2, R4, R8 and R21) of the identified specific sensitive receptor locations is less than 0.5% of the AQAL and so can be described as negligible irrespective of baseline concentrations.

6.92 R2 is located along Ford Lane. A review of local air quality monitoring data shows that baseline concentrations close to this receptor are likely to be no more than 14.98 µg/m^3 (the maximum monitored concentration at the Ford Lane 2 diffusion tube (site 5)). Applying this as the baseline concentration at R2, the PEC is predicted to be 15.20 µg/m^3 or 38.01% of the AQAL. Therefore, the magnitude of change at R2 is described as negligible as the annual mean process contribution is less than 1.5% of the AQAL and the PEC is less than 75% of the AQAL.

6.93 R4 is located along Rodney Crescent, in which there are a number of residential properties where the impact cannot be screened out as negligible irrespective of the baseline concentration. The Rodney Crescent (site 3) diffusion tube measures 12.34 µg/m^3. Applying this as the baseline concentration at R4, the PEC is predicted to be 12.70 µg/m^3, or 31.75% of the AQAL. Therefore, the magnitude of change at R4 is described as negligible as the annual mean process contribution is less than 1.5% of the AQAL and the PEC is less than 75% of the AQAL.

6.94 R8 and R21 are located away from a busy road between Horsemere Green Lane and Apple Tree Walk. A review of local air quality monitoring data has shown that concentrations along Horsemere Green Lane are likely to be no more than 12.73 µg/m^3 (maximum monitored concentration from the Horsemere Green Lane diffusion tube (site 8)). When this background concentration is applied the magnitude of change at R8 and R21 is described as negligible as the annual mean process contribution is less than 1.5% of the AQAL and the PEC is predicted to be less than 75% of the AQAL.

6.95 In all cases the baseline concentration is well below 75% of the AQAL and the process contribution from the ERF is less than 1.5% of the AQAL. Therefore, the magnitude of change is described as negligible.

Annual mean VOCs as benzene

6.96 For annual mean VOCs if it is assumed that the entire VOC emissions consist of only benzene, the process contribution at the point of maximum impact is 1.79% of the AQAL, and the maximum impact at a receptor is 0.86% of the AQAL. When the baseline concentration of 0.36 µg/m^3 or 7.20% of the AQAL is included, the PEC at the point of maximum impact and at all receptor locations is well below 75% of the AQAL. Therefore, the magnitude of change is described as negligible, as the maximum impact is less than 5.5% of the AQAL and the PEC is less than 75% of the AQAL. Figure 6.5: Annual mean VOCs as benzene, shows the spatial distribution of emissions. This is extremely conservative as it assumes that the VOC emissions consist of only benzene.

Annual mean VOCs as 1,3-butadiene

6.97 For annual mean VOCs if it is assumed that the entire VOC emissions consist of only 1,3-butadiene, the process contribution at the point of maximum impact is 3.97% of the AQAL and the maximum impact at a receptor is 1.90% of the AQAL. When the baseline concentration of 0.15 µg/m^3 or 6.57% of the AQAL is included, the PEC at the point of maximum impact and at all receptor locations is well below 75% of the AQAL. Therefore, the magnitude of change is described as negligible, as the maximum impact is less than 5.5% of the AQAL and the PEC is less than 75% of the AQAL. Figure 6.6: Annual mean VOCs as 1,3-butadiene, shows the spatial distribution of emissions. This is extremely conservative as it assumes that the VOC emissions consist of only 1,3-butadiene.

Annual mean cadmium

6.98 For annual mean cadmium, the process contribution at the point of maximum impact is 3.57% of the AQAL and the maximum process contribution at a receptor is 1.71% of the AQAL. When the baseline concentration of 0.26 ng/m^3 or 5.20% of the AQAL is included, the PEC at the point of maximum impact and at all receptor locations is well below 75% of the AQAL. Therefore, the magnitude of change is described as negligible, as the maximum impact is less than 5.5% of the AQAL and the PEC is less than 75% of the AQAL. This is extremely conservative as it assumes that the entire cadmium and thallium emissions consist of only cadmium. As detailed in Technical Appendix C3 - Emissions modelling, monitoring from facilities processing a similar fuel has indicated that average recorded concentration of cadmium and thallium is 8% of

the limit. Figure 6.7: Annual mean cadmium, shows the spatial distribution of emissions for the following scenarios:

- Worst-case – assumes emissions of cadmium at 100% of the ELV for cadmium and thallium
- Screening - assumes emissions of cadmium at 50% of the ELV for cadmium and thallium
- Typical - assumes emissions of cadmium at 8% of the ELV for cadmium and thallium

Annual mean heavy metals

6.99 The EA's metals screening guidance has been followed as detailed in Technical Appendix C3 – Emissions modelling. This has shown that if it is assumed that the ERF will perform no worse than a currently permitted facility, the predicted process contribution is below 1% of the annual mean AQAL and 10% of the 1-hour AQAL for all metals, with the exception of annual mean arsenic and nickel impacts. However, the PECs for arsenic and nickel are well below 100% of the AQAL and so the impacts can be screened out and the significance of effect of process emissions of metals on human health is considered negligible.

Dioxins and dioxin-like PCBs

6.100 A human health risk assessment has been undertaken (see Technical Appendix E – Human health risk assessment). This considers the impact of dioxins and dioxins-like PCBs which have the potential to accumulate in the food chain. This has shown that the impact of the proposed development on human health due to the accumulation of dioxins and dioxins-like PCBs in the environment is predicted to be negligible.

6.101 Using professional judgement, based on the conservatism in the process emissions modelling assumptions, the overall process emissions associated with the operation of the ERF is predicted to have a negligible and not significant effect on human health. Further details on this assessment are set out in the Habitats Regulation Assessment.

Operation phase process emissions – ecological receptors

6.102 As detailed in Technical Appendix C3, when considering the impact on ecological receptors, the maximum impact at the Duncton and Bignor Escarpment SAC and SSSI is less than 1% of the long-term and less than 10% of the short-term critical level and loads and can be screened out as insignificant.

6.103 The maximum impact at Ford Ancient Woodland is less than 1% of the long-term and less than 10% of the short-term critical level and loads and can be screened out as insignificant, with the exception of the following annual mean impacts:

- Oxides of nitrogen
- Ammonia
- Nutrient nitrogen deposition

6.104 Further analysis has been undertaken to determine the significance of the impact on Ford Ancient Woodland. This analysis is provided in chapter 13 of the ES.

Exhaust pollutants from operational traffic

6.105 The number of HGVs generated by the proposed development exceeds the screening IAQM threshold. As such, detailed modelling of road traffic exhaust emissions during the operational phase of the proposed development has been undertaken. This has considered a worst-case and best-case scenario where emissions do and do not reduce in line with projections. Even if it is assumed that the fleet mix does not change and therefore emissions do not reduce as a result of older vehicles being replaced by newer cleaner vehicles the impact is described as negligible.

6.106 In addition, the review of the process emissions dispersion modelling has shown that the area where peak impacts from process emissions occurs does not coincide with the same place as traffic due to the routing of the vehicles along Ford Road to the south. Therefore, there is little risk of significant in-combination impacts from process and traffic emissions.

Operational phase dust and odour

6.107 The IAQM (2018) guidance sets out a methodology for estimating the effect of odour on a receptor, taking into account the risk of odour exposure (which is a function of the source odour potential and pathway effectiveness) and receptor sensitivity.

6.108 The aspects of the proposed development likely to give rise to dust and odour are the delivery and unloading of waste to the ERF and the WSTF. The odour source potential is considered to be small as the planned odour containment and mitigation measures embedded in the design of the ERF and WSTF, as detailed in chapter 3, are intended to prevent an unacceptable level of odour beyond the site boundary.

6.109 As noted in the dust assessment there are no receptors of high sensitivity within 200 m of the proposed development.

6.110 A review of the surrounding area has shown that the following residential receptors lie within 500 m of the proposed development:

- Residential properties along Nelson Row, approximately 360 m east of the site boundary
- Residential properties on Rodney Crescent, approximately 405 m north east of the site boundary
- Wicks Farm House, approximately 360 m north west of the site boundary
- Residential properties in Rolston Park, approximately 390 m south west of the site boundary

6.111 The wind roses from Shoreham for 2014 to 2018 show that there is a distinct peak in frequency of winds from the south west, with winds from the north also occurring relatively frequent. When considering wind direction, receptors located downwind of the peak wind direction frequency (to the north east and south)

have the most effective odour pathway. Receptors not located downwind of the peak wind direction have an ineffective pathway.

6.112 Wicks Farm House and residential properties along Nelson Row and Rolston Park lie upwind of the site. Therefore, the pathway effectiveness to these receptors is ineffective. However, properties along Rodney Crescent and sections of Ford Lane lie downwind of the site, i.e. the wind blows frequently from the site towards the receptor. Therefore, the pathway effectiveness for these receptors is moderate.

6.113 The risk of odour exposure at Wicks Farm House and properties along Nelson Row and Rolston Park has been assessed as negligible, as the source odour potential is small and the pathway effectiveness is ineffective. These properties are high sensitivity receptors. Taking into consideration the risk of odour exposure and sensitivity of the receptor, the likely magnitude of odour effect at the properties is considered to be negligible.

6.114 The risk of odour exposure at properties along Rodney Crescent and sections of Ford Lane has been assessed as negligible as the source odour potential is small and the pathway effectiveness is moderately effective. These receptors all include residential dwellings and as such are high sensitivity receptors. Taking into consideration the risk of odour exposure and sensitivity of the receptor, the likely magnitude of odour effect at the properties is deemed to be negligible.

6.115 In order to assess the impact of fugitive dust from the operational phase of the proposed development the principals of the approach used to determine construction phase dust impacts have been applied.

6.116 A review of the proposed development has shown that during the operational phase the most significant sources of fugitive dust would arise during the delivery and unloading of waste to the ERF and the WSTF. Noting that the environmental permit would ensure any fugitive dust would be controlled to ensure there is no impact beyond the site boundary. Therefore, the likelihood of significant dust arisings during the operational phase is minimal.

6.117 Based on the inherent mitigation, as detailed in chapter 3, the dust emission magnitude of fugitive dust is deemed to be small. Only a small group of high sensitivity receptors have been identified and baseline annual mean PM_{10} concentrations are well below 24 $\mu g/m^3$. Therefore, the sensitivity of the area is deemed to be low. The risk of dust impacts during the operational phase is deemed to be negligible as the magnitude of dust emissions is low and the sensitivity of the area is low.

6.118 The operational phase fugitive emissions of dust and odour associated with the operation of the proposed development are predicted to have a negligible and not significant effect.

Microclimate

6.119 The UK met office define microclimate as "*the distinctive climate of a small scale area, such as a garden, park, valley or part of a city*". These climatic conditions include variances in wind speed and temperature. The local authority may consider that the proposed development has the potential to affect the wind flow patterns and temperature.

6.120 In terms of wind, the buildings will interact with the wind flow pattern and change conditions on a very local level. These changes would be restricted to the area around the buildings and could mean that wind speeds could be higher close to and between the buildings where winds are "tunnelled". However, these conditions would dissipate as the area between the buildings opens.

6.121 In terms of temperature, in theory the proposed development has the potential to alter temperature by overshadowing or changing the albedo of the land surface by the introduction of a plume from the stack at a temperature of around 140°C. Overshadowing is covered in the community and social effects chapter (chapter 9). As explained overshadowing would be restricted to the immediate surroundings of the buildings and there is not expected to be any overshadowing of neighbouring properties. The existing site is covered with building and large areas of hard-standing. Therefore, although the surface would change with the construction of new buildings this is not a significant change from existing conditions (i.e. not from greenfield to hardstanding). The introduction of a plume, at temperature, would be at a height of 85 m. This would mix with the atmosphere and cool relatively quickly with distance from the release point. Therefore, any change in temperature will be very localised and at height. The proposed development is therefore not expected to have a significant effect on microclimate.

Plume visibility

6.122 The plume emitted from the ERF stack contains water vapour. When the ambient conditions of the atmosphere are sufficiently cold and humid, there is insufficient capacity in the atmosphere to allow this water to remain in vapour form and it will condense into water droplets. This process produces a visible plume, which will appear white to an observer with the sun behind him / her, and dark should the sun be behind the plume (i.e. in front of the observer). The plume will cease to be visible at some point downwind of the stack, when the plume has become sufficiently dispersed for the droplets to evaporate.

6.123 The ADMS dispersion model has been used to estimate the frequency and length of visible plumes, using inputs defining the moisture content of the plume and meteorological data containing hourly observations of relative humidity and temperature. This assessment only considers daylight hours when the plume will be visible. A summary of the results of the plume visibility assessment are set out in table 6.17. This provides the percentage of the year when there would be a visible plume during daylight hours.

Parameter	Year visible plumes would have occurred					
	2014	2015	2016	2017	2018	Average
% of modelled daylight hours with any visible plumes	19.8%	20.8%	21.9%	20.3%	25.2%	21.6%
>20m from stack	17.2%	17.3%	18.8%	18.0%	22.6%	18.8%
>50m from stack	10.9%	10.7%	10.8%	11.5%	15.7%	11.9%
>100m from stack	4.2%	4.4%	4.5%	5.1%	6.5%	4.9%
>200m from stack	0.7%	0.6%	0.7%	0.9%	1.3%	0.8%

Table 6.17 Summary of plume visibility results

6.124 The assessment shows that visible plumes are likely to be present on average for 21.6% of the time, but up to 25.2% in exceptional years (i.e. 2018). The plume length is predicted to be greater than 200 m for on average 0.8% of the year (1.3% for 2018) during daylight hours. The plume will be white or grey depending on lighting conditions and will be somewhat broken and diffuse as the plume disperses.

Mitigation and monitoring

Incorporated mitigation

6.125 The ERF will require an environmental permit in order to operate, which would include a list of conditions including limits on emissions to air known as ELVs. For the purpose of this EIA, it has been assumed that the ERF complies with the requirements of the environmental permit.

6.126 As explained, previously, the IED allows the relevant sector BREF to become binding as BAT guidance and, when finalised, all new plants will need to comply with the BAT conclusions and AELs. These are more stringent than the ELVs set in the IED.

6.127 As detailed in Chapter 3, all operations would be conducted within enclosed buildings, and vehicles would deposit waste into an enclosed tipping hall. The building is totally enclosed except for the roll-up doors. The tipping hall would be held under negative pressure, with the air being used in the combustion process. This prevents the release of odours and dust from the building when the doors are opened for short periods for deliveries. Residual waste would be stored within a waste bunker, albeit this would be within the enclosed waste recycling and tipping hall and waste would not be stored for prolonged periods helping to minimise the conditions which can lead to the generation of malodours. There would be no waste stored outside the buildings. Any odours from the waste stored within the bunker would be drawn into the combustion process by the induced draft fan, where the odorous compounds would be destroyed as a result of the high temperatures within the furnace. Therefore, there would be no release of odour from the stack emissions.

6.128 In the event of a planned shut-down / closure, the incoming waste would be managed such that residual waste in the waste bunker would be processed prior to shut-down and the amount of residual waste remaining in the waste bunker would be minimal. In the event on an unplanned shut-down, the residual waste in the bunker would be back-loaded and removed for processing at alternative facilities. This would minimise the risk of odours during these events.

6.129 It should be noted that as part of the environmental permit for the proposed development, all emissions, including fugitive dust and odour, would be required to be controlled to ensure there is no impact beyond the installation site boundary.

6.130 No additional mitigation is required beyond that imbedded into the design and required by legislation that will be regulated by the EA under the environmental permit.

Construction phase mitigation measures

6.131 The construction dust assessment has identified the site as a medium risk site for dust soiling and human health effects. Appropriate mitigation measures based on best practice for a site of this size and nature that could be implemented are listed below. The final mitigation measures to be implemented will be site-specific, will be determined by the contractor, included in a construction environment management plan and agreed with the local authority prior to commencement of construction phase activities.

- 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
- 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
- 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
- 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
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period
- Avoid site runoff of water or mud
- Cover, seed or fence stockpiles to prevent wind whipping
- Ensure all vehicles switch off engines when stationary - no idling vehicles
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate
- Avoid bonfires and burning of waste materials
- Avoid scabbling (roughening of concrete surfaces) if possible
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place
- Ensure effective water suppression is used during demolition operations. Handheld 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

- Avoid explosive blasting, using appropriate manual or mechanical alternatives
- Bag and remove any biological debris or damp down such materials before demolition

6.132 The mitigation measures stated above are based on best practice for a site of the size and nature proposed. It is considered that with the implementation of these measures any residual impacts would not be significant.

Residual effects

6.133 With mitigation in place, the proposed development is not predicted to give rise to significant residual air quality, odour and dust effects.

Cumulative effects

Construction phase dust generating activities

6.134 A number of schemes are listed in chapter 5 of this ES which could give rise to cumulative environmental effects with the proposed development. Of these schemes, the following have been identified as having the potential to cause cumulative dust emissions:

- The proposed Landings Residential Development (ref:F/4/20/OUT)
- The proposed extension to the Ford Airfield Market (ref:F/5/20/PI)
- The Ford strategic housing allocation (site SD8 in policy H SP2c of the Arun Local Plan)

6.135 If the construction phase of the above schemes were to coincide with the construction phase of the proposed development, there would be the potential for in-combination effects. The construction phase dust assessment for the proposed development has identified that it is a medium risk for dust soiling and human health effects associated with demolition activities. However, with appropriate mitigation measures the proposed development will have a negligible impact and not significant effect. Information on the exact timescales for the cumulative schemes is not available from the EIAs submitted with the planning applications. However, each development would need to include mitigation measures to control the emissions from their works to a suitable level. If each development imposes mitigation measures appropriate to the level of works each are undertaking the cumulative dust impact will remain negligible as it is the intention that the measures control dust to an appropriate level.

6.136 Each of the above schemes are located within 350 m of the proposed development. If these are constructed (and occupied) before the construction on the proposed development commences the risk of the proposed development giving rise to dust impacts may be higher than if these sites were not constructed and additional mitigation may be needed. The dust impact assessment has been updated to take into account the number of properties within in each zone and determine if the risk of dust impacts is greater with these additional schemes.

6.137 The following table outlines how many sensitive human receptors have been identified.

Distance from the source (m)	Estimated number of Human Receptors			
	From Site Boundary		From Site Access Routes*	
	High Sensitivity	Medium Sensitivity	High Sensitivity	Medium Sensitivity
<20	0	0	0	0
<50	8	2	0	0
<100	30	5	-	-
<200	158	12	-	-
<350	177	23	-	-

Notes: *Distance from site access routes is used in the assessment of trackout, and only receptors within 50m of the edge of the road (up to 500m from the Site entrance) need to be considered.

Table 6.18 Cumulative analysis - dust sensitive receptors

6.138 For the purposes of the assessment, the closest high sensitivity receptor identified is a residential property from the proposed Landings residential development, located just under 50 m to the south west of the construction boundary. Although the residential development may not be built at this point, the land is allocated for residential development and therefore as a conservative approach this has been included as a receptor.

6.139 The medium sensitivity receptors identified are commercial and leisure facilities that will constitute part of the proposed Landings residential development. The closest being a commercial building located approximately 30 m to the east of the site boundary.

6.140 The sensitivity of the area is defined in the following table, taking into account the number of receptors and proximity to the source of potential dust emissions using the criteria outlined in tables 5 - 8 of Technical Appendix C2 - Construction phase assessment methodology.

Potential Impact	Demolition	Earthworks	Construction
Dust Soiling	Low	Low	Low
Human Health	Low	Low	Low

Table 6.19 Sensitivity of the surrounding area

6.141 The risk of dust impacts from construction activities is summarised in the following table using the criteria outlined in table 8 of Technical Appendix C2 - Construction phase assessment methodology. This is based on the dust emission magnitude and the sensitivity of the area.

Potential Impact	Demolition	Earthworks	Construction
Dust Soiling	Medium Risk	Low Risk	Low Risk
Human Health	Medium Risk	Low Risk	Low Risk

Table 6.20 Summary of cumulative dust risk to define site specific mitigation

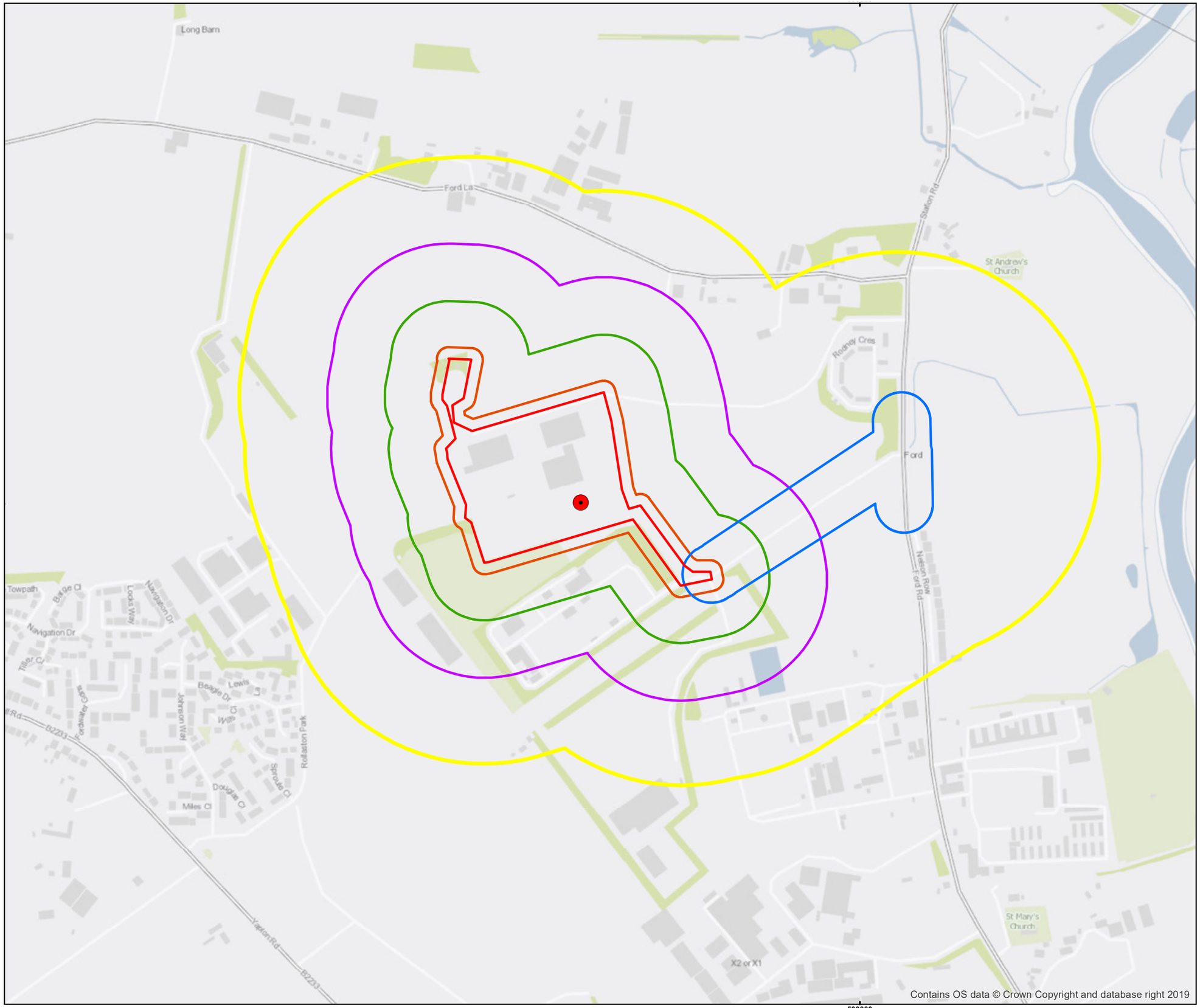
6.142 As shown, when considering construction phase dust impacts from the proposed development and the introduction of the proposed residential schemes, the proposed development has been assessed to be a medium risk site for dust soiling and human health effects associated with demolition activities. Any impacts would be temporary in nature, short-term in duration and would only occur during the construction period. This is the same conclusion as if these schemes were not developed. Therefore, the potential mitigation measures detailed in the mitigation section of this chapter remain appropriate, and with the implementation of these mitigation measures the impact is expected not to be significant.

Process emissions

6.143 None of the cumulative schemes listed in chapter 5 include point source emissions, so there is no potential for cumulative effects with the stack emissions from the ERF. However, a number receptor points have been included in the dispersion modelling to represent the proposed or allocated residential developments identified as being within the modelling domain. The impact of process emission on these receptor points has been assessed as part of the main assessment.

Fall-back position

6.144 In 2015, Grundon Waste Management Ltd secured planning permission for an energy from waste facility and a materials recovery facility (application reference: WSCC/096/13/F). The application was subject to EIA and was accompanied by an ES that was written in October 2013 and an ES Addendum that was prepared in November 2013. The ES considered the potential effects from dust during construction, exhaust pollutants from construction traffic, emissions from the operational waste treatment facilities, exhaust pollutants for operational phase traffic, impacts on ecologically designated sites, odour and plume visibility. For all aspects negligible or insignificant effects were concluded. No additional mitigation measures were considered to be necessary, although reference was made to compliance with an environmental permit (which would limit emissions to air and control dust and odour) and to a construction management plan, which would include control measures to suppress dust emissions from construction activities. The 2013 ES therefore concluded that there was no risk of significant environmental effects on air quality. The conclusions of the extant permission therefore match those of the current proposed development.



Legend

- Stack Location
- Site Boundary
- Trackout 50 m Buffer
- 20 m Buffer Zone
- 100 m Buffer Zone
- 200 m Buffer Zone
- 350 m Buffer Zone

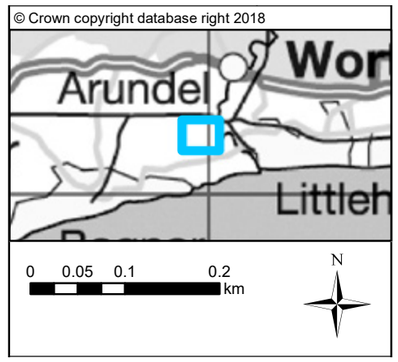
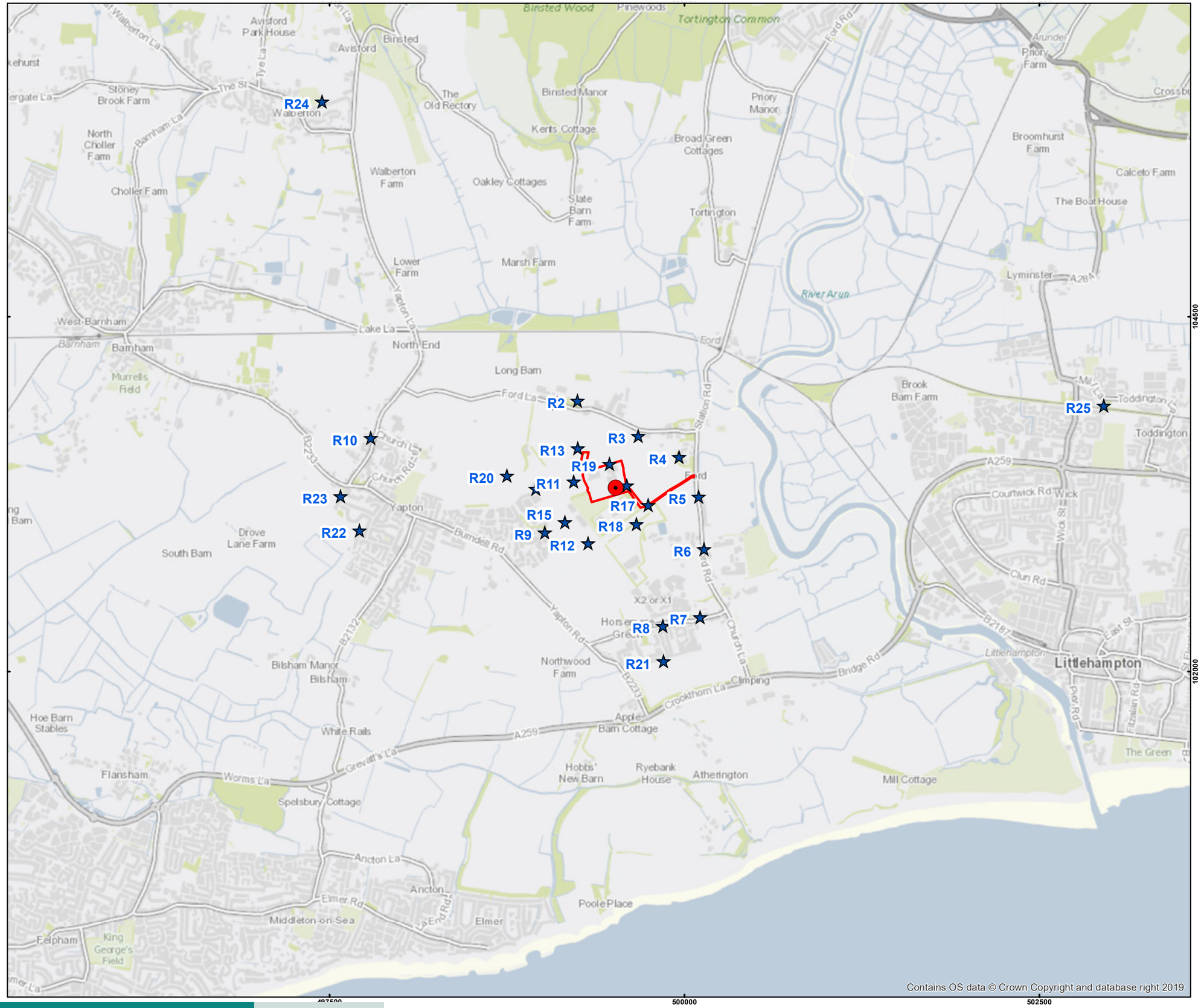


Figure 6.1 Construction dust screening zones

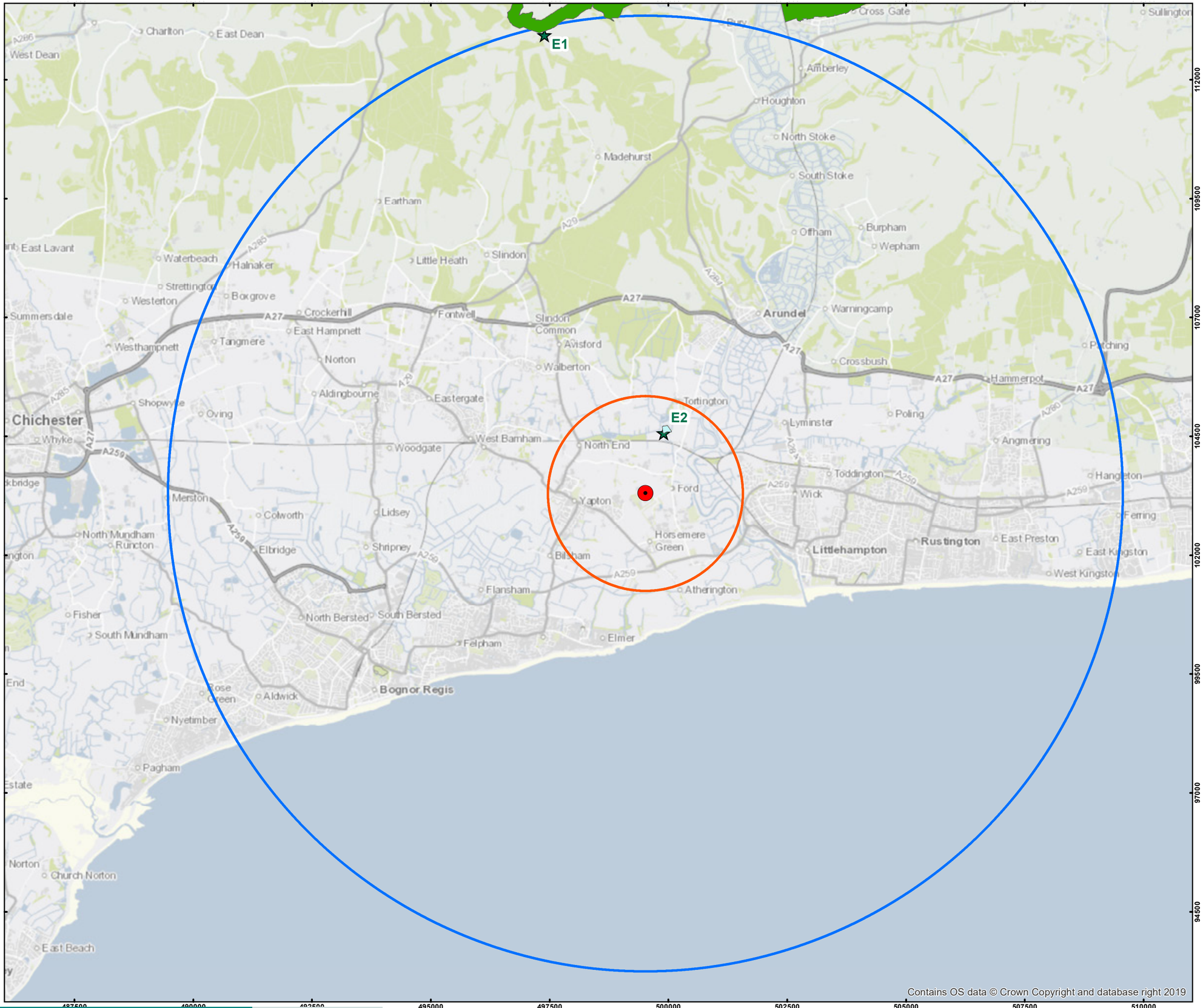


FORD ENERGY RECOVERY FACILITY AND WASTE SORTING AND TRANSFER FACILITY, FORD CIRCULAR TECHNOLOGY PARK

ENVIRONMENTAL STATEMENT

Figure 6.2 Human sensitive receptor locations

FICHTNER Consulting Engineers Limited


E1
E2
Legend
Stack Location
Ecological Receptor Points
2 km Buffer
10 km Buffer
Duncton & Bignor Escarpment Extent
Ford Ancient Woodland Extent
Chichester
Bognor Regis
Littlehampton
Arundel
Worthing
Contains OS data © Crown Copyright and database right 2019
© Crown copyright database right 2018
0 0.75 1.5 3 km
N

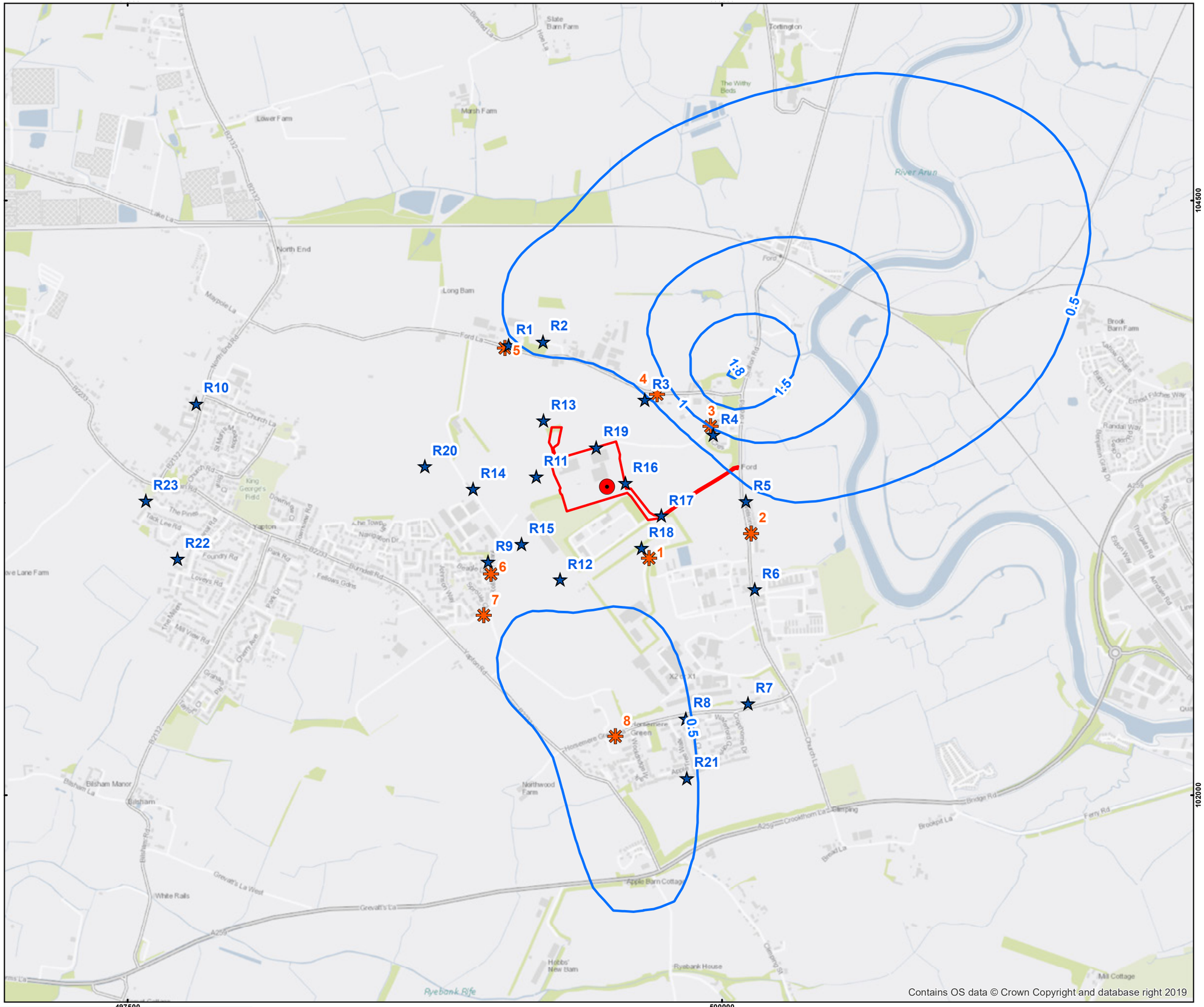


Figure 6.4
Annual mean nitrogen dioxide

Legend

- Stack Location
- Site Boundary
- Human Sensitive Receptors
- Annual Mean Benzene as % of AQAL

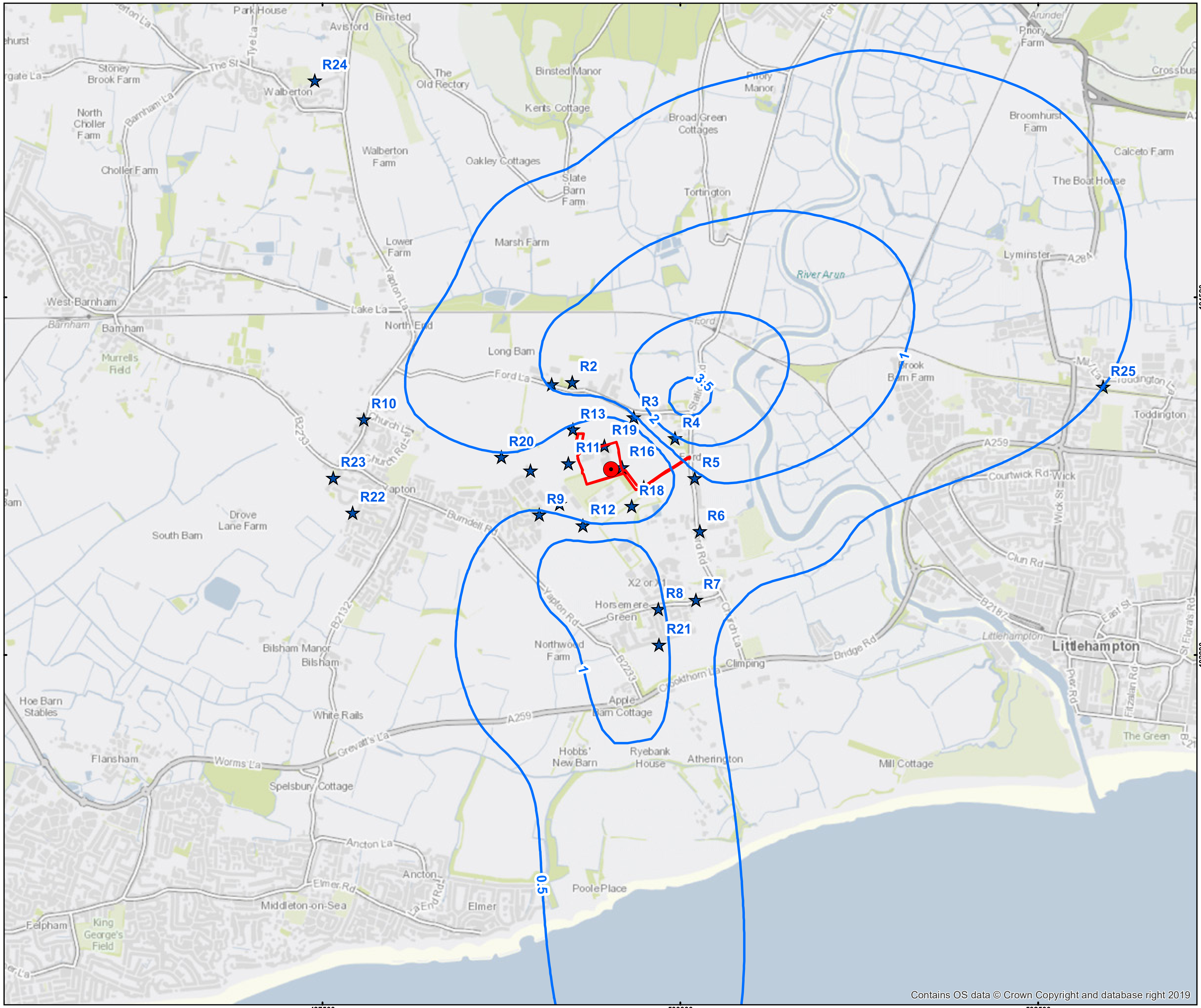
0.5
1:1
1:5
1
0.5

R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23

104500
102000
497500
500000

0 0.15 0.3 0.6 km

N



Legend

- Stack Location
- Site Boundary
- Human Sensitive Receptors
- Annual Mean 1,3-butadiene as % of AQAL

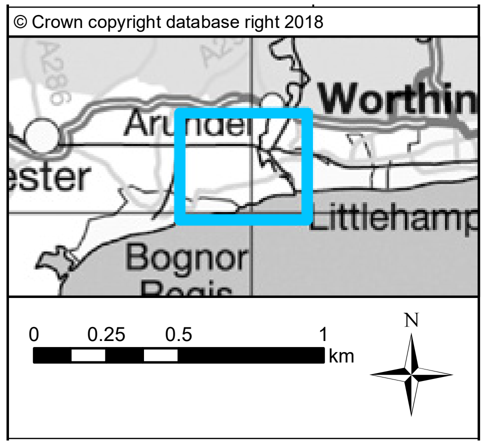


Figure 6.6 Annual mean VOCs as 1,3-butadiene

Legend

- Stack Location
- Site Boundary
- Human Sensitive Receptors
- Annual Mean Cadmium as % of AQAL (screening)

R24 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R16 R18 R19 R20 R21 R22 R23 R25

1 2 0.5

River Arun

Park House Avisford Binsted Walberton Stoney Brook Farm North Choller Farm Choller Farm The Old Rectory Binsted Manor Kents Cottage Broad Green Cottages Priory Manor Priory Farm Broomhurst Farm Calceto Farm The Boat House Walberton Farm Oakley Cottages Slate Farm Farm Tortington Marsh Farm Lower Farm Lyminster West Barnham Barnham Lake La North End Long Barn Ford La Murrells Field Brook Barn Farm Toddington Courtwick Rd Wick Drove Lane Farm South Barn Yapton Burndell Rd Station Rd Church La Church Rd Yapton La Clun Rd Littlehampton Pier Rd Fitzalan Rd East St St Flora's Rd Bridge Rd Climping Crookthorn La Northwood Farm Horsemere Green X2 or X1 Bilsham Manor Bilsham Hoe Barn Stables White Rails Flansham Worms La Grevatts La Spelsbury Cottage Apple Barn Cottage Hobbs' New Barn Ryebank House Atherington Mill Cottage The Green Poole Place Ancton Middleton-on-Sea Elmer Elmer Rd Ancton La Felpham King George's Field

104500 102000 497500 500000 502500