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MICHELDEVER RAIL SIDINGS
WASTE MANAGEMENT DEVELOPMENT

MICHELDEVER STATION, HAMPSHIRE,

7 - AIR QUALITY – TECHNICAL APPENDIX
ATMOSPHERIC DISPERSION MODELLING

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Clean Power Properties Limited (CPPL) and
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1.0 INTRODUCTION

This Technical Appendix presents an air quality assessment undertaken in support of an Environmental Impact Assessment (EIA) for a proposed Waste Management Development (WMD) at the Micheldever Rail Sidings (MRS) site at Micheldever Station, Hampshire.

This report presents the detailed atmospheric dispersion modelling undertaken in relation to emissions of combustion products from stacks serving the Advanced Conversion Technology (ACT) and Anaerobic Digestion (AD) waste treatment processes and forms a technical appendix to the air quality chapter of the Environmental Statement (ES).

1.1 Scope

This assessment quantifies and assesses the potential direct air quality impacts associated with releases from stacks serving the ACT and AD waste treatment processes using Environment Agency approved techniques against published standards for the protection of human health and sensitive ecological receptors.

1.2 Structure of Report

The remainder of this report is structured as follows:

- Section 2 provides a summary of the policy, legislation and guidelines relevant to the proposed activities at the site;
- Section 3 details the methodology applied in undertaking the assessment;
- Section 4 provides a description of the surrounding environment, including the identification of potentially sensitive receptors and a description of local climate and air quality conditions;
- Section 5 details how the emission rates discharge characteristics from the installation have been calculated and provides a detailed description of the dispersion modelling inputs; and
- Section 6 reports the predicted potential impacts of the proposed operations on air quality.

2.0 POLICY, LEGISLATION AND RELEVANT GUIDANCE

2.1 Ambient Air Quality

2.1.1 Air Quality Strategy

The 'Air Quality Strategy for England, Scotland, Wales and Northern Ireland' (UKAQS) sets out a comprehensive strategic framework within which air quality policy will be taken forward in the short to medium term, and the roles that Government, industry, the Environment Agency, local government, business, individuals and transport have in protecting and improving air quality.

2.1.2 Local Air Quality Management (LAQM)

LAQM requires local authorities to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met within the relevant time period, the authority must designate an Air Quality Management Area (AQMA). The UKAQS provides a phased approach to assessing air quality. The core guidance documents for use by persons involved in Local Air Quality Management (LAQM), or considering the impacts of a development with the potential to impact on air quality as covered by LAQM, are LAQM.TG (09)[1] and LAQM.PG (09)[2].

The Environment Agency's role in relation to Local Air Quality Management has been detailed[3], with the following commitments made:

> *"The Environment Agency is committed to ensuring that any industrial installation or waste operation we regulate will not contribute significantly to breaches of an AQS objective.*
>
> *It is a mandatory requirement of EPR legislation that we ensure that no single industrial installation or waste operation we regulate will be the sole cause of a breach of an EU air quality limit value. Additionally we have committed that no installation or waste operation will contribute significantly to a breach of an EU air quality limit value."*

2.1.3 Air Quality Standards and Objectives

The UKAQS contains air quality objectives based on the protection of both human health and vegetation (ecosystems). The UKAQS actually includes more exacting objectives for some pollutants than those required by EU legislation. This air quality assessment refers to UK Air Quality Standards, as compliance with these standards will also ensure that the less demanding EU Air Quality limit values would also be met. In a majority of cases, these standards have been carried through into the Environmental Permitting regime as short and long term EAL's for these pollutants.

A summary of the current air quality standards (as detailed in the UKAQS 2007) for pollutants relevant to this assessment is provided in Table 2-1 below.

[1] DEFRA, Local Air Quality Management Technical Guidance LAQM.TG(09), (February 2009).
[2] DEFRA, Local Air Quality Management Policy Guidance, LAQM.PG(09) (February 2009).
[3] Regulating to Improve Air Quality. AQPG3, version 1, Environment Agency 14 July 2008.

Table 2-1
Relevant UKAQS Air Quality Objectives and Standards

Pollutant	Concentration	Measured as
Human Health Standards		
Carbon monoxide (CO)	10 mg/m^3	Maximum daily running 8 hour mean
Lead (Pb)	0.25 µg/m^3	Annual mean
Benzene (C_2H_6)	5µg/m^3	Annual average
Nitrogen dioxide (NO_2)	200 µg/m^3	1 hour mean (18 exceedences per year 99.79%ile of hourly averages)
	40 µg/m^3	Annual mean
Sulphur dioxide (SO_2)	266 µg/m^3	15 minute mean (35 exceedences per year; 99.90%ile of 15-min averages)
	350 µg/m^3	1 hour mean (24 exceedences per year; 99.73%ile of hourly averages)
	125 µg/m^3	24 hour mean (3 exceedences per year; 99.18%ile of 24-hr averages)
Particulate matter (PM_{10}) (gravimetric)	40 µg/m^3	Annual mean
	50 µg/m^3	24 hour mean (35 exceedences per year ; 90.41%ile of 24-hr averages)
Vegetation and Ecosystem Standards		
Nitrogen oxides (NO_x)	30 µg/m^3	Annual mean
Sulphur dioxide (SO_2)	20 µg/m^3	Annual mean
	20 µg/m^3	Winter mean (1 October to 31 March)

In addition to these UKAQS objectives, the following additional 'target values' are defined within the Air Quality Standard Regulations 2010:

Table 2-2
Relevant Additional Air Quality 'Target Values'

Pollutant	Concentration	Measured as	Target date
Particulate matter ($PM_{2.5}$) (gravimetric)	25 µg/m^3 [(a)]	Annual mean	(See table note a)
Arsenic (As)	6 ng/m^3	Annual average in PM_{10} fraction	31.12.2012
Cadmium (Cd)	5 ng/m^3		
Nickel (Ni)	20 ng/m^3		

Table Notes:
a) AQS 2010 includes an urban background exposure reduction target.

2.2 Environmental Permitting Regulations

Atmospheric emissions from industrial processes are controlled in the UK through the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments. EPR seeks to improve environmental protection by introducing measures to reduce or prevent emissions to air, land and water.

Of relevance to the assessment of air quality impacts is the EPR guidance document H1 Annex F. The purpose of this Annex is to provide supplementary information, relevant to all sectors, to assist Applicants in responding to the requirements described in the EPR Sector and General Guidance Notes. This document can be used to support an Environmental Assessment of the overall impact of the emissions resulting from the installation to confirm

that the emissions are acceptable (i.e. do not cause significant pollution). The H1 Annex F guidance provides the assessor with Environmental Assessment Levels (EAL's) for each pollutant against which impact may be assessed (refer to section 2.2.1).

H1 Annex (f) also details ecological sites where air pollution impacts must be assessed. This list includes sites of local importance (local nature reserves and local wildlife sites).

2.2.1 Environmental Assessment Levels (EAL)

The EALs used in this assessment have been reproduced from Annex F of the EPR Guidance Note H1. A summary of the relevant EALs for pollutants for this assessment are included in Table 2-3. EALs have been applied in this assessment where no air quality standard exists, or where the EAL is lower than the corresponding air quality standard.

Table 2-3
Relevant EALs (µg/m^3)

Pollutant		Long Term (Annual average)	Short Term (Hourly average)
Nitrogen dioxide	(NO_2)	40	200
Particulates	(PM_{10})	40	50
Particulates	($PM_{2.5}$)	25	--
Carbon monoxide	(CO)	---	30000 (1-hr)
Carbon monoxide	(CO)	---	10000 (8-hr)
Sulphur dioxide	(SO_2)	50[(a)]	267 (15-min)
Sulphur dioxide	(SO_2)	---	350 (1-hour)
Sulphur dioxide	(SO_2)	---	125 (24-hour)
Hydrogen chloride	(HCl)	20[(a)]	750
Hydrogen fluoride	(HF)	16	160
Benzene (surrogate for TOC)		5	208[(a)]
Arsenic	(As)	0.003	15[(a)]
Antimony	(Sb)	5	150
Cadmium	(Cd)	0.005	1.5[(a)]
Chromium (II and III)	(Cr)	5	150
Chromium (VI)	(Cr(VI))	0.0002	3[(a)]
Cobalt	(Co)	0.2[(a)]	6[(a)]
Copper	(Cu)	10	200
Lead	(Pb)	0.25	---
Manganese	(Mn)	150	1500
Mercury	(Hg)	0.25	7.5
Nickel	(Ni)	0.02	30[(a)]
Thallium	(Tl)	1[(a)]	30[(a)]
Vanadium	(V)	5	1

Table Note:
a) Where the current H1 Guidance Note Table does not include an EAL from the previous version of the H1 document has been applied.

There are no Air Quality Limits or EALs for dioxins and furans on the basis that inhalation is not a significant exposure route with the majority of our exposure via our diet.

EALs for the protection of Ecosystems and Vegetation

The following EALs for the protection of ecosystems and vegetation are also defined in H1 as critical levels.

Table 2-4
Additional EALs for Ecosystems

Pollutant	Concentration (µg/m^3)	Measured as
Sulphur dioxide	10	Annual mean (for sensitive lichen communities & bryophytes and ecosystems where lichens & bryophytes are an important part of the ecosystem's integrity)
	20	Annual mean for all higher plants (all other ecosystems)
Nitrogen Oxides	30	Annual mean
	75	Daily mean
Hydrogen Fluoride	<5	Daily mean
	<0.5	Weekly Mean

2.3 Air Quality Impacts on Ecological Receptors

2.3.1 Air Quality Assessment under the Habitats Regulations

The Conservation of Habitats and Species Regulations 2010 transpose Council Directive 79/409/EEC on the conservation of wild birds ('Birds Directive') and Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('Habitats Directive') into national law (in conjunction with the Wildlife and Countryside Act, see below).

Regulation 21 (1) states that

> *Where it appears to the appropriate nature conservation body that an application for consent under regulation 20(2)(a) relates to an operation which is or forms part of a plan or project which—*
>
> *(a) is likely to have a significant effect on a European site (either alone or in combination with other plans or projects), and*
>
> *(b) is not directly connected with or necessary to the management of that site,*
>
> *they must make an appropriate assessment of the implications for that site in view of that site's conservation objectives.*

In order to clarify the procedure for assessing the impact of Industrial facilities under the Habitat Regulations; the Environment Agency has prepared Operational Instructions. These operational instructions form Appendix 7[4] of the Agency's guidance (the EU Habitats & Birds Directive Handbook) on how the Agency implements the Habitats Regulations when they consider new consents and review old consents. They define a 4-stage assessment procedure as detailed below:

- Stage1 – identification of relevant application by distance from designated site;

[4] Appendix 7, Assessment of new PIR permissions under the Habitat Regulations, Operational Instruction. Environment agency, Version 2, 06/06/07.

- Stage 2 – identification of permissions that are likely to be significant;
- Stage 3 – the 'appropriate assessment'; and
- Stage 4 – determination of the permission.

As part of the 'stage 2' assessment, the significance of the long-term process contribution (PC) is assessed against the following criteria:

- If the PC is less than 1% of the relevant long-term or 10% of the relevant short-term benchmark (EAL, critical level or critical load), the emission is 'not likely to have a significant effect alone or in combination irrespective of the background levels'

Where this criterion is exceeded; consideration of the predicted environmental concentration (PEC) is required and the following criteria applied:

- If the PEC is less than 70% of the relevant long-term benchmark, the emission is 'not likely to have a significant effect'.

If on the basis of this Stage 2 assessment it cannot be concluded that the emission is not likely to have a significant effect, a Stage 3 'appropriate assessment' is required.

Where it is identified that a Stage 3 'appropriate assessment' is required in relation to emissions to air, the results of detailed atmospheric dispersion modelling are used to predict impacts of various pollutants at the sensitive locations. The procedure for undertaking such an 'appropriate assessment' has been defined by the Agency in conjunction with Natural England in the AQTAG06[5] guidance document.

The AQTAG06 procedure defines the dispersion modelling approach in terms of receptor location and arrays, use of topographical and terrain data, the calculation of deposition fluxes, how these should be considered alongside the background conditions and relevant critical levels and loads.

[5] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, working Draft version 10, 20/4/10.

3.0 ASSESSMENT METHODOLOGY

3.1 Dispersion Modelling

Detailed atmospheric dispersion modelling has been undertaken with due consideration to relevant guidance[6,7] and the modelling approach is based upon the following stages:

- identification of sensitive receptors;
- review of process design proposals and emission sources;
- compilation of the existing air quality baseline with due regard to Review and Assessments of local air quality;
- calculation of process contribution to ground level concentrations and deposition for key pollutants emitted from the process; and
- evaluation of effects on ecological receptors.

A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources. Dispersion models are predictive tools that incorporate assumptions in their dispersion algorithms; therefore all models will produce variations in results under certain conditions. For this assessment the AERMOD model[8] has been applied.

The AERMOD dispersion modelling program is widely used and accepted by the Environment Agency in the UK for undertaking such assessments and its predictions have been validated against real-time monitoring data by the USEPA[9].

3.2 Assessment of Air Quality Impacts on Air Quality

The significance of impacts from industrial sources on air quality is determined using the EA's EPR H1 methodology. The H1 guidance states that 'process contribution' (PC) 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.

On this basis the PC is described as either 'insignificant' or 'not insignificant'. Where impacts are not classified as 'not insignificant', consideration of the resultant Predicted Environmental Concentration (PEC) as a percentage of the applied limit value is required. The PEC is then used to identify whether the emission is 'potentially significant' as follows:

- [Maximum Process Contribution (long term) + background concentration] ≥ 70% of the Environmental Assessment Level; or
- [Maximum Process Contribution (short term) + 0.2 * background concentration] ≥ 20% Environmental Assessment Level.

[6] Air Dispersion modelling report requirements (for detailed air dispersion modelling). AQMAU, Environment Agency (not dated).
[7] Guidelines for the Preparation of Dispersion Modelling Assessment for Compliance with Regulatory Requirements – an update to the 1995 Royal Meteorological Society guidance. UK Atmospheric Dispersion Modelling Committee (ADMLC), Version 1.4, 2004.
[8] Software used: BREEZE AERMOD GIS Pro, v6.2.
[9] AERMOD: Latest Features and Evaluation Results. USEPA Report: EPA-454/R-03-003 June 2003, (http://www.epa.gov/scram001/dispersion_prefrec.htm#aermod)

The H1 guidance indicates that impacts are likely to be considered to be unacceptable where significant breaches (or significant addition to an existing breach) of the EAL's occur as a result of the impact from the facility. In such a situation consideration of the application of abatement techniques beyond the requirements of indicative BAT.

3.3 Assessment of Impacts on Vegetation and Ecosystems

EPR H1 requires that impacts on conservation sites need to be considered where they fall within the following set distances of the activity:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10km of the installation (or 15km coal- or oil-fired power station); and
- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), local wildlife sites and ancient woodland within 2km of the location of the installation.

The significance of the predicted impacts at ecological designated sites are based on the AQTAG approach for European sites and the EA's briefing note for ammonia from agriculture[10] for other designated sites which identifies the following thresholds, below which no further assessment is required:

- for SSSI's a process contribution threshold of 20% of the critical level or load is set, below which no further assessment of the potential to cause damage is required;
- for other ecological designated sites a process contribution threshold of 50% is set, below which no further assessment is required to ensure the site is adequately protected.

3.3.1 Critical Levels

Critical levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Critical levels for the protection of vegetation and ecosystems are specified within relevant European air quality directives and corresponding UK air quality regulations.

For nature conservation sites process contributions (and predicted environmental concentrations where required) of NO_x, HF and SO_2 have been calculated for comparison against critical level thresholds.

3.3.2 Critical Loads

For ecological receptors, deposition to land is assessed using the concept of critical loads; critical loads are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Critical loads are set for the deposition of various substances to sensitive ecosystems.

H1 indicates that consideration of deposition effects on ecosystems is only required when the contribution to critical levels in 'not insignificant' i.e. in excess 1%. Predicted contributions to acid deposition and nitrogen deposition are calculated as detailed below and

[10] Ammonia Emission from Intensive Pig and Poultry Farms – Clarification of Environment Agency assessment process. EA Briefing Note, 2010.

compared with the relevant critical load range for the habitat types associated with each designated site as derived from the UK Air Pollution Information System (APIS).

3.3.3 Calculation of Contribution to Critical Loads

Deposition rates were calculated using dispersion modelling results processed by following empirical methods recommended by the Environment Agency in AQTAG06 and summarised in the following sections

Dry deposition flux was calculated using the following equation:

> Dry deposition flux (µg/m^2/s) = ground level concentration (µg/m^3) x deposition velocity (m/s)

The applied deposition velocities for various chemical species are as shown in Table 3-1.

Table 3-1
Applied Deposition Velocities

Chemical Species	Recommended deposition velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.003
SO_2	Grassland	0.012
	Woodland	0.024
NH_3	Grassland	0.020
	Woodland	0.030
HCl	Grassland	0.025
	Woodland	0.060

The units are then converted from µg/m^2/s to units of kg/ha/year by multiplying the dry deposition flux by standard conversion factors as summarised in Table 3-2.

Table 3-2
Applied Deposition Conversion Factors

Chemical Species	Conversion factor [µg/m^2/s to kg/ha/year]	
NO_2	of N:	96
SO_2	of S:	157.7
NH_3	of N:	259.7
HCl	of Cl:	306.7

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow, and is not considered significant over short distances (AQTAG06) compared with dry deposition and therefore for the purposes of this assessment, wet deposition has not been considered.

Critical Loads - Eutrophication

The contribution to critical loads for Nitrogen deposition are recorded as KgN/ha/yr.

Critical Loads - Acidification

The predicted deposition rates are converted to units of equivalents (keq/ha/year), which is a measure of how acidifying the chemical species can be, by dividing the dry deposition flux (kg/ha/year) by standard conversion factors as presented in Table 3-3.

Table 3-3
Applied Acidification Conversion Factors

Chemical Species	Conversion factor [kg/ha/year to keq/ha/year]
of N:	divide by 14
of S:	divide by 16
of Cl:	Divide by 35.5

4.0 BASELINE ENVIRONMENT

4.1 Site Location

The Proposed Development consists of approximately 6 acres to the north of Micheldever railway station and to the south of the A303. The site was previously used as a rail freight yard and as a rail head at the end of the line.

The site is situated within a predominately rural setting, being sparsely populated but with some residential properties surrounding the site. The nearest residential property is Western Farm at 80m to the south east, with a small settlement at Micheldever Station (with a recreation ground), at 530m south of the site. There are other properties along the north side of A303 as shown on drawing MS 7/1.

There are also a number of sensitive habitats with ecological designations as described in Section 4.5.2 below (the closest of which are shown on drawing MS 7/2).

4.2 Local Air Quality Management

The study area encompasses two local authorities responsible for LAQM, Winchester City council (to the south of the site) and Basingstoke and Deane Borough Council (to the north)). Information on LAQM in each area is presented in the sections below.

4.2.1 Winchester City Council (WCC)

WCC declared an AQMA in Winchester City Centre for annual mean nitrogen dioxide and 24-hour mean PM_{10} was declared in November 2003. Ongoing monitoring within the AQMA has confirmed the requirement for this AQMA and has not identified any areas in the vicinity of the site which require more detailed assessment.

4.2.2 Basingstoke and Deane Borough Council

There are currently no AQMA's in Basingstoke and Deane Borough Council (BDBC), however, the council has identified certain areas of the borough where levels of nitrogen dioxide exceed or are close to the AQO. It has not been necessary to declare an AQMA in the borough due to the absence of relevant receptors such as residential properties and the site is not located within proximity to one of these areas of concern.

4.3 Background Levels and Predictions

This section reviews the existing baseline air quality in the vicinity of the Application Site undertaken by local authorities as part of LAQM obligations and DEFRA predictions.

4.3.1 Automatic Monitoring Data

WCC currently have two real time air quality monitoring stations in Winchester town centre which monitor levels of both NO_2 and PM_{10}, given the location of these monitors in a city centre AQMA, they are not considered applicable to this assessment. BDBC do not undertake real-time air quality monitoring.

4.3.2 Non-automatic monitoring data

WCC monitor levels of nitrogen dioxide via a diffusion tube survey with over forty tubes located across both the town centre and the district. BDBC also monitors levels of nitrogen dioxide via diffusion tubes at 28 locations

Monitoring locations are predominantly at either roadside or residential façade close to busy roads and are not in close proximity to the site and therefore are not considered applicable to this assessment.

4.3.3 National Air Quality Archive

Background pollutant concentrations have been obtained from the National Air Quality Archive UK Estimated Background Air Pollution Maps. These maps are provided to assist local authorities in support of review and assessment of local air quality.

The maps show estimated UK background concentrations of PM_{10}, $PM_{2.5}$, NO_x, NO_2, SO_2, Benzene and CO and are given for the centre of each 1 km x 1 km grid square. The estimated annual mean background concentrations relating to the WMD are as shown in Table 4-1.

Table 4-1
Estimated Background Air Quality (2010 annual average µg/m^3)

Pollutant	x: 451500, y:143500	x: 451500, y:144500
PM_{10}	16.6	15.1
$PM_{2.5}$	10.9	10.1
NO_x	21.7	16.6
NO_2	15.2	12.0
SO_2	1.7	1.7
CO	111	110
Benzene	0.145	0.145

4.3.4 Metals

Monitoring of metals is currently carried out by Defra at 38 sites around the UK (14 as part the UK rural heavy metals monitoring network and 24 for the UK urban heavy metals network). The closest monitoring site is located at Wytham Wood, approximately 60km to the north of the proposed WMD and) the monitoring data from 2007 to 2009 is presented in Table 4-2.

Table 4-2
Heavy Metals Monitoring at Urban Background Sites (ng/m^3)

Metal		2007	2008	2009	Average
Arsenic	(As)	0.549	0.478	0.511	0.513
Antimony	(Sb)	0.896	0.908	0.746	0.850
Cadmium	(Cd)	0.097	0.103	0.076	0.092
Chromium (II and III)	(Cr)	0.712	0.611	0.559	0.627
Cobalt	(Co)	0.051	0.045	0.044	0.047
Copper	(Cu)	2.873	3.258	2.992	3.041
Lead	(Pb)	5.356	5.020	4.534	4.970
Manganese	(Mn)	2.388	1.964	1.754	2.035

Metal		2007	2008	2009	Average
Mercury	(Hg)	1.599	0.841	0.600	1.013
Nickel	(Ni)	1.239	4.032	1.555	2.275
Vanadium	(V)	1.323	1.255	1.195	1.257

Monitoring is not routinely undertaken for thallium in the UK and therefore no background data is available.

With regard to the fraction of Chromium(VI) the most recent EPAQS report on heavy metal monitoring states '*data from Canada, quoted by Rowbotham et al. (2000), suggest that Cr(VI) constitutes between 3 and 8% of total airborne chromium in that country'.* Therefore a value of 5.5% has been applied in the assessment.

4.3.5 Hydrogen Halides

Modelled background levels of HCl are available based on data collected by the UK Nitric Acid Network[11]. These maps indicate that the predicted background levels of HCl in the vicinity of the site are 0.25-0.35µg/m^3.

Only a small number of measurements of ambient concentrations of hydrogen fluoride have been made in the UK. All of these have been made in the vicinity of three industrial plants and many samples were below the limit of detection and therefore no background value can be assigned.

[11] http://pollutantdeposition.defra.gov.uk/image/tid/33

4.4 Summary of Applied Background Concentrations

The background concentrations in Table 4-3 have been applied in this air quality assessment, these values are based on the monitoring and predicted background concentrations detailed in the previous section. In general a conservative approach has been applied with use of high background concentrations from the review of data above. EPR H1 indicates that background concentrations of all pollutants must be multiplied by a factor of 2 to derive short term backgrounds.

Table 4-3
Applied Background Concentrations (µg/m^3)

Pollutant	Short Term	Long Term	Data Source
PM_{10}	33.2	16.6	NAQA 2010
$PM_{2.5}$	n/a	10.9	NAQA 2010
NOx	n/a	21.7	NAQA 2010
NO_2	30.4	15.2	NAQA 2010
CO	222	111	NAQA 2010
SO_2	3.4	1.7	NAQA 2010
HCl	0.70	0.35	Nitric Acid Monitoring Network background maps
Benzene	0.30	0.15	NAQA 2010
Cadmium ηg/m^3	0.18	0.09	Heavy Metal Monitoring for Wytham Wood. 2007 – 2009 Average
Mercury ηg/m^3	2.02	1.01	
Antimony ηg/m^3	1.70	0.85	
Coblat	0.09	0.05	
Arsenic ηg/m^3	1.02	0.51	
Chromium ηg/m^3	1.26	0.63	
Copper ηg/m^3	6.08	3.04	
Lead ηg/m^3	9.94	4.97	
Manganese ηg/m^3	4.08	2.04	
Nickel ηg/m^3	4.56	2.28	
Vanadium ηg/m^3	2.52	1.26	

4.5 Sensitive Receptors

The term 'sensitive receptors' includes any persons, locations or systems that may be susceptible to changes as a consequence of the proposed development.

4.5.1 Human Receptors

According to the LAQM TG(09), air quality standards should only apply to all locations where members of the public may be reasonably likely to be exposed to air pollution for the duration of the relevant objective. Thus short term standards such as the 1 hour standard for NO_2 should apply to footpaths at site boundaries and other areas which may be frequented by the public even for a short period of time. Longer term standards such as the 24 hour for PM_{10}, or annual means, should apply at houses other locations which the public can be expected to occupy on a continuous basis. These standards do not apply to exposure at the workplace.

This assessment has used a receptor grid across an Ordnance Survey map of the study area, pollutant exposure isopleths are generated by interpolation between receptor points and superimposed onto the map. This method allows the exposure at any receptor (long term or short term) in the study area to be determined and presented graphically. The receptor grid spacing used was: 25m up to 500m; 50m from 500m to 1km, 100m from 1km to 2.5km and 150m from 2.5km to 5km.

The following discrete human receptor locations have been modelled in addition to the receptor grid. These receptors are also shown on Drawing MS 7/1.

Table 4-4
Discrete Human Receptor Locations

ID	Name	OS GR x (m)	OS GR y (m)
HR1	Coxford Farm	451942.3	143788.3
HR2	The boundary	452200.6	143823.3
HR3	The Pines	452447.3	143834.9
HR4	Woodlands	452350.6	143823.3
HR5	The Beacons	452653.9	144096.6
HR6	Granary	452050.6	143968.2
HR7	Works building	451762.3	143598.3
HR8	Western Farm	452104.0	143374.9
HR9	Travellers Rest	451995.6	142891.6
HR10	Micheldever Station A	451484.0	142965.0
HR11	Micheldever Station B	451634.0	142975.0
HR12	Micheldever Station C	451750.6	142981.6
HR13	New Road A	451928.1	142867.7
HR14	New Road B	451844.9	142867.7
HR15	Station Garage Yard	451648.1	142885.4
HR16	Black Wood Holiday Cottages	452924.6	143347.1

4.5.2 Ecological Receptors

Environment Agency H1 Guidance Note states that ecological habitats should be screened against relevant standards if they are located within the following set distances from the WMD:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10km of the installation; and
- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), local wildlife sites and ancient woodland within 2km of the location of the installation.

Relevant nature conservation sites to this assessment and the location of discrete receptors applied in the model are presented in Table 4-5 and drawing MS7/2.

Table 4-5
Relevant Designated Habitat Sites within Zone of Influence

ID	X	y	Designation	Name
ER1	456435	135418	SAC	River Itchen

ID	X	y	Designation	Name
ER2	Grid (217 receptor locations)		SSSI	Micheldever Spoil Heaps
ER3	450186.6	144435.2	SINC & AWL	Freefolk Wood
ER4	450943.3	145273.3	SINC & AWL	Laverstoke Wood
ER5	451100	144900	SINC & AWL	Round Wood, Roundwood Estate
ER6	452400	145300	SINC & AWL	Cobley Wood North
ER7	452500	144900	SINC & AWL	Cobley Wood Middle
ER8	452600	144500	SINC & AWL	Cobley Wood South
ER9	453400	144600	SINC & AWL	Oaken Copse
ER10	453500	143900	SINC	Black Wood North
ER11	449933.2	144029.5	SINC & AWL	Norton Wood
ER12	450835.5	142647.7	SINC	Upper Cranbourne/Hunton Down Farms
ER13	450100	143400	SINC & AWL	Cranbourne Wood
ER14	450370	143900	SINC	Field Near Freefolk Wood
ER15	450500	143600	SINC	Freefolk Beech Break
ER16	451940.6	143429	SINC	Micheldever Oil Terminal
ER17	452867.3	143595.9	SINC & AWL	Black Wood, Micheldever
ER18	450806.2	144142.6	AWL	Kitelands Clump
ER19	451787.6	144332.3	AWL	Burntheat Copse
ER20	452473.6	145106.4	AWL	Cobley Wood (Location 1)
ER21	452522.1	144727.1	AWL	Cobley Wood (Location 2)

4.6 Meteorological Conditions

The most important meteorological parameters governing the atmospheric dispersion of pollutants are as follows:

- wind direction determines the broad transport of the emission and the sector of the compass into which the emission is dispersed;
- wind speed will affect ground level concentrations of emissions by increasing the initial dilution of pollutants in the emission; and
- atmospheric stability; a measure of the turbulence, particularly of the vertical motions present.

Following consultation with the meteorological data provider, it was concluded that RAF Odiham, located approximately 22km to the east-northeast of the application site, would provide the most complete and representative data set for purposes of this assessment. Meteorological data used in this assessment was for the period 1st January 2007 to 31st December 2011 (inclusive).

A windrose of the data used in the assessment is presented in Figure 4-1. As is apparent from this windrose, the predominant wind direction is from the south west and wind from the north, northeast and easterly directions occur relatively infrequently.

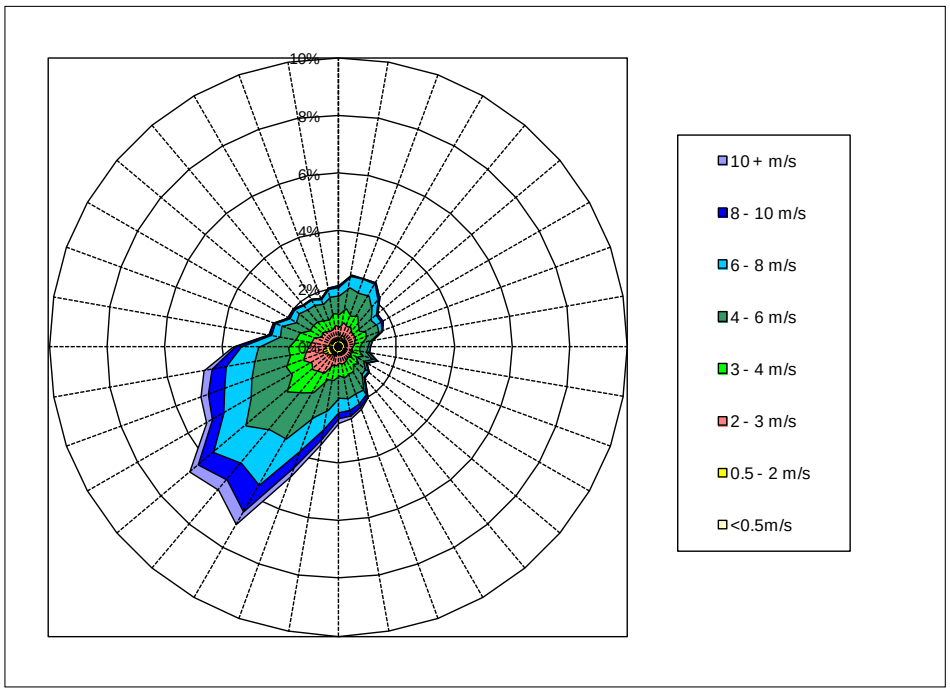

Figure 4-1
Windrose for RAF Odiham Meteorological Station (2007 – 2011)

4.7 Topography

The presence of elevated terrain can significantly affect the dispersion of pollutants and the resulting ground level concentration in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and, hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away.

The application site lies at approx 125-130m AOD towards western end of a slight ridge which falls away to around 100m AOD to the north, south and west. Locally there is significant variation in the topography resulting from the construction of the railway through a cutting and tunnel beneath the A303. For this reason elevation data has been included in the model.

5.0 ASSESSMENT OF IMPACTS – INPUT DATA

5.1 Quantification of Emissions

The process design indicates that there will be 4 point source emission to air from the WMD, with Emission point A1 representing the combined release from the 4 separate pyrolysis units and A2-A4 corresponding to release from gas engines 1-3.

5.1.1 Process Conditions

The following process conditions were provided by the process designer and used during the dispersion modelling process:

Table 5-1
Emission Characteristics from Stack

Parameter / Source	A1	A2-4 (per stack)
Stack Diameter (m)	1.2[(a)]	1.0
Stack Height (m)	20	20
Volume Flow (Nm^3/s)	6.15	8.5
Emission Temperature (ºC)	300	385
Emission velocity (m/s)	17.2	26.2

(a) Effective stack diameter – four 0.6m stacks within 1 wind shield.

5.1.2 Applied Emission Rates

The applied emission rates presented in Table 5-2 have been provided by the process designer. In order to predict a realistic 'worst case' scenario, the proposed WMD has been assumed to be in operation continuously throughout the year. This ensures that the maximum possible impacts on air quality are predicted.

Table 5-2
Pollutant Emission Rates

	A1		A2-4 (per stack)	
Pollutant	**Emission Concentration (mg/Nm^3)**	**Emission Rate (g/s)**	**Emission Concentration (mg/Nm^3)**	**Emission Rate (g/s)**
NO_X	10	0.0615	12.5	0.105
PM_{10}	10	0.061	-	-
SO_2	50	0.307	-	-
CO	50	0.31	750	6.4
HCl	10	0.061	-	-
HF	1	0.0061	-	-
TOC	10	0.061	-	-
	Emission Concentration (mg/Nm^3)	**Emission Rate (mg/s)**	**Emission Concentration (mg/Nm^3)**	**Emission Rate (mg/s)**
Cadmium	0.025	0.154	-	-
Thallium	0.025	0.154	-	-
Mercury	0.05	0.308	-	-

	A1		A2-4 (per stack)	
Antimony	0.0115	0.071	-	-
Arsenic	0.0030	0.018	-	-
Chromium (III)	0.0521	0.321	-	-
Chromium (VI)	0.0011	0.007	-	-
Cobalt	0.0039	0.024	-	-
Copper	0.0196	0.121	-	-
Lead	0.0368	0.227	-	-
Manganese	0.0368	0.227	-	-
Nickel	0.1362	0.839		
Vanadium	0.0010	0.006	-	-
Dioxins	0.1 I-TEQng/m^3	0.616 I-TEQng/s	-	-

The metals have been included under the requirements of the Waste Incineration Directive, however due to the nature of the process, the actual emissions of metals will be significantly lower than those stated by the WID and by typical EfW processes. The proposed development, due to the use of autoclaves and downstream associated materials recovery plant removes all metals, plastics and non-organic fractions from the waste stream. The resulting biomass material is therefore devoid of all inorganic species and compounds (beyond trace levels) and thus resulting in very high purity biomass and char materials.

The technology provider has demonstrated that inorganic species within the biomass will be retained in solid phase within the vitrified ash slags produced by the pyrolyser. Therefore the technology provider considers that the actual emissions of metals within the flue gases will be significantly below any regulatory emission limits prescribed by the Waste Incineration Directive (WID), Environmental Permitting Regulations or the forthcoming Industrial Emissions Directive.

The technology provider has described this in detail as part of the 'End of Waste' (EoW) determination application that was approved by the Environment Agency in March 2012. The approval of this determination means that all syn-gas produced by the process falls outside of the WID requirements and hence why the assessment of 'WID metals' and dioxins has not been undertaken for points A2-4.

It is understood that a further EoW application has been prepared and submitted to the EA by the technology provider relating to the end use of the pyrolysis char. Once approved, all references to the WID and thus the requirement to include 'WID metals' and dioxins within the assessment of release point A1 will be removed.

5.1.3 Pollutant Specific Issues

Particulate Matter – Particle Size

For the purposes of this assessment, in order to provide a worst-case assessment of the potential impacts associated with particulate, 100% of particulate matter has been assumed to be $PM_{2.5}$ or PM_{10} in each case.

Metals

The WID emission limits for metals are based on a total emission rates for 3 different groups of compounds. To assign emission rates for each metal. guidance[12] from the EA's Air Quality Modelling Assessment Unit (AQMAU) department has been applied as follows:

- Group 1 metals (Cadmium and Thallium): each metal has been assessed as representing 50% of the emission limit for the group as per the AQMAU Step 2 approach,
- Group 3 metals (Antimony, Arsenic, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Tin, and Vanadium): the maximum measured emission rate from operation EfW facilities in the UK has been applied as per the AQMAU Step 3 approach.

Chromium (IV)

In relation to chromium, it is important to note that different EALs apply depending on the oxidation state of chromium. The EPAQ recommended annual mean limit of 0.2ηg/m^3 relates specifically to chromium (VI) (i.e. hexavalent chromium), with the long-term EAL of 5µg/m^3 applying to all other oxidation states of chromium.

With respect to the proportion of Cr(VI) to total Cr in combustion emissions, guidance released by AQMAU[13] summarises the Agency's data collected from 10 UK incinerators, in this data the mean proportion of Cr (VI) to total Cr is 0.7% and the maximum 2.1%. AQMAU state they '*anticipate that applicants for MWI plant will have use the maximum values when completing screening assessments. For detailed modelling, applicants may consider the implications of the data ranges but should still justify any source data used in their impact assessments*'.

Therefore a level of 2.1% has been applied in the assessment.

Total Organic Carbon

There are no relevant air quality assessment levels or background for Total Organic Carbon. Whilst it is unlikely that any benzene would be released from the process due to the high temperature of combustion a cautious approach has been adopted by assuming all the organic carbon would be in the form of benzene in line with guidance in EPR H1.

5.2 Dispersion Model Set-up

5.2.1 Meteorological Data

Meteorological data used in this assessment comprised a 5-year sequential hourly average dataset to comply with current EA modelling guidance. This accounts for inter-year variability in meteorological conditions, with the average of the 5-year data set being used.

The meteorological data from RAF Odiham was obtained in .met format from the data supplier and converted to the required surface and profile formats for use in AERMOD using AERMET Pro. Details specific to the exact site location were used for the conversion, such

[12] Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Release – V.2 June 2011. AQMAU.

[13] AQMA, Interim Guidance to Applicants on Metals Impact Assessment for Waste Incineration Plant (13th September 2010)

as latitude, longitude and surface characteristics in accordance with the latest guidance[14]. Given the varying nature of the surface features in around the proposed development site, the surface characteristics were divided into nine sectors and applied as shown in Table 5-3.

Table 5-3
Met Data Preparation – Applied Surface Characteristics

Zone (Start)	Zone (end)	Albedo	Bowen	Roughness
015	045			0.272
045	075			0.075
075	115			0.102
115	180			0.051
180	210	0.2732	0.944	0.438
210	270			0.072
270	305			0.071
305	345			0.075
345	015			0.900

From the dataset used, a total of 1.0% 'calm hours', were recorded over the 5-year period with 0.3% missing hours.

5.2.2 Atmospheric Boundary Layer Urban/Rural Classification

The ‘urban’ option utilises different calculations to estimate the night time boundary layer based on the urban heat island effects associated with larger cities, latest guidance from the USEPA[14] has been used to determine whether to select this option. Due to urban land uses accounting for <50% in a 3km radius under the Auer classification system[15] urban heat island effects are unlikely to be significant. On this basis the ‘rural option’ was selected.

5.2.3 Terrain Data

The model was run with OS 1:50,000 scale digital height contour data. Data was processed by the AERMAP function within AERMOD to calculate terrain heights, and interpolate data to calculate terrain heights for sources, buildings etc. The ground level elevations for buildings within the application site have been entered on the basis of site survey data.

5.2.4 Assessment Area

The potential air quality impact of the proposed plant was assessed over a receptor grid; the receptor grid spacing used was: The receptor grid spacing used was 25m up to 500m; 50m from 500m to 1km, 100m from 1km to 2.5km and 150m from 2.5km to 5km.

5.2.5 Building Downwash

The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics. Building downwash occurs when turbulence, induced by nearby structures,

[14] AERMOD Implementation guide. AERMOD implementation workgroup, USEPA. Last revised March 19, 2009.

[15] Auer, August H Jr, Correlation of Land Use and Cover with Meteorological Anomalies, Journal of Applied Meteorology. Pp 636-643, 1978

causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations. Building downwash should always be considered for buildings that have a maximum height equivalent to at least 40% of the emission height and which are within a distance defined as five times the lesser of the height or maximum projected width of the building. On this basis the process building and AD tanks have been input to the model as shown in Figure 5-1.

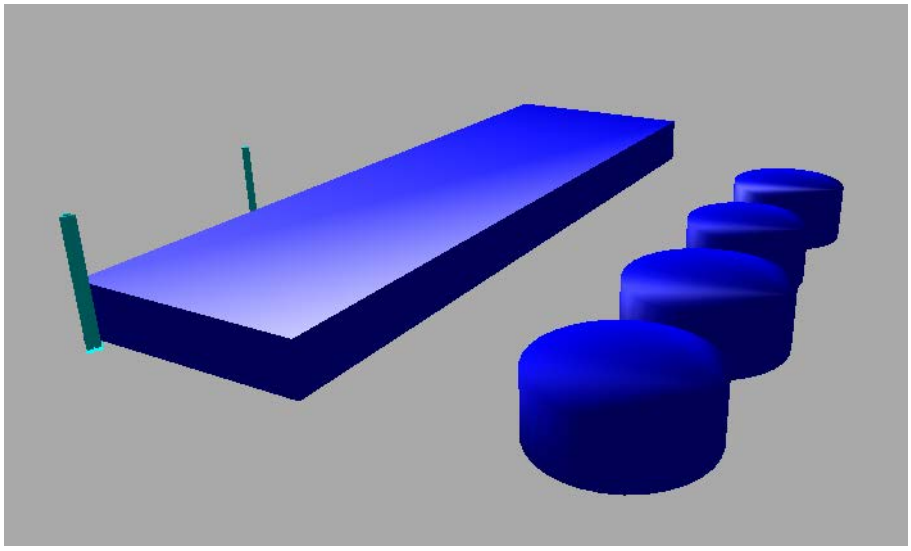

Figure 5-1
Building Layout Applied in Model

5.2.6 Special Treatment of Results

Nitric Oxide to NO_2 Conversion

Oxides of nitrogen (NO_x) emitted to atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar radiation and the availability of oxidants, such as ozone (O_3).

Following the Environment Agency AQMAU guidance[16] on conversion ratio for NOx and NO_2 and a worst case scenario has been applied in that 35% of NOx is presented as NO_2 in relation to short term impacts and 70% of NOx is present as NO_2 in relation to long term impacts.

Sulphur Dioxide – 15 minute averaging period

As dispersion models utilise hourly average meteorological data, calculation of 15-minute averages, such as required for SO_2, requires the application of conversion factors. For the

[16] http://www.environment-agency.gov.uk/business/regulation/38791.aspx

purposes of detailed modelling of SO_2, a conversion factor of 1.34 is applied to hourly average data as detailed in EPR Guidance Note H1.

6.0 PREDICTED IMPACTS

6.1 Predicted Short-term Impacts

A summary of the peak predicted short-term process contributions (PC) from the proposed WMD is presented in Table 6-1. These predicted short-term impacts relate to the highest predicted level of impact at any location on the receptor grid and impacts at all other locations, and at all other times, will be lower.

The maximum short-term PC presented in Table 6-1 is less than 10% of the relevant EAL and are therefore considered to be insignificant at all locations for all pollutants except SO_2. Isopleth drawings have been generated for pollutants where the predicted short-term process contributions are greater than 10% of the relevant EAL (i.e. solely for SO_2) as shown in drawings MS 7/3 (24-hr SO_2 PC) & MS 7/4 (15-min SO_2 PC). These drawings illustrate that the PC is below 10% of the EAL at discrete receptor locations, and can therefore be considered insignificant at these locations.

Table 6-1
Predicted Short-term Process Contributions PC (µg/m^3)

Pollutant	Applied Standard	Av. Period	PC Max	PC Max as % of EAL
PM_{10}	50	24-hr, 90.41%ile	1.7	3.4%
NO_2	200	1-hr, 99.79%ile	6.0	3.0%
SO_2	125	24-hr, 99.18%ile	13.4	10.7%
SO_2	350	1-hr, 99.73%ile	25.2	7.2%
SO_2	266	15-min, 99.88%ile	34.4	12.9%
CO	10000	8-hr max	747.8	7.5%
CO	30000	1-hr max	894.7	3.0%
HCl	750	1 hour max	5.5	0.7%
HF	160	1 hour max	0.5	0.3%
TOC	208	1 hour max	5.5	2.6%
Cadmium	1.5	1 hour max	0.014	0.92%
Thallium	30	1 hour max	0.014	0.05%
Mercury	7.5	1 hour max	0.028	0.37%
Antimony	150	1 hour max	0.006	<0.01%
Arsenic	15	1 hour max	0.002	0.01%
Chromium (III)	150	1 hour max	0.029	0.02%
Chromium (VI)	3	1 hour max	0.001	0.02%
Cobalt	6	1 hour max	0.002	0.04%
Copper	200	1 hour max	0.011	0.01%
Manganese	1500	1 hour max	0.020	<0.01%
Nickel	30	1 hour max	0.075	0.25%
Vanadium	1	1 hour max	0.001	0.13%

The predicted short-term PC is combined with the background concentration to derive the predicted environmental concentrations (PEC) as presented in Table 6-2.

Table 6-2
Predicted Short-term Predicted Environmental Concentrations (PEC) (µg/m^3)

Pollutant	Applied Standard	Background	PEC Max	Max PEC as % of EAL
PM_{10} (24-hr)	50	33.2	34.9	69.8%
NO_2	200	30.4	36.4	18.2%
SO_2 (24-hr)	125	34.0	47.4	37.9%

Pollutant	Applied Standard	Background	PEC Max	Max PEC as % of EAL
SO_2 (1-hr)	350	34.0	59.2	16.9%
SO_2 (15-min)	266	34.0	68.4	25.7%
CO (8-hr)	10000	222.0	969.8	9.7%
CO (1-hr)	30000	222.0	1,116.7	3.7%
HCl	750	0.7	6.2	0.8%
HF	160	0.0	0.5	0.3%
TOC	208	0.3	5.8	2.8%
Cadmium	1.5	0.0002	0.0140	0.93%
Thallium	30	N/m	0.0138	0.05%
Mercury	7.5	0.0020	0.0296	0.39%
Antimony	150	0.0017	0.0080	0.01%
Arsenic	15	0.0010	0.0027	0.02%
Chromium (III)	150	0.0013	0.0300	0.02%
Chromium (VI)	3	0.0001	0.0007	0.02%
Cobalt	6	0.0001	0.0022	0.04%
Copper	200	0.0061	0.0169	0.01%
Manganese	1500	0.0041	0.0244	<0.01%
Nickel	30	0.0046	0.0797	0.27%
Vanadium	1	0.0025	0.0038	0.38%

All PECs as presented in Table 6-2 are less than 70% the relevant EAL or AQS, therefore no significant impacts or exceedence of any short-term EAL or AQS are predicted.

6.2 Predicted Long-term Impacts

A summary of the peak predicted long-term process contributions (PC) from the proposed WMD is presented in Table 6-3. These maximum predicted long-term impacts (annual average) relate to the highest predicted level of impact at any location on the receptor grid and impacts at all other locations will be lower.

Isopleth drawings have been generated for pollutants where the predicted long-term process contributions are greater than 1% of the relevant EAL (i.e. not insignificant) in Drawings MS 7/5 to MS 7/14. These drawings illustrate that the PC is below 1% of the EAL at discrete residential receptors, where the long-term objectives apply, and impacts can therefore be considered insignificant.

Comment [p1]: TBC when drawings done...might not be true for Metals...

Table 6-3
Predicted Long-term Process Contributions (µg/m^3)

Pollutant	Applied Standard	PC Max	PC Max as % of EAL
PM_{10}	40	0.61	1.5%
$PM_{2.5}$	25	0.31	1.2%
NO_2	40	1.16	2.9%
SO_2	50	3.08	6.2%
HCl	20	0.59	3.0%
HF	16	0.06	0.4%
TOC	5	0.59	11.8%
Cadmium	0.005	0.0015	29.80%
Thallium	1	0.0015	0.15%

Pollutant	Applied Standard	PC Max	PC Max as % of EAL
Mercury	0.25	0.0030	1.19%
Antimony	5	0.0007	0.01%
Arsenic	0.003	0.0002	5.96%
Chromium (III)	5	0.0031	0.06%
Chromium (VI)	0.0002	0.0001	32.60%
Cobalt	0.2	0.0002	0.12%
Copper	10	0.0012	0.01%
Lead	0.25	0.0022	0.88%
Manganese	1	0.0022	<0.01%
Nickel	0.02	0.0081	40.58%
Vanadium	5	0.0001	<0.01%

The predicted long-term PC is combined with the background concentration to derive the predicted environmental concentrations (PEC) as presented in Table 6-4.

Table 6-4
Predicted Long-term Predicted Environmental Concentrations (µg/m^3)

Pollutant	Applied Standard	Background	PEC Max	Max PEC as % of Standard
PM_{10}	40	16.6	17.2	43.0%
$PM_{2.5}$	25	10.9	11.2	44.8%
NO_2	40	15.2	16.4	40.9%
SO_2	50	1.7	4.8	9.6%
HCl	20	0.4	0.9	4.7%
HF	16	0.000	0.1	0.4%
TOC	5	0.2	0.7	14.8%
Cadmium	0.005	0.0001	0.0016	31.64%
Thallium	1	N/m	0.0015	0.15%
Mercury	0.25	0.0010	0.0040	1.60%
Antimony	5	0.0009	0.0015	0.03%
Arsenic	0.003	0.0005	0.0007	23.06%
Chromium (III)	5	0.0006	0.0037	0.07%
Chromium (VI)	0.0002	<0.0001	0.0001	49.84%
Cobalt	0.2	<0.0001	0.0003	0.14%
Copper	10	0.0030	0.0042	0.04%
Lead	0.25	0.0050	0.0072	2.87%
Manganese	1	0.0020	0.0042	<0.01%
Nickel	0.02	0.0023	0.0104	51.96%
Vanadium	5	0.0013	0.0014	0.03%

All PECs as presented in Table 6-4 are less than 60% the relevant EAL or AQS, therefore no significant impacts or exceedence of any long-term EAL or AQS are predicted.

The maximum predicted long-term PC of Dioxins 5.9 fg (I-TEQ)/m^3 is comparable to the rural background levels monitored by DEFRA[17]. The consideration of exposure via other routes would be assessed by the EA at permitting stage.

6.3 Results –Sensitive Ecosystems

6.3.1 Critical Levels - Annual

The maximum predicted annual mean ground level concentration of NO_x and SO_2 at each discrete ecological receptor is presented in Table 6-5 below.

Table 6-5
Annual Mean Process Contribution at Sensitive Ecosystems - (µg/m^3)

Local Site	NO_x PC	NO_x % of EAL	SO_2 PC	SO_2 % of EAL
ER1	0.002	0.01%	0.002	0.01%
ER2 (grid max)	0.245	0.82%	0.375	1.88%
ER3	0.006	0.02%	0.006	0.03%
ER4	0.010	0.03%	0.009	0.05%
ER5	0.012	0.04%	0.012	0.06%
ER6	0.027	0.09%	0.024	0.12%
ER7	0.043	0.14%	0.039	0.20%
ER8	0.079	0.26%	0.078	0.39%
ER9	0.037	0.12%	0.033	0.17%
ER10	0.043	0.14%	0.038	0.19%
ER11	0.006	0.02%	0.005	0.03%
ER12	0.014	0.05%	0.014	0.07%
ER13	0.006	0.02%	0.006	0.03%
ER14	0.008	0.03%	0.007	0.03%
ER15	0.008	0.03%	0.008	0.04%
ER16	0.138	0.46%	0.497	2.49%
ER17	0.054	0.18%	0.047	0.23%
ER18	0.011	0.04%	0.011	0.06%
ER19	0.049	0.16%	0.059	0.30%
ER20	0.034	0.11%	0.030	0.15%
ER21	0.055	0.18%	0.051	0.25%

The process contribution is below 1% of the relevant critical level for all receptors except for SO_2 at the Micheldever Spoil Heaps SSSI and Micheldever Oil Terminal SINC. Maximum impacts are <2% on the SSSI and <2.5% on the SINC and therefore no further assessment is required, however the impact of SO_2 on acid deposition has been investigated as detailed in Section 6.4.

6.3.2 Critical Levels – 24-hr

The maximum predicted daily mean ground level concentration of NO_x and HF at each nature conservation site is presented in Table 6-6 below.

[17] Data available from http://uk-air.defra.gov.uk/interactive-map#network=tomps

Table 6-6
Daily Mean Process Contribution at Nature Conservation Sites (µg/m^3)

ID	NO_x PC	NO_x % of EAL	HF PC	HF % of EAL
ER1	0.044	0.06%	0.001	0.02%
ER2 (grid max)	3.772	5.03%	0.083	1.67%
ER3	0.168	0.22%	0.003	0.06%
ER4	0.199	0.27%	0.004	0.07%
ER5	0.247	0.33%	0.005	0.10%
ER6	0.218	0.29%	0.004	0.08%
ER7	0.335	0.45%	0.006	0.12%
ER8	0.581	0.77%	0.012	0.23%
ER9	0.325	0.43%	0.005	0.11%
ER10	0.354	0.47%	0.006	0.12%
ER11	0.155	0.21%	0.003	0.05%
ER12	0.330	0.44%	0.006	0.11%
ER13	0.199	0.26%	0.004	0.07%
ER14	0.205	0.27%	0.003	0.07%
ER15	0.217	0.29%	0.004	0.08%
ER16	1.861	2.48%	0.126	2.52%
ER17	0.587	0.78%	0.009	0.18%
ER18	0.288	0.38%	0.006	0.12%
ER19	0.700	0.93%	0.014	0.29%
ER20	0.265	0.35%	0.005	0.09%
ER21	0.453	0.60%	0.008	0.16%

The process contribution is predicted to be below 10% of the respective short-term critical level and therefore the impact is considered insignificant and therefore no further assessment is required.

6.4 SO_2 - Acid Deposition

A summary of the maximum predicted SO_2 contribution to acid deposition at the identified nature conservation sites where SO_2 impacts exceeded 1% of the critical level are presented in Table 6-7 below.

Table 6-7
Predicted S-acid Deposition on Nature Conservation Sites (kg_{eq}/ha/yr)

Site	CLmaxS	PC S	S PC as % CLO
Micheldever Spoil Heaps SSSI	4.15[(a)]	0.044	1.2%[(b)]
Micheldver Oil Terminal SINC	3.91	0.059	1.5%

Table Note:
(a) Data from APIS for the most acid-sensitive feature of the SSSI (Inland rock outcrops and scree habitat).
(b) Calculated using the critical loads exceedence function on the APIS website http://www.apis.ac.uk/critical-load-function-tool.

The predicted PCs from the proposed WMD are less than 20% of the applied critical load for S-acid deposition on the SSSI and <50% on the SINC and therefore the impact is not considered to be significant and no further assessment is required.