13 Air Quality

13.1 Introduction

Overview

13.1.1 This Chapter considers the potential effects associated with releases to atmosphere during the construction and operational phases of the proposed EfW CHP facility. Emissions to air from the proposed facility have the potential to adversely affect human health and sensitive ecosystems.

13.1.2 The assessment is based on a number of individual assessments including:

- A qualitative assessment of impacts on amenity from dust generated during the construction process;
- A dispersion modelling study of chimney emissions. The optimum chimney height has been identified as part of an assessment of Best Available Techniques (BAT);
- A dispersion modelling study of the effect of additional road traffic on local air quality;
- A study of potential effects of emissions on nearby designated sensitive habitat sites; and
- A dispersion modelling study of the effect of odour emissions at times when the EfW process is offline and building air is emitted to atmosphere via a shutdown exhaust system.

13.1.3 The magnitude of air quality impacts at sensitive human receptors is quantified and the significance of the consequent risk of long-term human exposure to pollutants emitted by the proposed EfW CHP facility is evaluated. The impact of emissions on sensitive ecological receptors is considered in the context of relevant critical loads or critical levels for designated nature conservation sites.

13.1.4 The impacts of the operation of the proposed EfW CHP facility due to emissions to air from the chimney and road traffic exhaust emissions are considered in detail within a technical air quality dispersion modelling report. This chapter refers to this assessment where it is appropriate to do so. For full details of the methodology and approach taken in respect of this work, reference should be made to the air quality dispersion modelling report , which is provided as Appendix 13.1 to this ES.:

13.1.5 The significance of the impact of emissions from the EfW CHP facility on designated nature conservation sites are discussed within ES Chapter 7 on Ecology.

13.1.6 The significance of the effect of emissions at human health receptors is included in a wider assessment of effects on the health and well-being of the local community, with Chapter 18 of this ES. The health and well-being assessment includes:

- A technical report on human health effects resulting from exposure to sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) (Appendix 18.1) using the COMEAP and CAFÉ methods; and
- A technical Human Health Risk Assessment (HHRA), which builds on the results of the air quality assessment and considers the effect of long-term human exposure to pollutants emitted by the EfW CHP facility (Appendix 18.2)

Pollutants

13.1.7 The pollutants considered within the assessment of emissions from the main chimney are primarily those prescribed within the Waste Incineration Directive (WID). These are:

- Oxides of Nitrogen (NO_x), expressed as Nitrogen Dioxide (NO_2);
- Particulate Matter (as PM_{10});
- Carbon Monoxide (CO);
- Sulphur Dioxide (SO_2);
- Hydrogen Chloride (HCl);
- Hydrogen Fluoride (HF);
- Twelve metals (Cadmium (Cd), Thallium (Tl), Mercury (Hg), Antimony (Sb), Arsenic (As), Lead (Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni) and Vanadium (V));
- Polychlorinated dibenzo-*para*-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans); and
- Volatile organic compounds (VOCs), as benzene.

13.1.8 Emissions of the following pollutants not included within WID are also considered:

- Polycyclic Aromatic Hydrocarbons (PAH), as benzo[a]pyrene;
- Ammonia (NH_3); and
- Fine particulate matter ($PM_{2.5}$).

13.1.9 PAHs have recently become an increasingly prominent air pollutant of interest and one of the key PAH species, benzo[a]pyrene, is subject to a statutory air quality standard in the UK. Ammonia is recognised as having the potential to impact on sensitive ecological habitats, both directly and as a component of acid and nutrient nitrogen deposition. $PM_{2.5}$ has increasingly become associated with impacts on health in recent years and has subsequently been included within the statutory limit values set out within the most recent European and UK air quality legislation.

13.1.10 Of the pollutants listed above, the primary pollutants of interest in relation to impacts from road traffic emissions are NO_2, PM_{10} and $PM_{2.5}$.

Consultation

13.1.11 An EIA Scoping Report was submitted to Plymouth City Council (PCC) in June 2010 (see Appendix 2.1). The proposed approach to the air quality assessment was described in that document. The Scoping Opinion (see Appendix 2.3) approved the proposed scope and approach to the air quality assessment.

13.1.12 Consultation discussions were also undertaken with PCC officers and other statutory bodies on the scope of the air quality assessment, the outcomes of which were incorporated into the scope of the air quality assessment. These bodies included:

- Natural England; and
- The Environment Agency.

13.2 Legislation and Policy

Legislation

13.2.1 The key legislation relating to facilities like the proposed EfW CHP facility is the Waste Incineration Directive (2000/76/EC) (EC, 2000). This Directive was implemented through the Waste Incineration (England and Wales) Regulations 2002 No. 2980 (H.M. Government, 2002). The Directive contains measures relating to the control of emissions, including emissions to air, for example by specifying minimum standards for gas temperature and the residence time of combustion gases within the combustion chamber. The Directive sets limits on emissions of a wide range of air pollutants, and requires operators to monitor and report emissions to air as well as to other environmental media.

13.2.2 By the time the EfW CHP facility becomes operational in 2014, Directive 2010/75/EU (EC, 2010) will have been transposed into UK law. This, the Industrial Emissions Directive (IED), amends, consolidates and replaces seven Directives on pollution from industrial installations, including those relating to Integrated Pollution Prevention and Control (IPPC) and Waste Incineration. The emissions limits to air for EfW facilities set out within the IED have been carried over from the WID.

13.2.3 The proposed EfW CHP facility will require an Environmental Permit to operate under the provisions of the Environmental Permitting (England and Wales) Regulations 2010 (H.M. Government, 2010). This permitting regime is separate from but complementary to the planning regime. In order to be issued with an operating permit, the site will need to demonstrate to the satisfaction of the Environment Agency that Best Available Techniques are being used to minimise emissions to all environmental media. A detailed assessment of controls on air pollutants and any residual air quality effects will be required as part of the Environmental Permit application process.

13.2.4 The Clean Air for Europe (CAFE) programme revisited the management of air quality within the EU and replaced the EU Framework Directive 96/62/EC, its associated Daughter Directives 1999/30/EC, 2000/69/EC, 2002/3/EC, and the Council Decision 97/101/EC with a single Directive, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (EC, 2008).

13.2.5 Directive 2008/50/EC is currently transcribed into UK legislation by the Air Quality Standards Regulations 2010 SI No. 1001 (H.M. Government, 2010) which came into force on 11th June 2010. These limit values are binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole. For substances not specified in these Regulations, air quality guidelines are provided in Environment Agency guidance.

13.2.6 The UK is bound by the terms of the European Birds and Habitats Directives and the Ramsar Convention. The Conservation of Habitats and Species Regulations 2010 (the "2010 Regulations") provide for the protection of European Sites created under these, i.e. Special Areas of Conservation (SACs) designated pursuant to the Habitats Directive, Special Protection Areas (SPAs) classified under the Birds Directive, and Ramsar Sites designated as

wetlands of international importance. The 2010 Regulations apply specific provisions of the European Directives to SACs, SPAs, candidate SACs (cSACs) and proposed SPAs (pSPAs), which require them to be given special consideration to and further assessment of any development which is likely to lead to a significant effect upon them (see Regulation 61).

13.2.7 The legislation concerning the protection and management of designated sites and protected species within England is set out within the provisions of the 2010 Regulations, the Wildlife and Countryside Act 1981 (as amended) and the Countryside and Rights of Way Act 2000 (as amended).

National Planning Policy

13.2.8 Planning Policy Statement 23: Planning and Pollution Control (ODPM, 2004) sets out the Government's core policies and principles in relation to planning and pollution control. It affirms that the planning and pollution control systems are separate but complementary. Accordingly, the planning system should focus on whether the development itself is an acceptable use of the land and the impacts of those uses, rather than seeking to control the processes or emissions themselves.

13.2.9 Appendix A of PPS23 sets out matters for consideration in preparing Local Development Documents and taking decisions on individual planning applications. The listed matters include the following, which are of relevance to this assessment:

- *"the possible impact of potentially polluting development (both direct and indirect) on land use, including effects on health, the natural environment or general amenity";*
- *"the potential sensitivity of the area to adverse effects from pollution, in particular reflected in landscape, the quality of the soil, air, and ground and surface waters…";*
- *"the environmental benefits that the development might bring";*
- *"the existing, and likely future, air quality in an area, including any Air Quality Management Areas (AQMAs) or other areas where air quality is likely to be poor (including the consideration of cumulative impacts of a number of smaller developments on air quality, and the impact of development proposals in rural areas with low existing levels of background air pollution)";*
- *"the need for compliance with any statutory environmental quality standards or objectives (including the air quality objectives prescribed by the Air Quality 2000 and Amending Regulations 2002 and the Urban Waste Water Treatment Directive 1991)"; and*
- *"existing action and management plans with a bearing on environmental quality including: Air Quality Management Area Action Plans (prepared by LAs under Part IV of the Environment Act 1995)".*

Local Planning Policy

13.2.10 The Local Development Framework (LDF) is a system for the preparation of Local Development Documents, brought into effect by the Planning and Compulsory Purchase Act 2004. At the heart of the LDF is the Core Strategy that sets out a long term vision and spatial strategy for Plymouth.

13.2.11 The Core Strategy of the LDF (PCC, 2007) was formally adopted in 2007 and is central to delivering PCC's vision for the City over the next 15 to 20 years.

13.2.12 Chapter 11 of the Core Strategy, Natural Environment, contains Policy CS22, which states the Council aims *"To protect people and the environment from unsafe, unhealthy and polluted environments through…2. Ensuring development causes no unacceptable impact on water or air quality."*

13.2.13 Chapter 15 of the Core Strategy, Community Health, Safety and Well-being, contains Policy CS34, which states that *"Planning permission will be granted if all relevant considerations are properly addressed. These considerations will include whether the development…Has adequately considered the on and off-site impacts of the proposal in terms of climate change, flood risk, wildlife, natural resource use and pollution."*

13.2.14 The Plymouth Waste Development Plan Document 2006 – 2021 (the Waste DPD) sets out policies and identifies sites to facilitate the fulfilment of Plymouth's waste management strategy and the delivery of Strategic Objective 13 of the Core Strategy. Policy W8 sets out criteria that waste management development will be required to meet whether on allocated or unallocated sites. Policies W7 and W8 provide the planning framework against which proposals for waste management development not on allocated sites should be assessed. The criteria in W7 include the implementation of mitigation measures as necessary to protect amenity, good standards of design, energy efficiency and sustainability and adequate internal vehicle manoeuvring arrangements. Some of the criteria In W8 overlap with those of Policy W7 and most relate to themes of sustainable waste management and environmental effects & amenity impacts.

13.2.15 The RSS for the South West is currently only available as a draft (South West Regional Assembly, 2006) and there is currently uncertainty surrounding the future status of RSSs. Nevertheless, Chapter of 7 of the draft RSS includes policy relating to air quality. Policy RE9 states that:

"The impacts of development proposals on air quality must be taken into account and local authorities should ensure, through LDDs (Local Development Documents), that new development will not exacerbate air quality problems in existing and potential AQMAs (Air Quality Management Areas)."

Local Air Quality Management

13.2.16 The UK National Air Quality Strategy was initially published in 2000, under the requirements of the Environment Act 1995 (H.M. Government, 1995), and updated in 2003. The latest version of the strategy was published in 2007 (Defra, 2007). The strategy sets objective values for key pollutants as a tool to help local authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive. Some of these objective values have been laid out within national air quality legislation.

13.2.17 The air quality objective values referred to within the strategy have been set down in legislation for the purposes of local air quality management. Under local air quality management, PCC have a duty to carry out regular assessments of air quality against the air quality objective values and, if it is unlikely that the objective values will be met within the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values.

Guidance

13.2.18 Environment Agency Guidance Note H1 (EA, 2010) provides guidance on the assessment of Best Available Techniques for the purposes of the Environmental Permitting system. This guidance note sets out guidelines for use in air quality assessment work to support an Environmental Permit application.

13.2.19 Defra has published technical guidance (Defra, 2009) to assist local authorities in fulfilling their duties (see paragraph 6.2.17) in relation to Local Air Quality Management. Parts of this guidance, and associated tools, may be useful in assessing the impacts of individual developments within the planning process.

13.2.20 The Environment Agency's EU Habitats and Birds Directive Handbook provides guidance to Environment Agency inspectors for carrying out a screening assessment, and (if required) an "appropriate assessment" of effects on European Sites.

13.3 Baseline Conditions

Overview

13.3.1 A full review of baseline air quality data has been undertaken for the air quality assessment of the EfW CHP facility. The baseline air quality data used within the assessment has been gathered from a number of sources, which include:

- Project-specific continuous, periodic and diffusion tube monitoring undertaken in the vicinity of the site by the Transport Research Laboratory (TRL) between July 2010 and February 2011; monitoring will continue until May 2011;
- Monitoring undertaken by PCC in the course of its statutory duties;
- Monitoring data from other national networks; and
- Interpolated background pollutant data derived from UK-wide mapping of pollutant emission sources.

13.3.2 There are few significant sources of industrial emissions around the site, with natural gas / oil fired boiler plant, a surface treatment process and spray painting process elsewhere within Devonport being the closest authorised processes (PCC, 2010). The Weston Mill Crematorium is also situated around 1 km to the east of the site. Langage power station, 12 km to the east, is a significant emitter of oxides of nitrogen, but is sufficiently far away that it is likely to have an imperceptible effect on the air quality around the EfW CHP facility application site.

13.3.3 Of greater significance is that the development site is not far from a number of heavily trafficked roads. These roads include the A3064 Wolseley Road / Weston Mill Road which passes through the Camel's Head junction adjacent to the site access point. Traffic accessing the application site would pass through the junction. The A38 trunk road is located to the north, running east-west, and at its closest point it is approximately 2 km from the application site.

13.3.4 Concentrations of some pollutants, e.g. SO_2, are largely uniform across the study area, whereas other pollutant concentrations (notably those related to traffic emissions, i.e. NO_X and particulate matter) are more spatially variable and are likely to be influenced by emissions from significant local sources.

13.3.5 Full details of the review of baseline air quality data, and a detailed summary of the project-specific baseline monitoring programmes and results, is presented within Appendix 13.1.

Local Air Quality Review and Assessment

Plymouth City Council

13.3.6 In fulfilment of its obligations under the Environment Act 1995, PCC has undertaken a phased review and assessment of air quality within its area. At the time of writing, PCC's website[1] states that three AQMAs are designated within the City:

- Mutley Plain NO_2 AQMA;
- Exeter Street NO_2 AQMA; and
- Exeter Street Benzene AQMA.

13.3.7 The AQMAs are located close to or within the city centre, around 5 km to the southeast of the application site. It has been confirmed, through the implementation of a project-specific baseline monitoring survey, that local pollutant concentrations in the immediate vicinity of the site are not currently at risk of exceeding relevant EU Limit Values and UK Air Quality Objectives.

13.3.8 In a pre-application consultation meeting held in February 2011, Officers from PCC's Public Protection Service advised that the situation regarding AQMAs in the city may soon change. The Exeter Street Benzene AQMA may be revoked. Three new NO_2 AQMAs may be designated at Tavistock Road in Crownhill, Stoke village and Royal Parade. There is also the possibility of a city-wide AQMA.

Cornwall Council

13.3.9 The site of the proposed development is close to the River Tamar which forms the boundary with Cornwall. Cornwall Council also has an obligation to periodically review and assess local air quality within its geographical area. Prior to the amalgamation of the Cornwall District Councils into Cornwall Council, there had been a requirement for Kerrier District Council and North Cornwall District Council to declare as AQMAs in 2005 and 2008 respectively, due to exceedances of the annual mean NO_2 air quality objective.

13.3.10 Since their amalgamation into Cornwall Council in 2009, the need to declare an additional AQMA has been identified. Cornwall Council is currently in the process of declaring this AQMA at Tideford, which is located between Liskeard and Saltash on the A38, due to exceedances of the annual mean NO_2 objective. The spatial scale of the AQMA is yet to be decided, but may cover the entire village. Tideford is approximately 10.5 km to the west of the application site.

Local Authority Air Quality Monitoring

Plymouth City Council

13.3.11 As part of their review and assessment of local air quality, PCC operates an air quality monitoring network across the city. There is, however, little measurement data representative

[1] http://www.plymouth.gov.uk/homepage/environmentandplanning/pollution/airquality/airqualityareas.htm

of baseline air quality in the vicinity of the application site itself. The nearest continuous monitoring stations are situated within other parts of the city, around 4 km to the east and south east of the application site.

13.3.12 Air quality data collected at the continuous monitoring stations over the last five years demonstrate that there is a continued risk of the annual mean NO_2 objective being exceeded at Mutley Plain, due to emissions from road traffic. Annual mean PM_{10} and $PM_{2.5}$ concentrations are generally well within the objective values, but an annual mean PM_{10} concentration in excess of the objective has been recorded at Exeter Street for 2010. At the current time, PCC suspect that this could be due to ongoing road works, temporary traffic diversions and associated congestion in that part of the city. The council are to continue to monitor the situation following completion of the improvements, but are not intending to proceed to a detailed assessment of PM_{10} in this area at the current time.

13.3.13 Of the NO_2 diffusion tube sites operated by PCC, only one site is relevant to the immediate area around the application site. This is located on the façade of a bungalow at 3 Weston Mill Drive, adjacent to the Camel's Head Junction. In 2010, the mean NO_2 concentration was well within the annual mean objective.

13.3.14 Overall, the available existing sources of measurement data do not suggest that the air quality objectives for the pollutants measured are at risk of exceedence in close proximity to the application site. The Mutley Plain monitoring station and a number of NO_2 diffusion tubes, in close proximity to major roads elsewhere in the city centre, indicate that there is the potential for the NO_2 annual mean objective to be exceeded in some locations within the AQMAs.

Cornwall Council

13.3.15 Within Saltash, a roadside continuous monitoring site has measured PM_{10}, from July 2008 to the end of August 2010. The site also measured $PM_{2.5}$ between February and August 2010. The available data indicates that baseline PM_{10} and $PM_{2.5}$ concentrations are well within their respective objectives within Saltash and the surrounding area.

Project Specific Air Quality Monitoring

13.3.16 Existing sources of background air quality data have been supplemented with a project specific air quality study, which has consisted of the following monitoring:

- a diffusion tube survey in the vicinity of the application site and the wider area, in order to evaluate the variation in concentrations across the air quality study area; and
- operation of a continuous monitoring station within HMNB Devonport, a short distance to the west of the application site boundary.

13.3.17 The full results of the survey are presented in Appendix 13.1. At the time of writing, six months of data are available, but the monitoring survey is due to run until May 2011, when a total of nine months data will have been collected. The six months of data are adequate for the purposes of this assessment and cover a suitably representative timescale including seasonal variations, and as such it has been agreed with PCC officers that it is acceptable to base this air quality assessment on the six months of data, subject to the additional three months of data being submitted for completeness as a supplement during the course of the planning application determination period.

Diffusion Tube Monitoring

13.3.18 The NO_2 diffusion tube survey confirmed that there is a wide variation in concentrations of this pollutant across the study area, with higher results at locations near to significant road traffic emission sources. The highest concentrations were measured at Beaumont Street (close to the A3064 to the south east of the site), Wolseley Road adjacent to the Camel's Head Junction and Ferndown Road near to the Weston Mill fire station. Concentrations are lower in areas away from main roads. Overall, the results confirmed that long-term NO_2 concentrations are well within the annual mean objective at all the monitoring sites.

13.3.19 Diffusion tube monitoring for SO_2 showed that the long-term average concentration is low in close proximity to the monitoring sites, with no significant local sources of this pollutant. It is likely that the short term objectives for SO_2 would also be met at these locations.

Continuous Monitoring Station

13.3.20 The air quality monitoring station was installed by TRL, on behalf of MVV, within HMNB Devonport adjacent to the application site. The station has taken the following measurements:

- Continuous monitoring of oxides of nitrogen (NO, NO_X and NO_2);
- Continuous monitoring of SO_2;
- Continuous monitoring of PM_{10};
- Monthly measurement of PAH and PCBs;
- Monthly measurement of dioxins and furans; and
- Monthly measurement of heavy metals.

13.3.21 Throughout the monitoring period there were no exceedances of short term NO_2 and PM_{10} objectives and the period mean concentrations were also well within the annual mean objectives. The variation in hourly values at the monitoring site compared well with the national network site in Plymouth Urban Centre over the same period.

13.3.22 Mean concentrations of PAH, PCBs, dioxins, furans and heavy metals were found to be generally low, and well within the respective long term criteria set for these pollutants.

Baseline Pollutant Concentrations Used in the Assessment

Baseline Pollutant Concentrations – Sensitive Human Receptors

13.3.23 Full details of the method of selection of baseline pollutant concentrations, and the source of the information, is detailed in Section 4.6 of Appendix 13.1 to this ES.

13.3.24 In the immediate vicinity of the facility and at nearby sensitive receptors within residential areas, baseline concentrations are assumed to be largely uniform, on the basis that they are not in close proximity to large sources of emissions, such as industrial plant or major roads.

13.3.25 In the assessment of impacts on sensitive receptors in close proximity to major traffic routes, however, specific consideration has been given to prevailing annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations in those areas, as road traffic is also a source of such pollutants.

13.3.26 The results of an NO_2 diffusion tube survey conducted in the vicinity of the site indicate that there is some variation in local long-term concentrations, with higher concentrations observed in close proximity to main roads. The survey did not, however, record concentrations to suggest that the annual mean NO_2 objective is at risk of being exceeded in the local area around the proposed site. This includes the Camel's Head junction, close to the access point to HMNB Devonport and the entrance to the proposed EfW CHP facility.

13.3.27 Baseline air quality concentrations adopted for use in the assessment in respect of the other study pollutants are well within their respective limit values or guideline criteria.

Baseline Pollutant Concentrations – Sensitive Ecological Receptors

13.3.28 A review of baseline conditions at sensitive ecological receptors has been undertaken within the technical assessment of air quality impacts. Full details of the baseline information for the designated ecological sites considered within the assessment are presented in Tables 5.9 to 5.14 of Appendix 13.1 to this ES.

13.3.29 At one SAC (South Dartmoor Woods) and one County Wildlife Site (Ernesettle Complex), baseline loads of acid and nutrient nitrogen deposition are already in excess of the critical loads. Baseline concentrations of ammonia are also in excess of the critical level at the South Dartmoor Woods SAC.

Baseline Dust Conditions

13.3.30 A background level of dust typically exists in all urban locations in the UK. Dust can be generated on a local scale in the urban area from vehicle movements and from the action of wind on exposed soils and surfaces. Dust levels can be affected by long range transport of dust from distant sources into the local vicinity. Concentrations of dust in the urban area can vary depending on various parameters such as meteorological conditions and time of year. A constant level of dust will be present in the urban environment from the above sources, which will constitute baseline levels.

13.4 Methodology

Emissions

13.4.1 The technical methodology and approach taken to the prediction of impacts is outlined within the technical assessments provided as Appendices to this ES. The methodology for determining significance criteria, developed by the Institute of Air Quality Management (IAQM, 2009), have however been used to assess the potential significance of effects in relation to combustion emissions from the main chimney and road traffic and are described in this chapter. The methodology for determining the effects of dust deposition on the amenity of local sensitive receptors during the proposal's construction phase is also described here.

13.4.2 A detailed description of the methodology for calculating the magnitude of impacts on local air quality can be found in Section 3 of Appendix 13.1 to this ES.

13.4.3 Emissions to air from the main chimney of the proposed EfW CHP facility have been modelled in detail using computer dispersion modelling. The model used was the latest version of ADMS 4, a new generation dispersion model accepted by the Environment Agency as an appropriate tool for the modelling of emissions from industrial sources.

13.4.4 The assessment of road traffic emissions during the construction and operational phases has been undertaken using an approach based on the use of detailed dispersion modelling. The model employed in the study was ADMS Roads, and the assessment was carried out using vehicle emission factors taken from the most recent release of the EFT database, provided by the Highways Agency. As well as modelling the effects of traffic using the EfW CHP facility, an additional scenario has been modelled with traffic flows from two other developments that have the potential to be built in the vicinity, the Weston Mill Local Centre and the Royal Marines DLCCP proposals (see the Transport Assessment, ES Appendix 12.1, for details).

13.4.5 The assessment of odour emissions has focused on emissions from the shutdown exhaust system outlet duct. At times when the combustion line is shut down, e.g. for maintenance, waste would continue to be accepted into the facility. At such times, air from the ventilation system would be fed to a filter system and emitted to atmosphere via the shutdown exhaust system outlet duct, which has been modelled using ADMS 4. Whilst the facility is operating normally the air from the Tipping Hall will be extracted and used as combustion air in the burning of the waste.

Construction Dust

13.4.6 There are currently no statutory methods for air quality impact assessments undertaken in support of a planning application in the UK. Several Local Authorities, Government Departments and Non-Governmental Organisations have published guidance for a wide range of related tasks, including that of undertaking Local Authority Review and Assessments of local air quality (Defra, 2009).

13.4.7 Dust is a generic term but is defined in BS 6069:1994 (BSI, 1994) as particulate matter with a diameter in the size range 1-75 µm (micrometres), and is primarily composed of mineral materials and soil particles.

13.4.8 Particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$), is composed of particles with an aerodynamic diameter of less than 10 µm and 2.5 µm in diameter respectively, and include the size fractions of greatest concern to impacts on human health. Total Inhalable Particles (TIP) includes all dust particles that are small enough to be inhaled, including PM_{10}, $PM_{2.5}$ and larger particulates that cannot penetrate into the respiratory system. The majority of dust generated by construction activity is larger than 10 µm in diameter and, therefore, increased levels of dust in the air do not necessarily equate to an increase in levels of PM_{10} and $PM_{2.5}$. In general, dust emissions associated with construction activity rarely represent an adverse risk to human health and are more typically associated with causing annoyance to the public through the visible deposits soiling property.

Construction Dust Sensitive Receptors

13.4.9 The site of the proposed EfW CHP facility is located in the northwest of Plymouth. There are a number of residential properties to the north, east and west of the site, including those located on Talbot Gardens to the west, Savage Road to the north and Hamoaze Avenue to the east.

13.4.10 When assessing the impact of dust emissions generated during site preparation and construction works, receptors are defined as the nearest potentially sensitive receptor to the perimeter of the main construction working area from each direction. These receptors have the potential to experience impacts of greater magnitude due to dusts generated by the works, when compared with other more distant receptors, or less sensitive receptors, and as such

represent examples of worst-case exposure. Receptors in the vicinity of the site have been identified and are displayed within the buffer zones represented in Figure 13.1. These include some of the properties located on Talbot Gardens, Savage Road and Hamoaze Avenue.

Construction Dust Assessment Methodology

13.4.11 There are limitations when quantifying likely deposition rates of nuisance dust or any changes in fugitive PM_{10} and $PM_{2.5}$ levels at nearby receptors during construction works, as it is dependant on a wide range of variables including ground and weather conditions and working methods. Therefore, it is not possible to accurately predict likely rates of dust deposition. As there are no statutory UK or EC standards relating to nuisance dust, the emphasis of the regulation and control of dust emissions from construction activities should be the adoption of best working practices on site. A qualitative assessment methodology has been adopted that considers the potential for the suggested mitigation measures to provide the required level of protection at sensitive receptors.

13.4.12 The methodology follows a qualitative risk-based approach that has been developed to identify the proposed construction site's potential to generate significant quantities of dust. The assessment of risk focuses on the type and duration of dust raising activities present at the work site combined with the nature of the receptors within a set distance of the work site.

13.4.13 Table 13.1 sets out empirically derived measures of the maximum distance, from a source of airborne dust, within which significant adverse effects of a given magnitude may be observed. The values are qualitative estimates for sites employing standard dust control procedures, based on the collective experience of many practitioners, as presented in an extensive body of environmental assessment reports and expert evidence. These criteria have been developed in the absence of any nationally agreed criteria.

Table 13.1 Zone for Potentially Significant Effects from Dust, with Standard Mitigation

Source	Zone for Potentially Significant Adverse Effects (Distance from Source)	
	Soiling at levels likely to cause annoyance	Exposure to PM_{10} at levels that could exceed the 24 – hour air quality objective
Visible emissions of dust, likely to occur at the source on a regular basis	100 m	25 m – 50 m
Visible emissions of dust, likely to occur at the source on an infrequent basis	50 m	15 m – 30 m
Short-lived limited emissions of dust, occurring at the source on an irregular basis	25 m	10 m – 20 m

* Significance is based on the 2007 objectives contained within the Air Quality (England) Regulations (2000), which allow 35 exceedences/year of 50 µg/m3 and takes account of existing high concentrations in the area. A range has been specified, as it is difficult to assess possible PM10 impacts, especially in an area with high baseline concentrations.

Source: Environmental Statement for Thames Gateway Bridge 2004 (Laxen D, 2004).

13.4.14 The proposed development considered in this assessment is likely to lead to visible emissions of dust, occurring at the source on a regular basis, due to the number of potentially dust

generating activities being undertaken across the site. Therefore, potentially significant impacts would normally be expected to occur within a 100 m radius of a dust generating activity. The equivalent distance for the risk of a potentially significant increase in annual mean exposure to PM_{10} is 50 m. For these reasons the distances of 100m and 50m are illustrated in Figure 13.1.

13.4.15 The generation of dust during the construction phase would be dependent on the sources of dust inherent within the activities undertaken. The best control of dust would be obtained using a combination of the established best practice techniques described within relevant guidance (BRE, 2003; Mayor of London, 2006). PCC has also adopted a Code of Practice for the Control of Pollution and Noise from Construction Sites (PCC, 2008). The assessment reviews the controls included within the Outline Construction Environmental Management Plan (see Appendix 6.3) and examines the likelihood of fugitive releases occurring. A consideration of working practices will identify how dust emissions can be minimised and controlled effectively.

Assessment Criteria

13.4.16 The potential impacts of emissions from the proposed facility and associated road traffic movements on sensitive human receptors are assessed against relevant air quality standards and guidelines. The effects on ecological receptors are assessed against critical loads and critical levels. The criteria against which impacts have been assessed are summarised below.

Construction Dust Assessment Criteria

13.4.17 For amenity effects (including that of dust), the aim is to bring forward a scheme, including mitigation measures if necessary, that does not introduce the potential for additional complaints to be generated as a result of the proposed development.

Sensitive Human Receptors Assessment Criteria

13.4.18 The assessment criteria against which impacts on sensitive human receptors have been assessed are summarised in Table 13.2, and are described in detail in Section 2 of Appendix 13.1. These criteria are derived from:

- EU Limit Values transcribed into UK legislation;
- Environmental Assessment Level (EAL) criteria set out within the Environment Agency's H1 guidance;
- Recommendations made by the Expert Panel on Air Quality Standards (EPAQS).

Table 13.2: Air Quality Assessment Criteria (for the Protection of Human Health)

Pollutant	Source	Concentration ($\mu g/m^3$)	Measured as	Future Date to be achieved (where applicable)
Nitrogen Dioxide (NO_2)	EU Air Quality Limit Values	40	Annual mean	
	EU Air Quality Limit Values	200	1-hour mean, not to be exceeded more than 18 times a year	
Particulate Matter as PM_{10}	EU Air Quality Limit Values	40	Annual mean	
	EU Air Quality Limit Values	50	24-hour mean, not to be exceeded more than 35 times a year	
Particulate Matter as $PM_{2.5}$	EU Air Quality Limit Values	25	Annual mean	1 January 2015
Sulphur Dioxide (SO_2)	WHO Guideline	50	Annual mean	
	UK Air Quality Strategy Objectives	266	15-min mean, not to be exceeded more than 35 times a year	
	EU Air Quality Limit Values	350	1-hour mean, not to be exceeded more than 24 times a year	
	EU Air Quality Limit Values	125	24-hour mean, not to be exceeded more than 3 times a year	
Benzene	UK Air Quality Strategy Objectives	16.25	Running annual mean	
	EU Air Quality Limit Values	5	Annual mean	
Carbon Monoxide (CO)	EU Air Quality Limit Values	10,000	Maximum daily running 8-hour mean	
	H1	30,000	1-hour maximum	
Hydrogen Chloride (HCl)	H1	750	1-hour maximum	
Hydrogen Fluoride (HF)	H1	16	Monthly mean	
	H1	160	1-hour maximum	
Poly Aromatic Hydrocarbons (PAH), as Benzo[a]Pyrene (BaP)	EU Air Quality Target Values	0.001	Annual mean	31 December 2012
	UK Air Quality Strategy Objectives	0.00025	Annual mean	31 December 2012
Lead (Pb)	EU Air Quality Limit Values	0.5	Annual mean	
	UK Air Quality Strategy Objectives	0.25	Annual mean	
Mercury (Hg)	H1	0.25	Annual Mean	

Pollutant	Source	Concentration ($\mu g/m^3$)	Measured as	Future Date to be achieved (where applicable)
	H1	7.5	1-hour maximum	
Antimony (Sb)	H1	5	Annual Mean	
	H1	150	1-hour maximum	
Arsenic (As)	EU Air Quality Target Values	0.006	Annual mean	31 December 2012
	H1	0.003	Annual mean	
Cadmium (Cd)	EU Air Quality Limit Values	0.005	Annual Mean	31 December 2012
Chromium, as Cr (II) compounds and Cr (III) compounds	H1	5	Annual mean	
	H1	150	1-hour maximum	
Chromium (VI), oxidation state in PM_{10} fraction	H1	0.0002	Annual mean	
Copper (Cu) (dusts and mists)	H1	10	Annual mean	
	H1	200	1-hour maximum	
Manganese (Mn)	H1	0.15	Annual mean	
	H1	1500	1-hour maximum	
Nickel (Ni)	EU Air Quality Target Values	0.02	Annual mean	31 December 2012
Vanadium (V)	H1	5	Annual mean	
	H1	1	1-hour maximum	
Ammonia (NH_3)	H1	180	Annual mean	
	H1	2500	1-hour maximum	
Polychlorinated Biphenyls (PCBs)	H1	0.2	Annual mean	
	H1	6	1-hour maximum	

13.4.19 With regard to the impact of chimney and road traffic emissions on concentrations of the pollutants NO_2 and particulate matter (PM_{10} and $PM_{2.5}$), the change in concentrations with respect to baseline concentrations has been quantified at receptors that are representative of exposure to impacts on local air quality within the study area. The absolute magnitude of pollutant concentrations in the baseline and with development scenario is also quantified and this is used to consider the risk of the air quality limit values being exceeded in each scenario.

13.4.20 For a change of a given magnitude (Table 13.2), the Institute of Air Quality Management has published recommendations for describing the magnitude of impacts at individual receptors and describing the significance of such impacts (IAQM, 2009).

13.4.21 A change in predicted annual mean pollutant concentrations of 1% of the assessment criteria is considered to be so small as to be imperceptible. A change (impact) that is imperceptible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

13.4.22 The magnitude of change is divided into four classes as defined in Table 13.3. The magnitude descriptors in the table are as proposed by Environmental Protection UK (EPUK, 2010).

Table 13.3 Magnitude of Changes in Annual Mean Pollutant Concentrations

Magnitude of Change	Annual Mean Concentration
Large	Increase/decrease > 10%
Medium	Increase/decrease 5% – 10%
Small	Increase/decrease 1% – 5%
Imperceptible	Increase/decrease < 1%

13.4.23 All relevant receptors that have been selected to represent locations where people are likely to be present are based on impacts on human health. The annual mean air quality standard or guideline values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such the sensitivity of receptors was considered in the definition of the air quality standards or guidelines, and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

13.4.24 For receptors that are predicted to experience a perceptible change in annual mean pollutant concentrations, the effect of the change on local air quality and the risk of exceeding the air quality standard or guideline is summarised in Table 13.4. A small increase in annual mean concentrations, at receptors exposed to baseline concentrations that are just below the air quality standard or guideline (90% to 100% of the assessment criteria) is considered to have a slight adverse effect as the slight increase in the risk of exceeding the standard or guideline value is significant. However, a small increase in annual mean concentration at receptors exposed to baseline concentrations that are below or well below (< 90% of the criteria) is not likely to affect the achievement of the objective value and is therefore not a significant effect (negligible).

Table 13.4 Significance of Magnitude of Change in Pollutant Concentrations

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration		
	Large	Medium	Small
Increase with Scheme			
Above Air Quality Standard or Guideline *With* Scheme (>100%)	Substantial Adverse	Moderate Adverse	Slight Adverse
Just Below Air Quality Standard or Guideline *With* Scheme (90%-100%)	Moderate Adverse	Moderate Adverse	Slight Adverse
Below Air Quality Standard or Guideline *With* Scheme (75%-90%)	Slight Adverse	Slight Adverse	Negligible
Well Below Air Quality Standard or Guideline *With* Scheme (<75%)	Slight Adverse	Negligible	Negligible
Decrease with Scheme			
Above Air Quality Standard or Guideline *Without* Scheme (>100%)	Substantial Beneficial	Moderate Beneficial	Slight Beneficial
Just Below Air Quality Standard or Guideline *Without* Scheme (90%-100%)	Moderate Beneficial	Moderate Beneficial	Slight Beneficial
Below Air Quality Standard or Guideline *Without* Scheme (75%-90%)	Slight Beneficial	Slight Beneficial	Negligible
Well Below Air Quality Standard or Guideline *Without* Scheme (<75%)	Slight Beneficial	Negligible	Negligible

13.4.25 The significance of all of the reported impacts is then considered for the proposed development in overall terms. The potential for the scheme to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principal focus is any change to the likelihood of future achievement of the air quality objective values.

Sensitive Ecological Receptors Assessment Criteria

13.4.26 The impact of emissions from the facility on sensitive ecological receptors are quantified within the dispersion modelling assessment in two ways:

- As direct impacts arising due to increases in atmospheric pollutant concentrations; and

- Indirect impacts arising through deposition of acids and nutrient nitrogen deposition to the ground surface.

13.4.27 The critical levels for the protection of vegetation and ecosystems are set out in Section 2 of Appendix 13.1 and apply regardless of habitat type. The critical levels are derived from UK Air Quality Standards and are set out in Environment Agency Horizontal Guidance.

13.4.28 Critical load criteria for the deposition of acids and nutrient nitrogen are dependant on the habitat type and species present, and are specific to the sensitive receptors considered within the assessment. The critical loads used are set out in Section 5 of Appendix 13.1.

13.4.29 Specific significance criteria relating to impacts on sensitive designated ecological receptors are set out within the H1 guidance. The impact of chimney emissions can be disregarded as insignificant if:

- The Process Contribution (PC) to the long term critical load or critical level is less than 1%; or if greater than 1% then
- The Predicted Environmental Concentration (PEC) is less than 70% of the critical load or critical level.

Odour Assessment Criteria

13.4.30 The threshold at which at which odour emissions from the shutdown exhaust system would cause “no reasonable annoyance”, have been set within this assessment at 1.5 OU_E $m/^3$, as a 98^{th} percentile of 1-hour means. 1.5 OU_E/m^3 is the benchmark level set within the Environment Agency’s Horizontal Guidance note H4 (Environment Agency, 2011) for "most offensive" odours, and has been adopted in this case.

13.5 Incorporated Mitigation

Emissions to Air

13.5.1 In view of the potential for adverse environmental effects, and the demanding restrictions on emissions to air from the proposed EfW CHP facility, a comprehensive suite of controls on emissions to air will be implemented as an integral part of the design. The design of the facility incorporates Best Available Techniques (BAT) in order to comply with the requirements of WID.

13.5.2 In summary the controls incorporated in the consented facility would include the following:

- Control on combustion conditions (e.g. maintaining the flue gases above the minimum temperature specified in the Waste Incineration Directive for a sufficient time and with adequate mixing);
- Rapid cooling of the flue gases to minimise the formation of dioxins and furans;
- Injection of urea to remove oxides of nitrogen from the flue gases;
- Injection of sodium bicarbonate for control of acid gases, including SO_2;
- Injection of activated carbon for control of mercury and dioxins and furans; and
- A bag filter system for removal of particulate matter.

13.5.3 The process will use a dry APC system using sodium bicarbonate, which will be delivered in sealed bulk powder carriers which are pneumatically loaded and emptied.

13.5.4 Acid pollutants HCl, SO_2 and HF will be removed by a dry scrubbing and filtration system, using sodium bicarbonate as the reagent, to enable more energy to be recovered from the flue gas.

13.5.5 A controlled amount of dry sodium bicarbonate will be injected into the flue gas upstream of economiser 3. Sodium bicarbonate will mix with the flue gases in the economiser and the downstream reaction duct section, which is designed with sufficient residence time to ensure that the necessary chemical reactions are completed. A controlled amount of powdered activated lignite carbon will also be injected into the flue gas upstream of the fabric filter. The purpose of this is described below.

13.5.6 The flue gases will pass through the fabric filter in which the entrained particles are trapped in the filter cake which covers the filter bags. The neutralisation reaction will be completed as the flue gases pass through the filter cake. The filter cake will be removed at regular intervals by reverse air pulses and fall into the filter discharge hoppers. A proportion of this residue will be re-circulated into the flue gas duct upstream of the fabric filter. This increases the neutralisation reaction efficiency, thereby reducing the final quantity of un-reacted sodium bicarbonate in the APC residue. The SO_2 and HCl concentrations at the boiler outlet and at the emission monitoring points in the chimney will be continuously monitored and the quantity of sodium bicarbonate injected will be adjusted in accordance with the difference in the concentrations of the acid gases at the two measurement points to achieve the permitted emission limits.

13.5.7 The primary method of minimising the release of dioxins will be by careful control of the combustion conditions. The gas residence times and the temperatures in the combustion system are such that dioxins / furans are efficiently destroyed.

13.5.8 For additional removal of dioxins and furans an activated lignite coke injection system will be used. The activated lignite coke adsorbs mercury, and organic compounds including dioxins and furans. Other heavy metals such as copper and cadmium are filtered out as particulates by the fabric filter.

13.5.9 The filter bags act as a foundation for the formation of a filter cake which serves as a reaction medium for both the acid gas neutralisation and the adsorption of heavy metals and organic compounds and provides particulate filtration.

13.5.10 The filter cake will be periodically removed from the bags by the automatic cleaning system in order to control the filter cake build up and hence the pressure drop across the bags. The bags are cleaned in rows by reverse jet pulses from compressed air nozzle tubes. The cleaning sequence is triggered automatically when a preset pressure drop across the bags has been reached. The bag filter will be provided with an electrical preheating system. The preheating system is used to preheat the bag filters at start-up and maintain the filter temperature in the event of a short term operational shutdown.

13.5.11 The differential pressure across the filter bag is measured as an indication of the build-up of filter cake on the bags. The material that falls into the ash hoppers during the cleaning process is removed from the system by conveyors. A proportion is re-circulated.

Road Traffic

13.5.12 There are a number of design factors associated with site access during construction that have a corresponding impact on minimising impacts to air quality. These include:

- Design of vehicle routing on site and optimising delivery schedules to minimise truck queuing in the site, at the site entrance and at the Camel's Head junction; and
- Routing of traffic to optimise access to the trunk road network (i.e. A38).

13.5.13 The measures to optimise traffic movements also minimise the potential for adverse impacts to air quality associated with vehicle emissions.

Construction Dust

13.5.14 It has been assumed in this assessment that the application of standard dust control measures will be normal working practice at the site during the construction phase, based on a Construction Environmental Management Plan. An Outline Construction Environmental Management Plan can be found at Appendix 6.3, the dust mitigation measures within which are reproduced below in Table 13.5.

13.5.15 It is important to note that materials arising from ground works will almost entirely be re-used within the site, reducing the amount of off site vehicle movements.

Table 13.5 Dust Mitigation Measures

Risk	Mitigation
Construction Traffic	• All construction traffic will follow specifically designated routes • Speed limits will be put into place on site for all vehicular movements • All vehicles carrying loose material will be covered • Wheel wash facility to be used for vehicles leaving site
Highways	• Where appropriate, use of road sweepers will be incorporated to ensure highways remain clear of dust and mud • Road edges and pathways will be swept by hand and damped down as necessary
Stockpiles	• To be sealed or sprayed with chemical bonding agents as required • Location of stockpiles away from any sensitive receptors • To be seeded to allow the growth of grass if stockpiled for long periods of time
Dust Suppression	• Mobile bowsers to be deployed on site at regular intervals; activity to be increased during significantly dry and windy periods • Where necessary, use of hoardings to be considered to ensure reduction in dust migration • Deliveries of significantly dusty materials to be sprayed to reduce dust potential • All cutting and grinding operations to conducted in ways to reduce risk of dust migration (wet cutting techniques etc)
Monitoring	• Ongoing monitoring to be undertaken by site personnel on regular basis, both on and off site to ensure no migration of dust • Regular liaison with EHO and Client to be undertaken • Regular reviews of mitigation methodology to be undertaken by Environmental Manager and Project Manager

13.6 Impact Assessment

Overview

13.6.1 This section summarises the results of the technical assessment work undertaken to predict the impacts of the proposed EfW CHP facility on local air quality, human health and sensitive ecosystems. The results of the air quality and human health assessments are presented in full within Appendices 13.1, 18.1 and 18.2 to this ES.

Impacts During Construction

Construction Dust

13.6.2 The type of construction activities that are expected to generate coarse dusts and PM_{10} emissions during the construction phase are as follows:

- Site clearance
- On site earth moving operations, site levelling, cut and fill etc
- Vehicle movements over haul roads
- Vehicle movements on site during dry periods
- Wind blowing across the site during dry periods
- Stockpiling of excavated materials
- Cutting and grinding
- Accidental spillage and loss of load from vehicles carrying loose material
- Deep excavations

13.6.3 A development of this size and duration has the potential to adversely affect amenity at existing receptors if the site is not managed to an acceptable standard.

13.6.4 It is assumed in this assessment that standard mitigation measures will be in place. It is recognised, however, that even with these measures, there is still a risk of infrequent impacts arising. The role of the Construction Environmental Management Plan is to define the actions that can reasonably be taken to mitigate impacts should they occur, as well as in defining routine controls and checks to be employed.

13.6.5 During each phase of the works, if dust generating activities are subject to standard dust suppression measures of the type normally associated with sites operating under the Considerate Contractor Scheme or similar, then the impacts on residential receptors would be small under normal atmospheric conditions, producing an effect of negligible significance. As shown on Figure 13.1, 141 residential properties have been counted within 100 m of the main construction area, including those located on Talbot Gardens, Savage Road and Hamoaze Avenue. These may experience an occasional increase in local soiling rates during times when activities are carried out in extremely dry and windy weather. Any such impacts would be restricted to short-term episodes affecting a small number of properties at any one time, and would be of minor significance. These impacts are most likely to take the form of increased soiling of property surfaces and are not normally associated with a general risk to health.

Construction Traffic

13.6.6 The proposed development would generate additional road traffic movements in the area and impacts on local air quality could therefore occur at all stages of the construction programme. However, it is likely to be during the operational phase when waste is transported to site via the local road network that the greatest potential impact on sensitive receptors would be expected, both in terms of the volume of traffic and the timescales involved. For this reason, the impact of additional road traffic emissions has been determined for the operational phase.

Impacts During Operation

13.6.7 The results of the dispersion modelling assessment to predict the impact of emissions from the proposed EfW CHP facility on sensitive human receptors and sensitive ecological receptors is summarised within this section. Full details of the model results are presented in Section 5 of Appendix 13.1 to this ES and associated Annexes.

Determination of Chimney Height

13.6.8 An evaluation of the height of the EfW CHP facility main chimney has been carried out as part of the dispersion modelling assessment. The selection of an appropriate chimney height requires a number of factors to be taken into account, the most important of which is the need to balance a chimney height sufficient to achieve adequate dispersion of pollutants against site specific constraints.

13.6.9 During the Invitation to Submit Detailed Solutions (ISDS) stage of the bidding process for the South West Devon Waste Partnership (SWDWP) Residual Waste Treatment PFI Contract, Scott Wilson undertook an initial air quality modelling assessment. This identified that a 85 m tall chimney would be a suitable option to progress to detailed design. Following MVV's appointment as preferred bidder for the SWDWP contract, Scott Wilson have undertaken a considerable amount of additional assessment work. This work, which is reported in full in Section 5 of Appendix 13.1, has considered a range of possible chimney heights from 45 m to 120 m. The magnitude of impacts at all receptors within 10 km of the proposed EfW CHP facility with an 85 m chimney would meet the assessment criteria for the protection of human health.

13.6.10 In addition to the main assessment criteria, an additional measure that is widely used as a screening check is to compare the magnitude of the contribution from the facility against a value of 1% of the criteria value. By increasing the height of the chimney to 95 m, the number of receptors that would experience an impact in annual mean concentrations of nitrogen dioxide for example, of less than 1% of the assessment criteria can be improved. Above 95 m, the incremental benefit of further increases in the chimney height becomes less effective in reducing the contribution of the facility to ground-level pollutant concentrations. It is therefore considered that 95 m is the height at which the costs of an increase in chimney height begin to outweigh the benefits to air quality.

13.6.11 The air quality dispersion modelling work has established that a chimney in the range of 85 m to 95 m in height would deliver the required air quality mitigation benefit, without giving rise to other undesirable effects. Through the public consultation process, including road show events and meetings of the Local Liaison Committee, MVV were made aware of local residents preference for air pollutants to be released from as tall a chimney as possible. The decision was taken by MVV to progress the design and the planning application based on a chimney

height of 95 m above local ground level. This ES has therefore used a 95 m chimney as the basis for an assessment of the significance of effects.

Summary of Impacts at Sensitive Human Receptors

13.6.12 The dispersion modelling assessment of chimney emissions has predicted the maximum PC for each pollutant included within the scope of the air quality assessment at:

- Selected sensitive human receptors across the air quality study area;
- Locations in close proximity to the Camels Head junction and other major traffic routes near to the proposed site; and
- The location of the highest impact predicted anywhere off-site within the air quality study area.

Impact on Annual Mean NO_2, PM_{10} and $PM_{2.5}$ Concentrations

13.6.13 The largest impacts on long-term pollutant concentrations due to chimney emissions would occur a short distance (400 m) to the north east of the proposed EfW CHP facility chimney, in an area where air quality standards are not at risk of exceedence. The predicted long-term NO_2 PC at the location of maximum impact is 1.8 µg/m^3. This small impact would not give rise to a significant effect at relevant receptors in the area, as baseline air quality would be of a good standard.

13.6.14 Contour plots showing the spatial variation in predicted ground levels impacts on long-term and short-term NO_2 and PM_{10} concentrations can be found in Annex A of Appendix 13.1.

13.6.15 The potential combined impact of chimney emissions and road traffic emissions on annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$, at sensitive receptors in close proximity to the Camels Head junction and other local roads in the area were also predicted. In these areas baseline annual mean concentrations of NO_2 and particulate matter are elevated to concentrations that are higher than those found in locations further from major traffic routes. The predicted change in annual mean NO_2 concentrations, in the year of opening, in the area around Weston Mill Community Primary School and residential properties in the vicinity of the Camels Head junction as a result of the proposed development would be 1.3 µg/m^3 or less. This is around 3% of the AQS and would represent a small change, giving an effect of negligible significance. The maximum predicted change in annual mean PM_{10} and $PM_{2.5}$ concentrations is 0.1 µg/m^3, which is too small to give rise to a significant effect at any receptor.

13.6.16 The impact of chimney emissions at the AQMAs identified within Plymouth City was considered. Only annual mean NO_2 was considered, as this is the pollutant and averaging period which is at risk of being exceeded at the AQMA locations, and therefore for which the AQMAs have been declared. As shown in Figure 5.2 of Appendix 13.1, the area where there is a predicted impact on annual mean NO_2 concentrations of 0.4 µg/m^3 or more is restricted to an area to the north east of the proposed facility, within a maximum distance of approximately 1.8 km from the chimney location. 0.4 µg/m^3 represents 1% of the annual mean objective for NO_2, which is an imperceptible change relative to baseline conditions. Plymouth's three existing AQMAs are situated more than 5 km to the south east of the site and the impact on the nearest AQMAs is therefore predicted to be too small to be capable of giving rise to a significant effect at any relevant receptor.

Impact on Concentrations of All Pollutants

13.6.17 For all pollutants included within the scope of the modelling assessment, the modelled predictions of impacts on air quality due to emissions from the EfW CHP facility chimney are summarised in Table 13.6. The full results of the dispersion modelling are presented in Section 5 of Appendix 13.1.

13.6.18 Table 13.6 shows the predicted change of each pollutant in terms of a percentage relevant air quality standard or guideline, and the overall predicted environmental concentration (PEC), as a percentage of the air quality standard or guideline. The value given is the maximum predicted impact within the air quality study area. The significance of the change in pollutant concentrations is then determined using the matrix detailed in Table 13.4.

13.6.19 As the magnitude of impacts from modern EfW facilities with an appropriate chimney height are associated with a low risk to public health, it is common practice to consider the maximum predicted impacts within the air quality study area. If the maximum impacts demonstrate the required level of performance, then there is minimal additional benefit in discussing the impact of these pollutants at specific receptors at length. For completeness, these values are reported in Annex D of Appendix 13.1 to this ES and should be read with reference to the receptor descriptions in Table 3.5 and Figure 1.1 of the Appendix.

Table 13.6: Summary of Maximum Impact on Concentrations of all Modelled Pollutants

Pollutant	Averaging Period	Predicted Change at Point of Max Impact (% AQ Standard or Guideline)	PEC (% AQ Standard or Guideline)	Significance of Change at Point of Max Impact
Nitrogen Dioxide (NO_2)	Annual Mean	4.5% (small)	43%	Negligible
	99.79th %ile of 1-hour means	5.6% (medium)	21%	Negligible
Particulate Matter (PM_{10})	Annual Mean	0.25% (imperceptible)	34%	Negligible
	90.41st %ile of 24-hour means	0.8% (imperceptible)	41%	Negligible
(Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	0.4% (imperceptible)	35%	Negligible
Sulphur Dioxide (SO_2)	Annual Mean	1.2% (small)	15%	Negligible
	99.9th %ile of 15-min means	3.3% (small)	8%	Negligible
	99.73rd %ile of 1-hour means	2.2% (small)	5%	Negligible
	99.18th %ile of 24-hour means	2.9% (small)	9%	Negligible
VOC, as benzene	Annual Mean	2.6% (small)	9%	Negligible
Carbon Monoxide (CO)	Max daily 8-hour running mean	<0.1% (imperceptible)	3%	Negligible
	Max 1-hour mean	<0.1% (imperceptible)	1%	Negligible
Hydrogen Chloride (HCl)	Max 1-hour mean	0.4% (imperceptible)	0.4%	Negligible
Hydrogen Fluoride (HF)	Max 1-hour mean	0.2% (imperceptible)	1%	Negligible
PAH (as benzo[a] pyrene)	Annual Mean	5.2% (medium)	54%	Negligible
Lead (Pb)	Annual Mean	2.4% (small)	4%	Negligible
Cadmium (Cd)	Annual Mean	12.6% (large)	14%	Slight Adverse
Mercury (Hg)	Annual Mean	0.4% (imperceptible)	<1%	Negligible
	Max 1-hour mean	0.2% (imperceptible)	<1%	Negligible
Antimony (Sb)	Annual Mean	0.2% (imperceptible)	<1%	Negligible
	Max 1-hour mean	0.1% (imperceptible)	<1%	Negligible
Arsenic (As)	Annual Mean	1.3% (small)	15%	Negligible
Total	Annual Mean	<0.1% (imperceptible)	<1%	Negligible

Pollutant	Averaging Period	Predicted Change at Point of Max Impact (% AQ Standard or Guideline)	PEC (% AQ Standard or Guideline)	Significance of Change at Point of Max Impact
Chromium (Cr)	Max 1-hour mean	<0.1% (imperceptible)	<1%	Negligible
Chromium, (VI) oxidation state in PM_{10} fraction	Annual Mean	4.4% (small)	55%	Negligible
Copper (Cu) (dusts and mists)	Annual Mean	0.1% (imperceptible)	<1%	Negligible
	Max 1-hour mean	0.1% (imperceptible)	<1%	Negligible
Manganese (Mn)	Annual Mean	4.0% (small)	5%	Negligible
	Max 1-hour mean	<0.1% (imperceptible)	<1%	Negligible
Nickel (Ni)	Annual Mean	8.5% (medium)	18%	Negligible
Vanadium (V)	Annual Mean	0.2% (imperceptible)	<1%	Negligible
	Max 1-hour mean	14.0% (large)	14%	Slight Adverse
Ammonia (NH_3)	Annual Mean	<0.1% (imperceptible)	<1%	Negligible
	Max 1-hour mean	0.1% (imperceptible)	<1%	Negligible
PCBs	Annual Mean	<0.1% (imperceptible)	1%	Negligible
	Max 1-hour mean	<0.1% (imperceptible)	<1%	Negligible

13.6.20 The results show that, taking existing baseline concentrations into account, the maximum predicted concentrations for each of the modelled pollutants would be well within the respective criteria set for the protection of human health. The emissions would largely result in changes to background concentrations and overall maximum ground level pollutant concentrations that can be considered to give an effect of negligible significance. The only exceptions to this statement are:

- Cadmium, as an annual mean; and
- Vanadium, as a maximum one hour mean.

13.6.21 In the case of Cadmium and Vanadium, the maximum predicted change in ground-level concentrations is classified as large (greater than 10% of the AQ standard or guideline).This is classified within the matrix shown in Table 13.3 as an effect of slight adverse significance even though the predicted environmental concentration is well below the annual mean EU Limit Value for Cadmium and the maximum 1-hour guideline for concentrations of Vanadium. The modelling results are based upon an assumption that each of these metal species are emitted at 100% of the WID limit for Group 3 metals. This is a highly pessimistic approach, and in reality actual emission rates of these pollutants would be well below this level.

13.6.22 The modelling predicts that emissions of dioxins and furans from the facility would result in a maximum change of less than 15% over the existing background concentration. Background concentrations have been found through the baseline monitoring survey to be very low in

comparison with the rest of the UK and a change of this magnitude is not considered to represent a significant effect on local air quality.

13.6.23 There are no air quality standards or guidelines for dioxins and furans to use in the assessment of significance. The predicted impacts of emissions of dioxins and furans on human health, reported in this chapter, are used in the assessment of health and well-being effects considered in Chapter 18 of this ES. The effect of emissions of metals and combustion gases are unlikely to be significant as the combined background concentration and process contribution would result in predicted environmental concentrations that are less than their respective air quality standards or guidelines. The potential impact of exposure to these pollutants at concentrations below the criteria is considered further in Chapter 18: Health and Well-being.

13.6.24 Overall, it is concluded that emissions associated with the operation of the proposed EfW CHP facility would have an overall effect on air quality sensitive receptors of negligible significance.

Summary of Impacts at Sensitive Ecological Receptors

13.6.25 The full results of the dispersion modelling for the sensitive ecological receptors due to acid deposition, nutrient nitrogen deposition, NO_x, SO_2, NH_3 and HF are presented in detail in Tables 5.7 to 5.14 of Appendix 13.1. The assessment results show that the predicted impacts are within the criteria for insignificance at most of the selected receptors.

13.6.26 At some locations within the Plymouth Sound and Estuaries SAC, the PC to annual mean NO_X concentrations is slightly above 1% of the assessment criteria, a threshold used by the Environment Agency to signify an insignificant effect. Taking existing background concentrations into account, however, the overall predicted annual mean concentration remains well within 70% of the critical level at all locations within the modelled domain. Using the H1 criteria, these impacts can therefore be considered to be insignificant.

13.6.27 At Ernesettle CWS, the PC to total acid deposition is predicted to be just above 3% of the critical load, with the PC to nutrient nitrogen deposition predicted to be 2.5% of the lower bound critical load. In both cases, baseline deposition rates are already in excess of the critical load without the contribution made by the proposed facility (100% for acid deposition and 260% for nutrient nitrogen). This would be a small additional contribution to existing levels at this locally designated wildlife site. Taking into account the relative vulnerability of the site, current deposition levels and the site's relative ecological importance the additional contribution is not considered to be significant (see Chapter 7: Ecology for further details).

13.6.28 National Planning Policy Statement 23 (ODPM, 2005) states that "*planning authorities should work on the assumption that the relevant pollution control regime will be properly applied and enforced. They should act to complement but not seek to duplicate it*". Through their roles in the Environmental Permitting process both Natural England and the Environment Agency are able to ensure that the effect of pollutants emitted by the EfW CHP facility are assessed and that appropriate controls are put in place to ensure that sensitive ecological receptors receive the protection afforded to them by legislation.

Assessment of Emissions of Odour

13.6.29 Waste odours are contained within the facility building through the use of a ventilation system to maintain negative pressure under the range of meteorological conditions typically experienced at the site. This virtually eliminates emissions through open doors in all but the

most adverse meteorological conditions, such as during periods of exceptionally high winds, and even then only very minor emissions of odour would occur. Air from the ventilation system is used as feed air to the combustion plant, which ensures destruction of odorous compounds before they are emitted to atmosphere. During normal operations, therefore, odour emissions from the facility building are unlikely to occur.

13.6.30 During periods when the combustion plant is not operating, the air from the ventilation system is passed through the dust and activated carbon filters of the shutdown exhaust system before being emitted to the atmosphere. The results of the modelling of odour emissions from the shutdown exhaust system at times when the main combustion plant is offline show that ground level odour concentrations are predicted to be very small and well within the benchmark level set within Environment Agency guidance for "most offensive" odours. Such odour concentrations are unlikely to be detectable at locations outside the site boundary.

13.7 Additional Mitigation

13.7.1 The main mitigation measures taken to minimise releases of pollutants to atmosphere are incorporated within the design of the proposed scheme, as described in sections 13.4 and 13.5 of this ES chapter. No additional mitigation measures are required to further reduce the impact of the proposed facility on air quality.

13.8 Residual Effects

Residual Effects

13.8.1 Dispersion modelling has been used to quantify the magnitude of the impacts at receptors of emissions from the proposed EfW CHP facility chimney and operational road traffic. The assessment has demonstrated that these impacts represent an overall effect of negligible significance

13.8.2 For European and nationally protected sites (SACs and SSSIs), no significant effects on ecological receptors have been predicted.

13.8.3 Odour emissions from the shutdown exhaust system are unlikely to be detectable at locations outside the site boundary.

13.8.4 The Environmental Permitting regime provides the mechanism by which the controls will be put in place and enforced to ensure that the proposed EfW CHP facility is operated in a manner that would not result in significant effects on local air quality or on sensitive ecological receptors as a result of emissions to atmosphere.

Cumulative Effects

13.8.5 Existing industrial facilities in the area have been accounted for as part of the "baseline" in the adoption of site-specific background pollutant concentrations from archive sources and a programme of project-specific baseline air quality monitoring in close proximity to the facility site. This includes the contribution of emissions from:

- the Langage natural gas fired power station, a major source of combustion emissions located 12 km to the east;

- Weston Mill Crematorium, a potential source of combustion pollutants, mercury compounds and dioxins / furans, 1 km to the east.

13.8.6 Given the distance to the Langage power station site, there is a very low likelihood of significant combined effects on human health due to emissions of oxides of nitrogen from both facilities.

13.8.7 The crematorium is situated around 1 km to the east of the application site and was operational throughout the project specific monitoring survey. Emissions from the process have therefore been accounted for in the use of project specific air quality monitoring data within the assessment. Existing background levels of all pollutants in the survey, including those associated with crematoria, such as mercury and dioxins / furans, have been shown to be well within air quality standards or guideline criteria. Given the small predicted contribution made by the proposed EfW CHP facility to ground level concentrations of such pollutants, and that the areas most affected by emissions from each respective facility are unlikely to coincide, there would be a low risk of significant effects from the cumulative operation of both processes.

13.8.8 15 km to the east of the proposed EfW CHP facility is the site of the proposed New England Quarry Resource Recovery Centre, for which a planning application has been made by Viridor. The distance between the Resource Recovery Centre and EfW CHP facility sites is such that the maximum ground level impacts of the two plants would not co-incide. The risk of cumulative effects is therefore not significant.

13.8.8.1 The steam raised within the proposed EfW CHP facility would be transferred to the Devonport steam system, which would remove the need to operate the steam raising plant during normal operations. For this reason, the contribution to local NO_2 concentrations made by the EfW CHP facility are likely to be partially offset by the reduction in emissions from the existing boiler plant. At times when the EfW CHP plant is offline, there would still be a requirement to have steam available at Devonport. The existing boilers would therefore be kept for this purpose and would not be decommissioned.

13.8.9 The traffic data used for the road traffic impact assessment includes two other developments with the potential to be constructed in the vicinity. An evaluation of the potential combined impact of chimney emissions and road traffic emissions on annual mean NO_2 concentrations demonstrated that there would not be an exceedence of the annual mean criteria for NO_2.

13.9 Conclusions

13.9.1 During the construction phase, residential properties within 100 m of the main construction area may experience an occasional increase in local soiling rates during times when activities are carried out in extremely dry and windy weather. Any such impacts would be restricted to short-term episodes affecting a small number of properties at any one time, and would be of minor significance. These impacts are most likely to take the form of increased soiling of property surfaces and are not normally associated with a general risk to health.

13.9.2 An evaluation of chimney heights has shown that a chimney height of 95 metres is capable of mitigating the short-term and long-term impacts of emissions to an acceptable level, with regard to existing air quality and ambient air quality standards.

13.9.3 The combined impact of emissions to air from the EfW CHP facility chimney and operational traffic would result in an overall effect of negligible significance at air quality sensitive receptors. Taking into account available information on background concentrations within the air quality study area, predicted operational concentrations of the modelled pollutants would be within the assessment criteria for the protection of human health.

13.9.4 Emissions from the proposed EfW CHP facility would not result in a significant effect on annual mean NO_2 concentrations within AQMAs in Plymouth or elsewhere.

13.9.5 No significant effects are predicted on designated ecological sites with regards to direct toxic effects (NO_X, SO_2, NH_3 and HF) and deposition (acid and nutrient nitrogen).

13.10 References

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