MVV Environment Services Ltd

Dundee EfW CHP

Air Quality Assessment

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This air quality assessment is part of a suite of documents submitted to Dundee City Council (DCC) in support of an application for planning permission by MVV Environment Services Limited (MVV) (the Applicant) for the construction and operation of an Energy from Waste Combined Heat and Power Facility (EfW CHP facility) (The Proposed Scheme) on land situated on Forties Road, in the north-east of Dundee (the Application Site).

The proposed EfW CHP facility would replace the existing Dundee Energy Recycling Ltd (DERL) EfW facility on the neighbouring site on Forties Road.

An assessment of likely air quality and odour effects arising as a result of the construction and operation of the Proposed Scheme has been undertaken. A review of current legislation and planning policy, a baseline assessment describing the current air quality conditions in the vicinity of the Proposed Scheme and an assessment of air quality impacts associated with the construction and operation of the scheme have been undertaken.

Air quality effects arising from the following activities have been assessed:

- Construction of the Proposed Scheme;
- Operation of the Proposed Scheme;
- Operation of the Proposed Scheme in combination with other operating developments in the vicinity of the Application Site i.e. cumulative effects.

Emissions from the adjacent Michelin boiler plant would also be significantly reduced as the proposed EfW CHP facility would supply steam to the Michelin factory for most of the year in place of that produced by the existing boilers.

The effect on air quality of emissions from the proposed EfW CHP facility were found to be not significant with respect to human and ecological receptors. For some limit or EAL values the EFW CHP facility would have a beneficial effect compared with the current DERL facility, despite the worst case assumption carried out using IED maximum emission limit values.

A human health risk assessment investigated the impact of dioxins, furans, trace metals and dioxin-like PCBs on human health. It demonstrated that the maximally exposed individual would not be subject to a significant carcinogenic risk or non-carcinogenic hazard, arising from exposures via both inhalation and the ingestion of foods.

The impact of the EfW CHP facility on odour nuisance was also found to be not significant.

1 Introduction

This air quality assessment is part of a suite of documents submitted to Dundee City Council (DCC) in support of an application for planning permission by MVV Environment Services Limited (MVV) (the Applicant) for the construction and operation of an Energy from Waste Combined Heat and Power Facility (EfW CHP facility) (The Proposed Scheme) on land situated on Forties Road, in the north-east of Dundee (the Application Site).

The proposed EfW CHP facility would replace the existing Dundee Energy Recycling Ltd (DERL) EfW facility on the neighbouring site on Forties Road.

Air quality effects arising from the following activities have been assessed:

- Construction of the Proposed Scheme;
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- Operation of the Proposed Scheme in combination with other operating developments in the vicinity of the Application Site i.e. cumulative effects.

Emissions from the adjacent Michelin boiler plant would also be significantly reduced as the proposed EfW CHP facility would supply steam to the Michelin factory for most of the year in place of that produced by the existing boilers.

Decommissioning of the existing DERL EfW facility will be subject to a separate planning application and has not been considered further in this assessment.

1.1 Scope of Assessment

Air quality studies are concerned with the presence of airborne pollutants in the atmosphere. This assessment outlines relevant air quality management policy and legislation, describes the existing air quality conditions in the vicinity of the Application Site, outlines the nature of the Proposed Scheme and addresses any air quality issues associated with its construction and operation. Mitigation measures are also proposed where necessary which would be implemented to reduce the likely effect of the proposals on air quality, as far as practicable.

For construction impacts, the assessment examines the potential emissions of dust and particulate matter from construction activities and exhaust emissions generated by plant and traffic associated with the Proposed Scheme. For operational impacts, the assessment looks at the potential emissions from the proposed EfW CHP facility. The proposed EfW CHP facility has also been assessed cumulatively with emissions from boilers at the adjacent Michelin factory and during ‘hot commissioning’ with oil of the proposed EfW CHP facility combined with emissions from the existing DERL plant.

It should be noted that the proposed EfW CHP facility and the existing DERL plant will not burn waste simultaneously.

1.2 Location of the Proposed Scheme

The Proposed Scheme is located approximately 5km north-east of Dundee city centre, on land situated on Forties Road. The centre of the site is approximately at national grid reference (NGR) 344576,732863. A map showing the location of the Proposed Scheme is given in Figure 1.

Land to the north of the Application Site is primarily residential in nature, with some associated green open space. Land to the east is predominantly industrial, with the Michelin Tyre Factory adjacent to the boundary. Land to the south is industrial and residential in nature, with a car-breakers yard located immediately adjacent to the Application Site, beyond which the land-use is primarily residential. Land immediately to the west of the Application Site is a mixture of grassland, scrub and a few industrial units to the north-west.

The Application Site comprises the existing waste management site known as the DERL EfW facility (Area E), the existing Authority Transfer Station (ATS) (Area C), the land immediately to the south of the existing DERL facility which will be used to site the proposed EfW CHP facility (Area A), a plot of land to the south-west of the existing waste management site on the south side of the Dighty Water (Area B), and land that would be required temporarily for use as a construction compound and for contractor parking (Area D). These areas are shown as the operational boundaries in Figure 2.

Figure 1: Site location

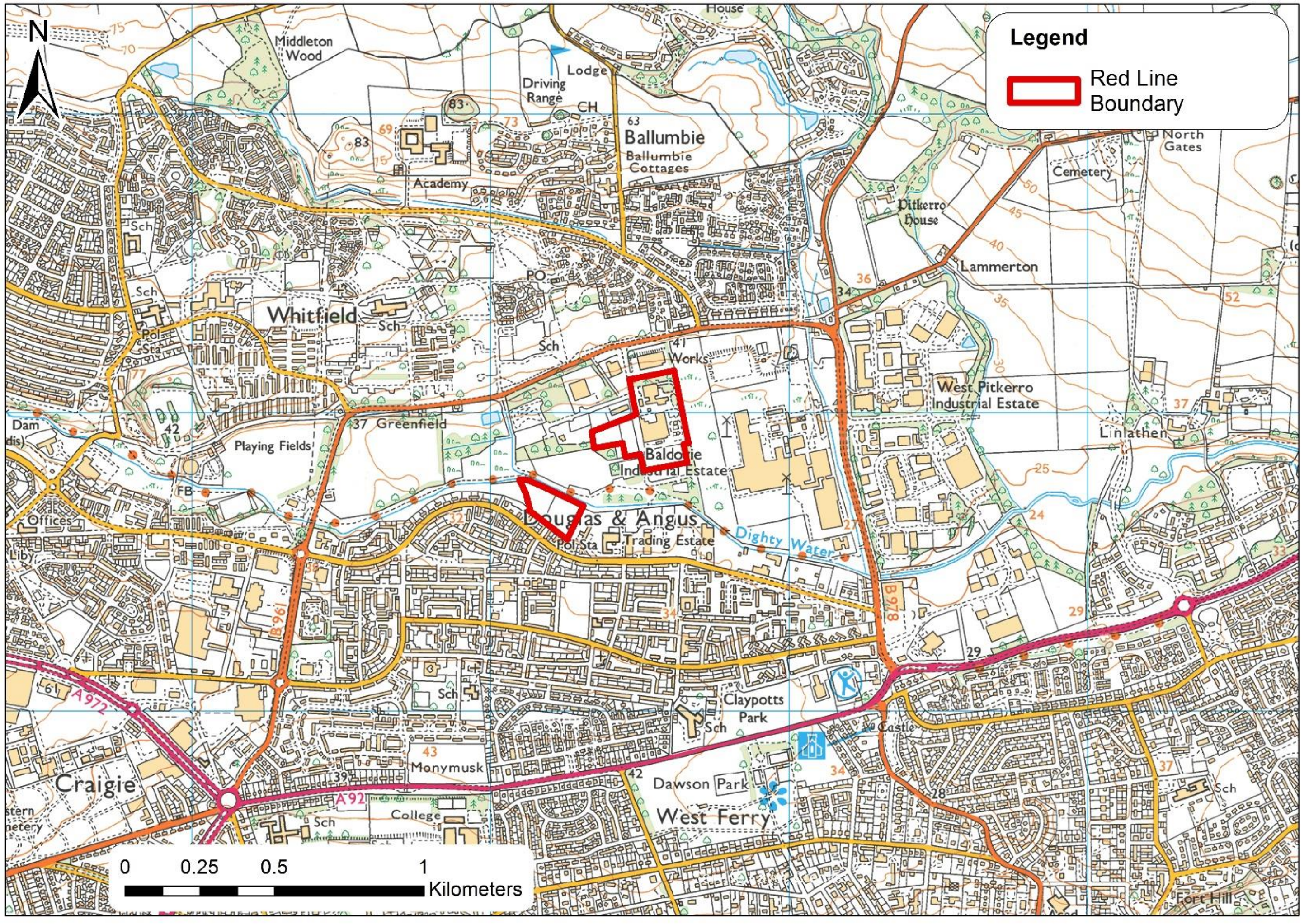
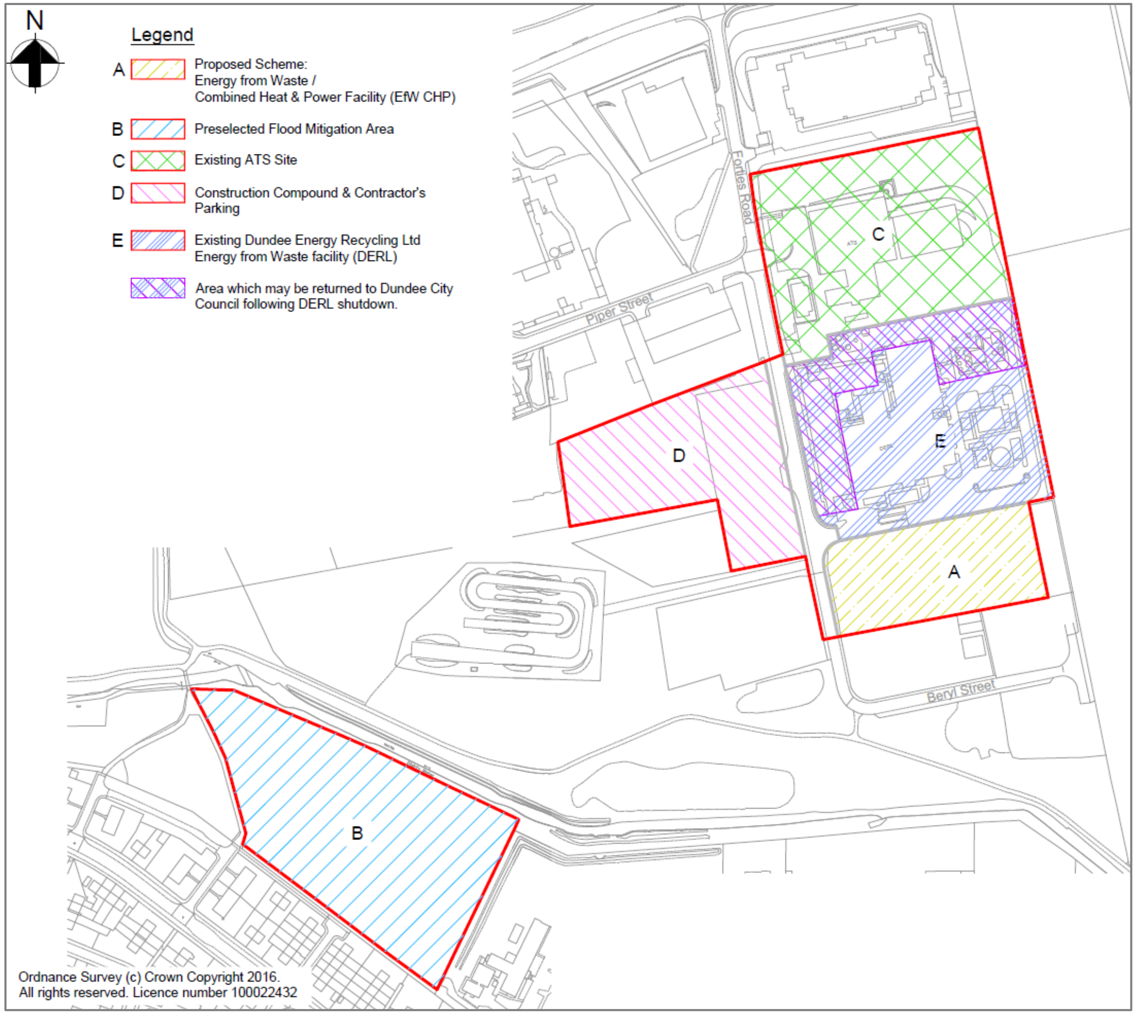


Figure 2: Planning application and operational boundaries plan



2 Air Quality Legislation

2.1 European Air Quality Management

In 1996 the European Commission published the Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC)[1]. This Directive defined the policy framework for 12 air pollutants known to have harmful effects on human health and the environment. Limit values (pollutant concentrations not to be exceeded by a certain date) for each specified pollutant are set through a series of Daughter Directives, including Directive 1999/30/EC (the 1st Daughter Directive)[2] which sets limit values for sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and oxides of nitrogen (NOx), particulate matter (PM_{10}) and lead in ambient air.

In May 2008 the Directive 2008/50/EC[3] on ambient air quality and cleaner air for Europe came into force. This Directive consolidates the above and provides a new regulatory framework for $PM_{2.5}$

The Directive was transposed into legislation in Scotland by the Air Quality Standards (Scotland) Regulations 2010[4]. The Scottish Ministers have the duty of ensuring compliance with the air quality limit values.

2.1.1 Environment (Scotland) Act 1995

Part IV of the Environment (Scotland) Act 1995[5] places a duty on the Scottish Ministers to develop, implement and maintain an Air Quality Strategy with the aim of reducing atmospheric emissions and improving air quality. The Air Quality Strategy[6] for England, Scotland, Wales and Northern Ireland provides the national air quality objectives and a framework for ensuring compliance with these values based on a combination of international, national and local measures to reduce emissions and improve air quality. This includes the statutory duty for local authorities to undergo a process of local air quality management and declare Air Quality Management Areas (AQMAs) where pollutant concentrations exceed the national air quality objectives. Where an AQMA is declared, the local authority needs to produce an Air Quality Action Plan (AQAP) which outlines the strategy for improving air quality in these areas.

[1] Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management
[2] Directive 1999/30/EC of 22 April 1999relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air
[3] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
[4] Scottish Statutory Instrument 2010 No.204, Environmental Protection, The Air Quality Standards (Scotland) Regulations 2010, 11 June 2010
[5] Environment Act 1995, Chapter 25, Part IV Air Quality
[6] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Volume 1, July 2007

2.2 Air Quality Objectives and Limit Values

Air quality limit values and objectives are quality standards for clean air. Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment (i.e. effects occur (long-term) after a prolonged period of exposure to elevated concentrations) and others have standards expressed as 24-hour, 1-hour or 15-minute average concentrations (short-term) due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations. Table 1 sets out the air quality objectives for Scotland, for the pollutants relevant to this study.

The standards apply at either human or ecological receptor locations. The standards which apply at human receptor locations apply where people will be exposed to a pollutant for a period relevant to the standard such as at residential locations, hospitals and schools for annual mean values. Standards which apply to ecological receptors apply at sensitive designated ecological sites.

The limit values and objectives have been used to assess the impact of the proposed EfW CHP facility. It is assumed that 100% of the Volatile Organic Compounds (VOCs) emitted by the EfW CHP facility will be benzene (C_6H_6), which represents an extreme worst case assessment.

Table 1: Air quality standards and guidelines for Scotland

Pollutant	Averaging period	Limit value/objective	Date for compliance
Nitrogen dioxide (NO_2)	1-hour mean	200µg/m^3 not to be exceeded more than 18 times a year	31 December 2005
	Annual mean	40µg/m^3	31 December 2005
Oxides of nitrogen (NOx)	Annual mean	30µg/m^3 (for protection of vegetation & ecosystems)	31 December 2000
Carbon Monoxide (CO)	Running 8-hour mean	10mg/m^3	31 December 2003
Volatile Organic Compounds (VOCs): Benzene (C_6H_6)	Annual mean	3.25µg/m^3	31 December 2010
Sulphur dioxide (SO_2)	15-minute mean	266µg/m^3 not to be exceeded more than 35 times a year	31 December 2005
	1-hour mean	350µg/m^3	31 December 2004

Pollutant	Averaging period	Limit value/objective	Date for compliance
		not to be exceeded more than 24 times a year	
	24-hour mean	125µg/m^3 not to be exceeded more than 3 times a year	31 December 2004
	Annual mean	20µg/m^3 (for protection of vegetation & ecosystems)	31 December 2000
Fine particulates (PM_{10})	24-hour mean	50µg/m^3 not to be exceeded more than 7 times a year	31 December 2010
	Annual mean	18µg/m^3	31 December 2010
Very fine particulates ($PM_{2.5}$)	Annual mean	10µg/m^3	2020
PAH (benzo[a]pyrene)	Annual mean	0.25ng/m^3	31 December 2010
Lead (Pb)	Annual mean	0.25µg/m^3	31 December 2008
Arsenic (As)	Annual mean	6ng/m^3	31 December 2012
Cadmium (Cd)	Annual mean	5ng/m^3	31 December 2012
Nickel (Ni)	Annual mean	20ng/m^3	31 December 2012

For other pollutants which will be emitted by the Proposed Scheme and regulated under the Industrial Emission Directive, there are no air quality objectives. For these pollutants assessment criteria in the form of Environmental Assessment Levels (EALs) provided by SEPA[26], the EA[27], and the Health and Safety Executive[7], has been used as the latest guidance in the UK. Of the trace metals emitted, there are European limit values for Pb, As, Cd and Ni and for other trace metals EALs are provided. A summary of the appropriate EALs considered for short-term (hourly mean) and long-term (annual mean) averaging periods, for all pollutants not included in Table 1, are presented in Table 2.

The air quality objectives and limit values as set out in Table 1 and Table 2 are the air quality standards used within this assessment for human health and the protection of vegetation and ecosystems. Where there is more than one standard, the most stringent has been used.

[7] Health and Safety Executive (2011) EH40/2005 Workplace exposure limits (Second edition, published 2011)

Table 2: Environmental assessment levels (EALs)

Pollutant	Averaging period	Value (µg/m^3)	Source
Ammonia (NH_3)	Annual mean	180	EA
	1-hour mean	2,500	EA
Antimony (Sb)	Annual mean	5	EA
	1-hour mean	150	EA
Arsenic (As)	Annual mean	0.003	EA
	Annual mean	0.006	UK/EU target
Benzene (C_6H_6)	1-hour mean	195	EA
Carbon monoxide (CO)	1-hour mean	30,000	EA
Chromium, Chromium (II) and Chromium (II) compounds (as Cr)	Annual mean	5	EA
	1-hour mean	150	EA
Chromium (VI) oxidation state in the PM_{10} fraction	Annual mean	0.0002	EA
Cobalt (Co)	Annual mean	100	Derived from HSE EH40
Copper (Cu)	Annual mean	10	EA
	1-hour mean	200	EA
Hydrogen chloride (HCl)	1-hour mean	750	EA
Hydrogen fluoride (HF)	Monthly mean	16	EA
	1-hour mean	160	EA
Manganese (Mn)	Annual mean	0.15	EA
	1-hour mean	1,500	EA
Mercury (Hg)	Annual mean	0.25	EA
	1-hour mean	7.5	EA
Polychlorinated biphenyls (PCBs)	Annual mean	0.2	EA
	1-hour mean	6	EA
Thallium (Tl)	Annual mean	100	Derived from HSE EH40
Vanadium (V)	Annual mean	5	EA
	1-hour mean	1	EA

There are no air quality strategy objectives, European limit values or EALs for dioxins (polychlorinated dibenzo-p-dioxins, PCDDs) or furans (polychlorinated dibenzofurans, PCDFs). Dioxins, furans, dioxin-like PCBs and trace metals have been assessed further in a human health risk assessment (HHRA, Appendix G). This uses the predicted ambient air concentrations of these pollutants to estimate the maximum possible additional dose (resulting from the proposed EfW CHP) of these substances, for a variety of humans (e.g. adult, child, resident, farmer) via inhalation and ingestion, and considers the carcinogenic and non-carcinogenic health impact of these doses.

2.3 Industrial Emissions Directive

The Industrial Emissions Directive (IED) (2010/75 /EU)[8], brought seven separate directives including the Waste Incineration Directive (WID) into a single directive. The IED was transposed into national legislation by The Pollution Prevention & Control (Scotland) Regulations 2012. The legislation contains the ELVs applicable to the proposed EfW CHP Facility as set out in Table 3. The ELVs are the maximum concentrations the Proposed Scheme can emit. In reality the emissions would be below the ELVs. SEPA is responsible for permitting operations that fall under the IED.

Operational air quality from the proposed EfW CHP facility based on emissions at IED ELVs has been assessed as part of the permit submitted to SEPA.

Table 3: IED ELVs (mg/Nm^3)

Substance	Daily mean[a]	30 minute mean[a]	
		100th percentile	97th percentile
Particles	10	30	10
Nitrogen dioxide (NO_2)	200	400	200
Sulphur dioxide (SO_2)	50	200	50
Carbon monoxide (CO)	50	100 [b]	150 [c]
Hydrogen fluoride (HF)	1	4	2
Hydrogen chloride (HCl)	10	60	10
Total Organic Carbon (TOC)	10	20	10
Group I metals - Cd and Tl [d]	0.05		
Group II metals - Hg [d]	0.05		
Group III metals - Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V [d]	0.5		
Dioxins and Furans [e]	0.1 ng I-TEQ m^3		

(a) Units are in mg/Nm^3 (273K, 0% water, and 11% (dry) O_2) unless otherwise stated
(b) 100th percentile of half hourly average concentrations in any 24 hour period
(c) 95th percentile of 10-minute mean CO concentration
(d) Average over a sample period between 30 minutes and 8 hours
(e) Average over a sampling period of 6 to 8 hours

2.4 Dust Nuisance

Dust is the generic term used in the British Standard document BS 6069 (Part Two) to describe particulate matter in the size range 1–75µm in diameter. Dust

[8] Directive 2010/75/EU of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

nuisance is the result of the perception of the soiling of surfaces by excessive rates of dust deposition. Under the Environmental Protection Act 1990[9], dust nuisance is defined as a statutory nuisance.

There are currently no standards or guidelines for dust nuisance in the UK, nor are formal dust deposition standards specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance. In law, complaints about excessive dust deposition would have to be investigated by the local authority and any complaint upheld (by reference to the relevant tests set out in the Environmental Protection Act 1990) for a statutory nuisance to occur. Dust deposition is generally managed by suitable on-site practices and mitigation rather than by the determination of statutory nuisance and/or prosecution or enforcement notice(s).

2.5 Non-Road Mobile Machinery Regulations and Guidance

The Non-Road Mobile Machinery (NRMM) (Emission of Gaseous and Particulate Pollutants) (Amended) Regulations 2014 (SI 2014/1309)[10], which implement EU Directive 2012/46/EU[11], requires that NRMM engines meet certain emissions standards for different engine types. It also aims to reduce emissions from NRMM through the fitting of devices to engines, to help meet the Stage IV emissions standard, where applicable.

2.6 Ecological Legislation

European Council Directive 92/43/EEC[12] (Habitats Directive) requires member states to introduce a range of measures for the protection of habitats and species. The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland)[13] transposes the Directive into law in Scotland.

The Habitats Directive requires the competent authority to firstly evaluate whether the Proposed Scheme is likely to give rise to a significant effect on the European site (Habitats Regulation Assessment screening). Where this is the case, it has to carry out an ‘appropriate assessment’ in order to determine whether the Project would adversely affect the integrity of the European site.

There are specific objective pollutant concentrations for vegetation called ‘critical levels’, which are shown in Table 4. These are concentrations below which

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[9] Environmental Protection Act 1990, Chapter 43, Part III Statutory Nuisances and Clean Air
[10] Non-Road Mobile Machinery (Emission of Gaseous and Particulate Pollutants) (Amendment) Regulations 2014, SI 2014/1309
[11] COMMISSION DIRECTIVE 2012/46/EU of 6 December 2012 amending Directive 97/68/EC of the European Parliament and of the Council on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery
[12] European Council Directive (92/43/EEC) of 21 May 1992, on the conservation of natural habitats and of wild fauna and flora
[13] The Conservation (Natural Habitats, &c.) Regulations (as amended in Scotland) 1994 No. 2716

harmful effects are unlikely to occur. The limit value applies to locations more than 20km from towns with more than 250,000 inhabitants or more than 5km from other built-up areas, industrial installations or motorways. However, the SEPA H1 guidance states that “the critical levels should be applied at all locations as a matter of policy, as they represent a standard against which to judge ecological harm”.

There are also critical loads for habitats which are defined as: "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge". The critical loads used in this assessment are those for nutrient nitrogen deposition and acid deposition and are detailed in Appendix E.

The critical loads are set as ranges, reflecting the uncertainty in the present scientific knowledge and evidence-base on the effects of air pollution on sensitive species. If the upper limit critical load is being exceeded, it is likely that there is harm to the relevant habitat/features arising from the current level of nitrogen deposition. If the deposition level is below the lower limit critical load, it is unlikely that the feature/habitat is being harmed. If the deposition level lies between the lower and upper critical load values, it is not possible to be certain that harmful effects are, or are not, occurring.

The relevant CLFs for this study have been derived from the most up-to-date information on the APIS website[14].

The objectives within the legislation are used to assess the potential impacts upon any sensitive ecosystems.

Table 4: Critical levels for the protection of ecosystems

Pollutant	Averaging period	Standard
Nitrogen oxides (expressed as NO_2)	Annual mean	30µg/m^3
	Daily mean	75µg/m^3
SO_2 for ecosystems where lichens and bryophytes are present	Annual mean	10µg/m^3
SO_2 for all other ecosystems	Annual mean	20µg/m^3
NH_3 for ecosystems where lichens and bryophytes are present	Annual mean	1µg/m^3
NH_3 for all other ecosystems	Annual mean	3µg/m^3
HF	Weekly mean	0.5µg/m^3
	Daily mean	5µg/m^3

[14] APIS (Air Pollution Information System) www.apis.ac.uk, accessed January 2017

3 Planning Policy and Guidance

The land-use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality consideration that relates to land-use and its development can be a material planning consideration in the determination of planning applications, dependent upon the details of the Proposed Scheme.

3.1 National Planning Framework

The third National Planning Framework[15] was published by the Scottish Government in June 2014. This framework sets out a strategy for long term development in Scotland for the next 20-30 years. The main focus of the framework is supporting economic growth and the transition to a low carbon economy and needs to be considered at all strategic and local development plans.

In relation to air quality, the framework states:

> *"Reducing the impact of the car on city and town centres will make a significant contribution to realising their potential as sustainable places to live and invest by addressing congestion, air pollution and noise and improving the public realm."*

3.2 Scottish Planning Policy

The Scottish Planning Policy[16] (SPP) is a statement of the Scottish Government policy on land use planning and provides the Scottish Government's vision on the purpose of land-use planning and desired outcomes. The SPP provides core principles on the operation of the planning system with objectives, statutory guidance on sustainable development, and categorised planning policies for development planning and development management.

3.3 Scotland's Local Air Quality Management Policy and Technical Guidance

Scotland's Local Air Quality Management Policy Guidance[17] provides guidance on the links between air quality and the land-use planning system. The guidance advises that air quality considerations should be integrated into the planning process at the earliest stage, and is intended to aid local authorities in developing action plans to deal with specific air quality problems and create strategies to improve air quality generally. It summarises the main ways in which land-use planning system can help deliver air quality objectives.

[15] The Scottish Government (2014); National Planning Framework for Scotland 3
[16] The Scottish Government (2014); Scottish Planning Policy
[17] The Scottish Government (2016); Local Air Quality Management Policy Guidance PG(S)(16)

Scotland's Local Air Quality Management Technical guidance[18] is designed to support local authorities in carrying out their duties under the Environment Act (1995). This includes various methodologies including model verification, which are appropriate for use in air quality assessments. Where technical guidance is relevant to the assessment, this has been included and used.

3.4 Cleaner Air for Scotland

Cleaner Air for Scotland[19] is a national strategy which links up the various contributing factors and responsible bodies, to encourage them to work together towards the common aim of achieving the best possible air quality for Scotland. Future updates and revisions to Scottish Planning Policy and the National Planning Framework, the Local Development Plans of local authorities and their air quality action plans should take "Cleaner Air for Scotland" into account.

3.5 Local Policy and Guidance

The Dundee Local Development Plan[20] was adopted by Dundee City Council (DCC) in December 2013 and provides a land use strategy that will guide development across Dundee up to 2024 and beyond.

The following policy was identified in relation to air quality and is relevant to this assessment.

"Policy 44: Air Quality

There is a general presumption against development proposals that could significantly increase air pollution or introduce people into areas of elevated pollution concentrations unless mitigation measures are adopted to reduce the impact to levels acceptable to the Council."

Additional guidance related to air quality assessments has been prepared by DCC, which is contained in the Supplementary Guidance document: Air Quality and Land Use Planning[21], and the associated technical guide[22].

The policy and guidance have been considered throughout this assessment.

3.6 Consultation

Following appointment, consultation was undertaken with DCC Environmental Health Section to confirm approval of the air quality scope. This was agreed via email and telephone communication throughout November/December 2016.

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[18] The Scottish Government (2016); Local Air Quality Management Technical Guidance TG(S)(16)

[19] The Scottish Government (2015) Cleaner Air For Scotland The Road To A Healthier Future, November 2015. Accessed at http://www.gov.scot/Resource/0048/00488493.pdf

[20] Dundee City Council (2014) Dundee Local Development Plan

[21] Dundee City Council (2014 assumed) Dundee Local Development Plan Supplementary Guidance: Air Quality and Land Use Planning

[22] Dundee City Council (2014 assumed) Air Quality and Land Use Planning SG: Technical Guide

3.7 Other Relevant Policy and Guidance

3.7.1 Institute of Air Quality Management Guidance (2014)

The Institute of Air Quality Management (IAQM) guidance on construction dust[23] was produced in consultation with industry specialists and gives guidance to development consultants and environmental health officers on how to assess air quality impacts from construction. The IAQM guidance provides a method for classifying the significance of effects from construction activities based on 'dust magnitude' (high, medium or low) and the sensitivity of the area based on the sensitivity of receptors and PM_{10} concentrations[24] in the area. The guidance recommends that once the significance of effect from construction is identified, the appropriate mitigation measures are implemented.

3.7.2 Environmental Protection UK/ Institute of Air Quality Management Guidance (2015)

The 2015 Land-Use Planning & Development Control guidance document[25] produced by Environmental Protection UK (EPUK) and the IAQM provides a framework for consideration of air quality within the planning system to provide a means of reaching sound decisions, having regard to the air quality implications of development proposals. The document provides guidance on when air quality assessments are required by providing screening criteria regarding the size of a development, changes to traffic flows/composition energy facilities or combustion processes associated with the Proposed Scheme.

3.7.3 Integrated Pollution Prevention and Control (IPPC) Horizontal Guidance Note H1

The IPPC H1 guidance[26] was produced by the Environment Agency (EA) for England and Wales in collaboration with the SEPA and the Northern Ireland Environment and Heritage Service (EHS). The IPPC is a regulatory system that employs an integrated approach to control the environmental impacts of certain industrial activities. The purpose of H1 guidance note is to provide supplementary information relevant to all sectors, for the appraisal of Best Available Techniques (BAT) and to carry out an appropriate environmental assessment of the overall impact of the emissions resulting from a proposed installation.

More recently the EA has revised the H1 guidance and has developed a web based version[27], with the latest revision date being August 2016. The SEPA H1 has been

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[23] IAQM (2014) Guidance on the Assessment of Dust from Demolition and Construction
[24] The guidance does not explicitly consider $PM_{2.5}$ concentrations but $PM_{2.5}$ is a major constituent of PM_{10}.
[25] IAQM and EPUK (2015). Land-use planning and development control: Planning for air quality
[26] IPPC H1 (2003) Environmental Assessment and Appraisal of BAT
[27] EA (2016) Air emissions risk assessment for your environmental permit
Available at: [https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit]

followed in the assessment, and where applicable, reference is also made to the EA air emissions risk assessment guidance.

3.8 Odour

Odour is perceived due to a single substance or a mixture of volatile chemical compounds triggering a reaction in the olfactory organ at very low concentrations. Any odour, whether pleasant or unpleasant, can result in a loss of amenity for nearby residents. If the odour is perceived for a sufficiently frequent time above a threshold level, then it can give rise to statutory nuisance. Odour can therefore be an important issue in planning, when proposals are submitted for potentially odorous developments located near sensitive receptors and vice versa.

There is no statutory limit in Scotland for ambient odour concentrations, for either single or a mix of compounds.

3.8.1 SEPA H4 Guidance

The Horizontal Guidance for Odour (H4) was produced by the EA in collaboration with SEPA. The guidance aims to bring consistency to the overall approach to the regulation of odorous emissions, and outlines the main considerations relating to the permitting and regulation of odour-generating activities. The second part of the guidance relates to odour assessment and control and describes a range of odour impact assessment methodologies, gives guidance on the collection of odour samples using analytical and sensory techniques, the control of odour by design, operational and management techniques and outlines the range of "end-of-pipe" odour abatement technologies available.

3.8.2 IAQM Odour Guidance

The IAQM produced guidance in 2014[28] with the specific intention to provide advice for "assessing odour impacts for planning purposes". It recommends various assessment techniques including the use of a Source-Pathway-Receptor model in which the risk of an adverse odour impact is determined by examining the source characteristics, how effectively the odours can travel from the Source to a receptor (i.e. the Pathway) and examining the sensitivity of the Receptor.

[28] IAQM, Guidance on the assessment of odour for planning, May 2014

4 Methodology

The overall approach to the air quality assessment comprised:

- A review of the existing air quality conditions at, and in the vicinity of, the Proposed Scheme;
- An assessment of the potential changes in air quality arising from the construction of the Proposed Scheme;
- An assessment of the potential changes in air quality and odour arising from the operation of the Proposed Scheme;
- Formulation of mitigation measures, where appropriate, to ensure any adverse effects on air quality or odour are minimised, eliminated or maintained at acceptable levels; and
- An assessment of cumulative effects of the EfW CHP facility with the DERL facility and the Michelin boilers.

4.1 Method of Baseline Assessment

Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment. These are present from various sources, such as industrial processes, commercial and domestic activities, traffic and natural sources.

The baseline assessment has considered background air pollutant concentrations from sources including:

- Local authority review and assessment reports and local air quality monitoring data[29];
- Project-specific air quality monitoring carried out by Arup;
- Defra UK Air Information Resource website[30] for details on air quality monitoring and AQMAs;
- Ammonia, Acid Gases and Aerosols, and Heavy Metals Monitoring Networks for the UK[31]; and
- Air Quality Scotland website[32] for local authority background data, and predicted background pollutant concentrations.

4.1.1 Pollutants Assessed

The review of existing air quality conditions considered background data from relevant monitoring studies carried out as part of the local air quality management regime, and data from national monitoring studies, for the following pollutants:

- Nitrogen oxides (NOx) and nitrogen dioxide (NO_2);
- Carbon monoxide (CO);

[29] Dundee City Council (2016) https://www.dundeecity.gov.uk/air-quality
[30] Defra (2016) https://uk-air.defra.gov.uk/data/
[31] Defra (2016) https://uk-air.defra.gov.uk/networks/network-info?view=metals
[32] Air quality in Scotland (2016) http://www.scottishairquality.co.uk/

- Total organic carbons (TOC) as benzene;
- Sulphur dioxide (SO_2);
- Fine particulate matter (PM_{10} and $PM_{2.5}$);
- Hydrogen fluoride (HF) and Hydrogen chloride (HCl);
- Ammonia (NH_3);
- Dioxins and furans;
- Polychlorinated biphenyls (PCB), and Polycyclic aromatic hydrocarbons (PAHs) as benzo(a)pyrene; and
- Trace metals: lead (Pb), arsenic (As), cadmium (Cd), nickel (Ni), thallium (Ti), mercury (Hg), antimony (Sb), chromium (Cr and CrVI), cobalt (Co), copper (Cu), manganese (Mn) and vanadium (V).

4.2 Method of Construction Assessment

4.2.1 Construction Dust Assessment

The construction dust assessment considers the construction of the proposed EfW CHP facility.

The relevant aspects include the potential to generate dust from earthworks, track out (HGVs carrying site materials/mud off-site)construction, and emissions from construction equipment and vehicles.

The construction effects have been assessed using a qualitative approach based on latest guidance from the IAQM[23]. The guidance methodology, which is given in detail in Appendix B, and provides the basis for the determination of significance for the construction dust assessment. It is considered that where the overall construction dust significance is deemed to be medium or high risk, the overall construction dust impacts of the Proposed Scheme would be significant.

For the construction assessment, works have been assumed to occur across the whole Application Site. This is a precautionary assumption as it assumes dust emissions can occur across the whole site. Taking this precautionary approach ensures any mitigation identified would be sufficient to effectively manage any potential dust emissions. The construction dust assessment methodology and assessment are given in Appendix B.

4.2.2 Construction Traffic Assessment

The development has the potential to impact existing air quality as a result of road traffic exhaust emissions, such as NO_2, PM_{10} and $PM_{2.5}$, associated with construction vehicles travelling to and from the Application Site during the construction phase. A screening assessment was therefore undertaken using the criteria contained within the EPUK/IAQM land-use guidance document[25] to determine the potential local air quality effects associated with construction vehicles.

As the Proposed Scheme lies in an AQMA, the EPUK/IAQM guidance document states the following criteria to help establish when a quantitative assessment of air quality is likely to be considered necessary:

- A change of Light Duty Vehicle flows of more than 100 Annual Average Daily Traffic (AADT) movements; and
- A change of Heavy Duty Vehicle flows of more than 25 AADT movements;

This screening assessment showed that Forties Road, Drumgeith Road and Baldovie Road are predicted to experience an increase of more than 25 HGV AADT movements and, with exception of Baldovie Road, an increase of more than 100 light goods vehicle (LGV) movements during the construction phase only. An assessment of traffic emissions has therefore been undertaken using the latest ADMS-Roads (version 4.0.1.0) atmospheric dispersion model.

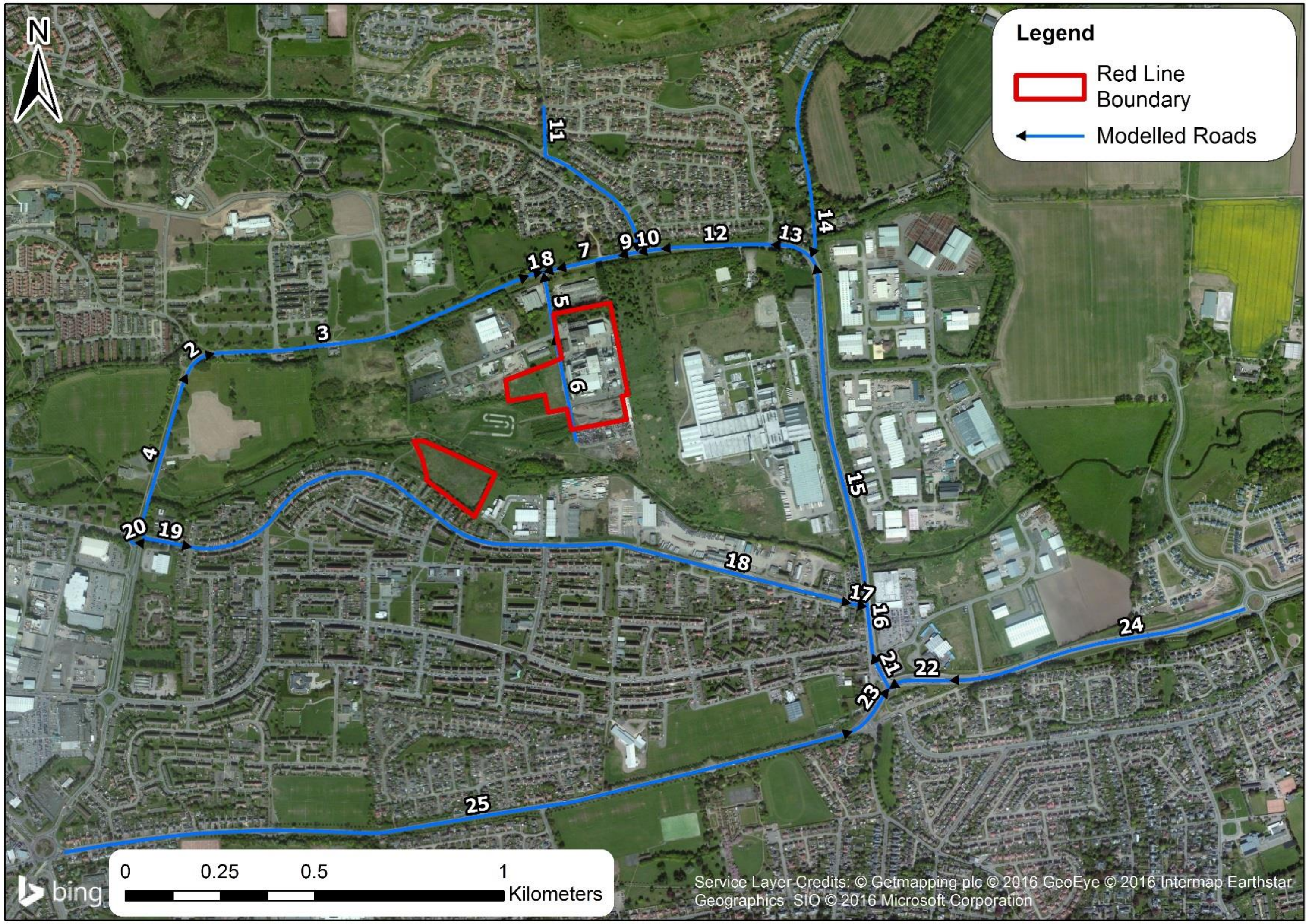
Transport data for the existing situation (assumed to be representative of 2015, the year used for model verification against air quality monitoring data) and the construction phase scenario were provided by the Arup transport planning team. The traffic data used in the assessment of air quality effects is shown in Appendix C. Emission rates for all road sources were calculated using Defra's Emissions Factor Toolkit v7.0[33]. Speeds were reduced close to junctions following Defra's Local Air Quality Management Technical Guidance (LAQM.TG16)[34], in which the speed at the junctions is assumed to be 20kph. The roads included in the model are shown in Figure 3.

The assessment has been undertaken for the discrete receptors given in section 4.3.1. Emissions from traffic affect locations within 200m of roads and therefore no assessment of traffic impacts is required across the gridded output domain discussed in section 4.3.1. The dispersion model set-up and meteorological data used for the assessment of construction traffic impacts is the same as that used in the assessment of operational effects.

[33] Defra Emissions Factors Toolkit. Accessed: http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

[34] Defra, 2016. Local Air Quality Management Technical Guidance (TG16). Accessed: http://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf .

Figure 3: Modelled road network



4.2.3 Model Verification

Model verification refers to the comparison of modelled and measured pollutant concentrations at the same location(s) to determine the performance of the model. This has been possible as scheme specific monitoring has been undertaken by Arup to help establish baseline conditions in the area of the Proposed Scheme. Should the model results for annual mean NO_2 concentrations be largely within ±25% of the measured values and there is no systematic over or under-prediction of concentrations, the LAQM.TG16 guidance advises that no adjustment is necessary. If this is not the case, then the modelled values are adjusted based on the observed relationship between modelled and measured NO_x concentrations due to road traffic to provide a better agreement.

Modelled results may not compare as well at some locations for a number of reasons, including:

- Errors/uncertainties in model input data (e.g. traffic flow and speed data estimates);
- Model setup (including street canyons, road widths, location of monitoring sites);
- Model limitations (treatment of surface roughness and meteorological data);
- Uncertainty in monitoring data, notably diffusion tubes (e.g. bias adjustment factors and annualisation of short-term data); and
- Uncertainty in emissions and emission factors.

These factors were investigated as part of the model verification process to minimise the uncertainties as far as practicable.

4.2.4 NO_x to NO_2 Conversion – Road Traffic Emissions

The model predicts roadside NO_x concentrations, which comprise principally nitric oxide (NO) and primary NO_2 (i.e. NO_2 that is emitted directly from the vehicle exhaust). The emitted NO reacts with oxidants in the air (mainly ozone) to form more NO_2 (known as secondary NO_2). Since only NO_2 has been associated with effects on human health, the air quality standards for the protection of human health are based on NO_2 rather than NO_x or NO. Thus, a suitable NO_x to NO_2 conversion needs to be applied to the modelled NO_x concentrations.

LAQM.TG16 details an approach for calculating the roadside conversion of NO_x to NO_2, which takes into account the difference between ambient NO_x concentrations with and without the development, the concentration of ozone and the different proportions of primary NO_2 emissions in different years. This approach is available as a spreadsheet calculator, with the most up to date version having been released in June 2016 (v5.1)[35].

[35] Defra, 2016. NO_x to NO_2 calculator. http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

4.2.5 Assessment of Impacts and Significance of Effects

The IAQM and EPUK guidance[36] for undertaking air quality assessments within the planning system provides a framework for professionals operating within the planning system to provide a means of reaching sound decisions, having regard to the air quality implications of development proposals.

It should be noted that strictly this guidance only applies to the planning system in England and Wales. Meanwhile, the document states that the general principles of air quality assessment set out within this guidance document are applicable in all parts of the UK and is considered to be applicable for use in Scotland.

The guidance provides an approach to determining the impacts on local air quality at individual receptors and the overall significance of local air quality effects resulting from the Proposed Scheme. The first step is to define the impact descriptors at each sensitive receptor as follows:

- Predict the absolute change in annual mean pollutant concentrations as a proportion of the relevant assessment level (i.e. air quality standard), to determine the magnitude of change;
- Calculate the total predicted pollutant concentrations as a proportion of the relevant assessment level; and
- Examine the magnitude of change in relation to the total predicted pollutant concentrations to determine the impact descriptor.

The impact descriptor therefore depends on the magnitude of the change in predicted concentrations and the total predicted concentrations in relation to the air quality standard, as shown in Table 5.

The guidance also notes that where the change in concentrations is less that 0.5% of the assessment level, only negligible impacts would be anticipated.

The second step is to make a judgement on the overall significance of effect for a proposed development. The impact descriptors at each individual receptor is used along with a set of qualitative factors such as:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Professional judgement should be used to determine the overall significance of effects. However, in some circumstances where the proposed development can be judged in isolation, it is likely that a ‘moderate’ or ‘substantial’ impact will give rise to a significance effect, while a ‘negligible’ or ‘slight’ impact will not result in a significant effect.

[36] Moorcroft & Barrowcliffe et al. (2015); Land-use Planning & Development Control: Planning for Air Quality; Institute of Air Quality Management; London

Table 5: Impact descriptors for air quality assessment

Total predicted annual mean concentrations	% Change in concentrations relative to air quality standard			
	1%	2 – 5%	6 – 10%	> 10%
< 75% of standard	Negligible	Negligible	Slight	Moderate
76 – 94% of standard	Negligible	Slight	Moderate	Moderate
95 – 102% of standard	Slight	Moderate	Moderate	Substantial
103 – 109% of standard	Moderate	Moderate	Substantial	Substantial
> 110% of standard	Moderate	Substantial	Substantial	Substantial

4.3 Method of Operational Assessment

The assessment has examined the changes in air pollutant concentrations in the surrounding area, that will result from operation of the proposed EfW CHP facility at full capacity (for 2020, the first full year of operation, as a worst case), cumulatively with existing adjacent developments and also the changes to air quality that result from abnormal operation of the proposed EfW CHP facility. The potential effect on human health and on designated wildlife sites has been assessed.

Once the proposed EfW CHP facility has been constructed it will be hot-commissioned using diesel fuel (for approximately 1.5 months) while the existing DERL plant continues to operate, burning waste. Once the proposed EfW CHP facility is ready to take waste, DERL will cease operation and the proposed EfW CHP facility will burn waste. There will be no simultaneous operation of the two plants burning waste.

Next to the proposed EfW CHP is the Michelin plant. The main sources of emissions to air from this plant are the three boilers. Michelin has confirmed that normal operation is to have one boiler operating at 60-80% load, one on standby operating at 10-20% load and one non-operational (for maintenance, servicing, insurance inspections etc). Emissions monitoring data were measured when the boilers were operating at 60% load and so these emissions have been increased by a factor of 80%/60% to estimate emissions at 80% load, which has been used as a worst case (compared with 60% load). Emissions at 20% load have been estimated from the operating load (80%) emissions.

Various scenarios have been modelled to estimate impacts from isolated and combined operations:

(A) the DERL facility (80% load) alone

(B) the proposed EfW CHP alone, burning waste

(C) the proposed EfW CHP, burning diesel (hot-commissioning) + (A)

(D) Michelin boilers (1 x 80% + 1 x 20% load) + (B)

To help inform the design, a stack height assessment was carried out, and is presented in Volume 2 Appendix B2 of the Environmental Statement which was submitted to accompany the planning application for the Proposed Scheme.

Detailed dispersion modelling of annual and hourly mean NO_2 ground level concentrations resulting from emissions from the proposed EfW CHP facility was undertaken. A range of stack heights between 70m and 110m (above ground level) were modelled.

The assessment showed that annual mean NO_2 concentrations are predicted to decrease steadily with height. Hourly mean concentrations decrease as the stack height increases up to around 87.5m above ground level. At heights above 90m, the rate of decrease in concentration is reduced. It was therefore considered that a 90m stack represents a height at which the additional visual impact of taller stack would begin to outweigh the air pollutant dispersion benefits. The operational assessment has therefore been undertaken based on a 90m stack.

The operational assessment considers those pollutants included in the Industrial Emission Directive (IED) and those included within EU, UK and Scottish air quality standards, namely:

- Nitrogen oxides (NOx) and nitrogen dioxide (NO_2);
- Carbon monoxide (CO);
- Total organic carbon (TOC) as benzene;
- Sulphur dioxide (SO_2);
- Fine and very fine particulate matter (PM_{10} and $PM_{2.5}$);
- Hydrogen fluoride (HF) and Hydrogen chloride (HCl);
- Ammonia (NH_3);
- Dioxins (Polychlorinated dibenzo-p-dioxins, PCDDs) and furans (Polychlorinated dibenzofurans, PCDFs);
- Dioxin-like polychlorinated biphenyls (PCB);
- Polycyclic aromatic hydrocarbons (PAHs) as benzo(a)pyrene; and
- Trace metals: lead (Pb), arsenic (As), cadmium (Cd), nickel (Ni), thallium (Ti), mercury (Hg), antimony (Sb), chromium (Cr and CrVI), cobalt (Co), copper (Cu), manganese (Mn) and vanadium (V).

The assessment presented in this chapter relates to the comparison of ambient concentrations to the relevant assessment standards or guidelines, and the change in concentrations with operation of the proposed EfW CHP facility in comparison to the existing DERL facility. The standards and guidelines are intended to protect human health from the inhalation of the pollutants.

In addition to this two other types of assessment based on potential impacts to air quality have been undertaken.

(1) Impacts on sensitive habitats: the potential impacts of NH_3, NOx, HCl and SO_2 have been assessed, both through the impacts directly to air and through deposition of acid species and nutrient nitrogen.
(2) Impacts on human health resulting from certain organic compounds (dioxins, furans, dioxin-like PCB and PAHs) and trace metals entering the food chain and being ingested by humans over the lifetime of the Proposed Scheme have been assessed (see the Human Health Risk Assessment (HHRA) in Appendix G).

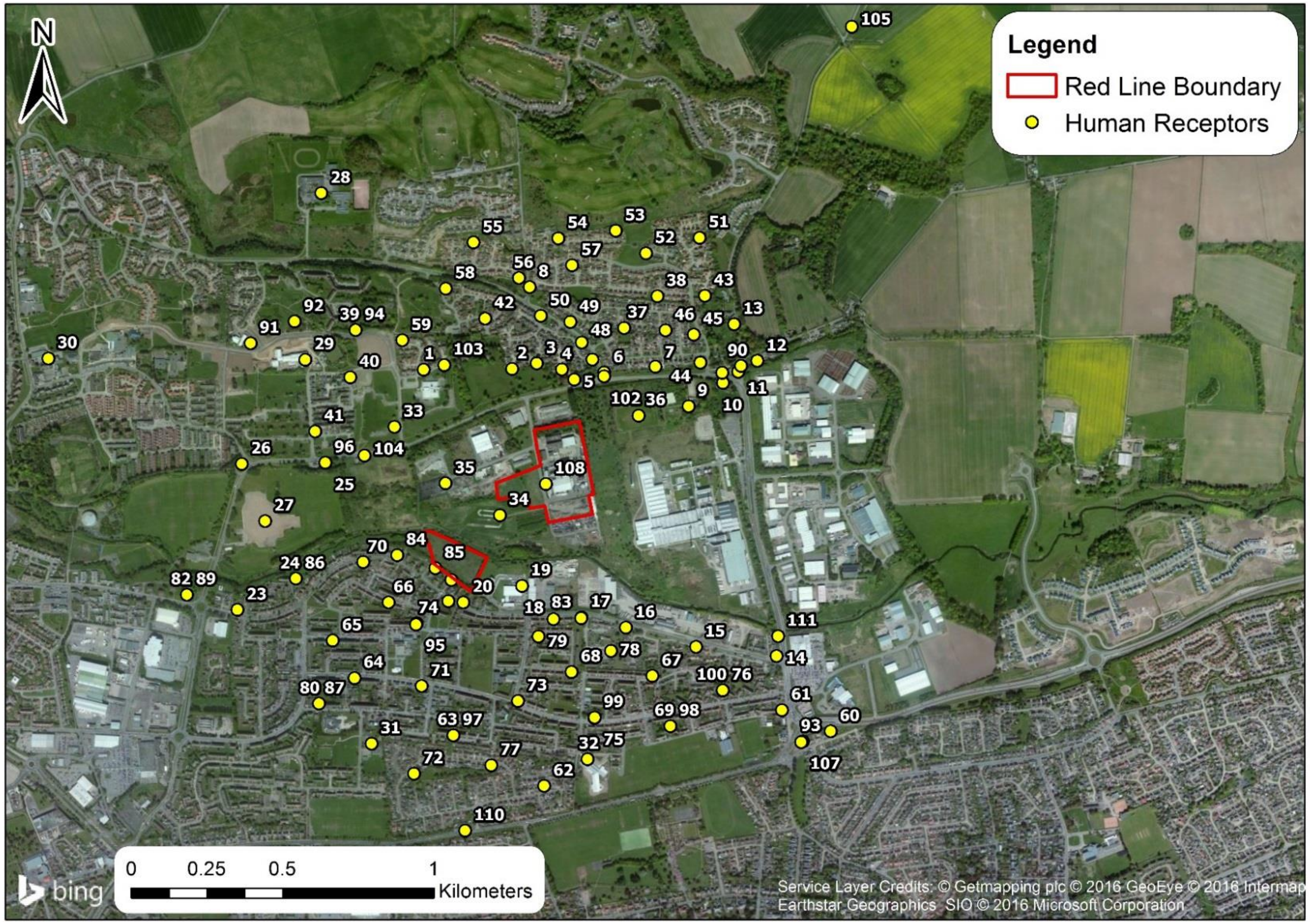
4.3.1 Sensitive Receptors

The receptors relevant to the assessment include residential properties, schools, hospitals and community facilities in the area and other sensitive locations such as designated ecological sites and protected wildlife sites.

Discrete human receptors have been selected based on relevant sensitive receptors in the vicinity of the proposed EfW CHP facility. Receptors have been selected at locations close to the road network (as discussed above for the assessment of construction traffic) and at a spread of locations around the Application Site. The location of the human receptors are shown in Figure 4 and details are presented in Table 6.

These human receptors have been modelled at heights of 1.5m and 7.5m, representative of inhalation height at ground level and at third floor respectively. Eleven of the receptors are at air quality monitoring locations commissioned as part of the scheme and discussed in section 5.2.2.

Figure 4: Location of sensitive receptors



*Receptor 109 is not shown on this map as it is outside the area shown.

Table 6: Discrete human receptors

ID	Name	NGR (m)		Height (m)	Distance to site (m)	Direction from site
		X	Y			
1	2 Silver Link Avenue	344099	733312	1.5	690	N
2	41 Ashkirk Gardens	344391	733315	1.5	500	N
3	24 Ashkirk Gardens	344473	733333	1.5	482	N
4	2 Montpellier Gardens	344556	733313	1.5	441	N
5	1 Montpellier Gardens	344598	733280	1.5	402	N
6	Baldovie Cottage West	344696	733303	1.5	428	NE
7	105 Hawick Drive	344867	733323	1.5	500	NE
8	42 Chirnside Place	344449	733586	1.5	731	N
9	Michelin Athletic Club	344976	733191	1.5	461	NE
10	Baldovie Cottage	345090	733269	1.5	597	NE
11	Jubilee Cottage	345140	733306	1.5	660	NE
12	Drumsturdy Road	345204	733342	1.5	732	NE
13	13 Kellas Road	345127	733463	1.5	762	NE
16	1 Bro'ty Ferry Court	345268	732365	1.5	814	SE
17	433 Balunie Drive	345000	732394	1.5	606	SE
18	305 Balunie Drive	344769	732458	1.5	442	SE
19	211 Balunie Drive	344622	732492	1.5	387	SE
20	193 Balunie Drive	344529	732487	1.5	407	S
21	Tayside Police	344424	732597	1.5	354	S
22	222 Balunie Rd	344230	732542	1.5	528	SW
23	158 Balunie Drive	344011	732698	1.5	651	SW
24	168 Balunie Drive	344138	732655	1.5	547	SW
25	18 Balunie Drive	343483	732517	1.5	1,210	SW
26	34 Balunie Crescent	343676	732621	1.5	995	SW
27	Greenfield Cottage, Drumgeith Road	343773	733005	1.5	873	W
28	Rowanbank, Drumgeith Road	343497	733001	1.5	1,146	W
29	Saint Saviour's High School	343574	732811	1.5	1,065	W
30	Braeview Academy	343760	733897	1.5	1,343	NW
31	Ballumbie Primary School	343707	733345	1.5	1,040	NW
32	Longhaugh Primary School	342856	733350	1.5	1,841	NW

ID	Name	NGR (m)		Height (m)	Distance to site (m)	Direction from site
		X	Y			
34	St Pius RC Primary School	343926	732074	1.5	1,074	SW
35	Claypotts Castle Primary School	344642	732023	1.5	857	S
36	1 Kilwinning Place	344002	733123	1.5	680	NW
37	BMX Track	344351	732830	1.5	289	W
38	Civic Amenity Site	344172	732936	1.5	469	W
39	Football Pitch	344811	733161	1.5	331	NE
40	25 Hawick Drive	344763	733451	1.5	585	NE
41	24 Spartleton Place	344873	733556	1.5	716	NE
42	30 Speckled Wood Court	343874	733444	1.5	949	NW
43	15 Kirkconnel Terrace	343856	733287	1.5	881	NW
44	4 Strathaven Terrace	343740	733108	1.5	926	NW
45	27 Duns Crescent	344302	733482	1.5	689	N
46	8 Old Toll Loan	345030	733557	1.5	784	NE
47	101 Hawick Drive	345015	733336	1.5	593	NE
48	71 Hawick Drive	344993	733428	1.5	655	NE
49	63 Hawick Drive	344900	733443	1.5	622	NE
50	42 Coldstream Drive	344658	733346	1.5	467	NE
51	20 Coldstream Drive	344622	733402	1.5	523	NE
52	13 Selkirk Gardens	344584	733470	1.5	593	NE
53	17 Ballumbie Road	344487	733491	1.5	629	N
54	13 Ardminish Place	345013	733749	1.5	947	NE
55	6 Machrie Place	344835	733698	1.5	842	NE
56	36 Traquair Gardens	344735	733772	1.5	898	NE
57	21 Traquair Gardens	344545	733747	1.5	873	N
58	16 Ballumbie Braes	344264	733734	1.5	932	N
59	21 Ballumbie Meadows	344415	733616	1.5	769	N
60	24 Peebles Drive	344590	733658	1.5	780	N
61	170 Aberlady Crescent	344173	733581	1.5	841	NW
62	23 Silver Link Avenue	344028	733410	1.5	807	NW
63	516 Arbroath Road	345446	732115	1.5	1,114	SE
64	22 Baldovie Road	345285	732186	1.5	950	SE
65	54 Gotterstone Drive	344498	731934	1.5	955	S
66	28 Balbeggie Street	344198	732102	1.5	893	SW

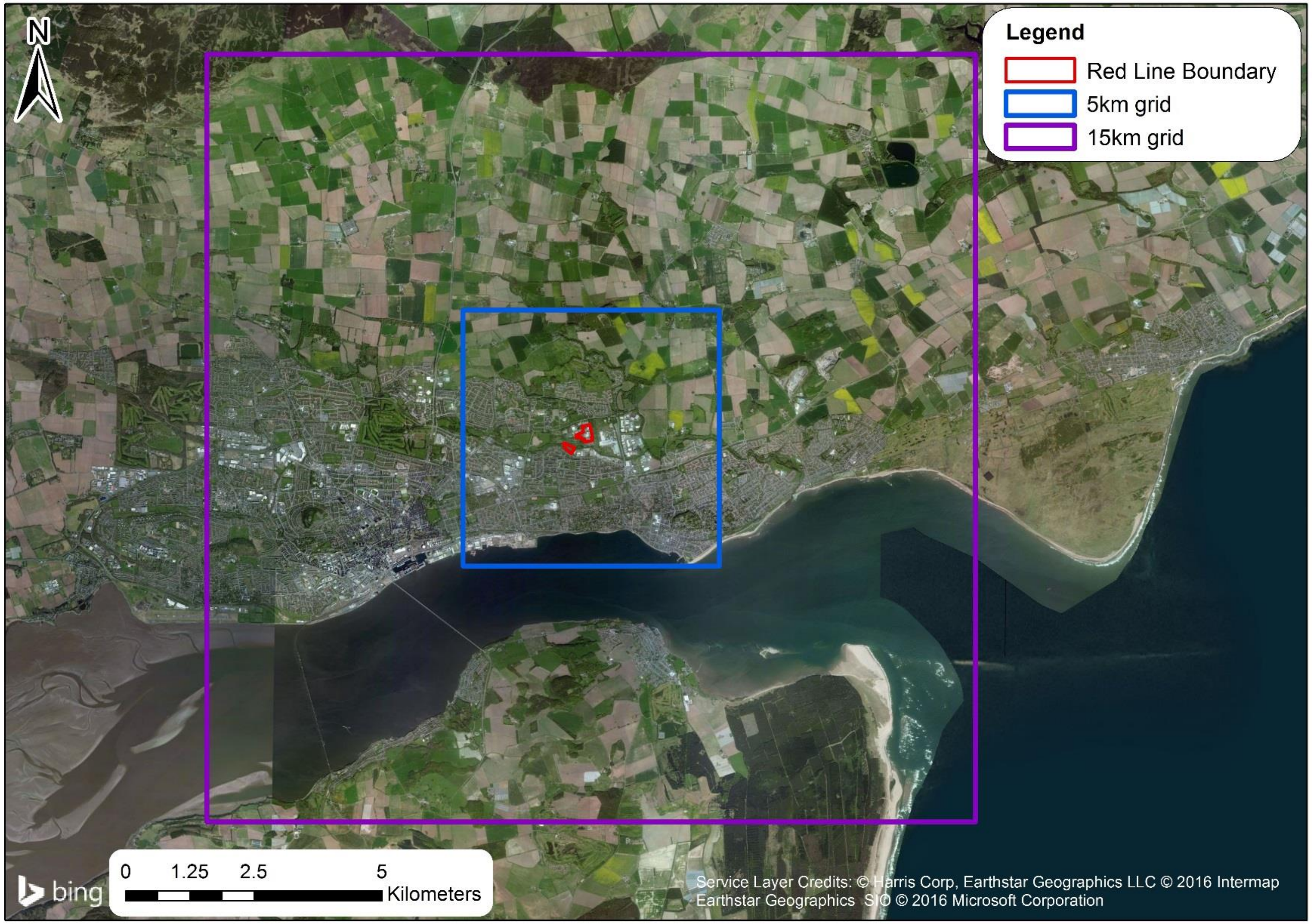
ID	Name	NGR (m)		Height (m)	Distance to site (m)	Direction from site
		X	Y			
67	17 Balunie Avenue	343870	732291	1.5	966	SW
68	11 Ballantrae Road	343798	732415	1.5	958	SW
69	55 Ballantrae Place	343983	732542	1.5	736	SW
70	68 Balunie Street	344856	732299	1.5	621	SE
71	35 Balmoral Gardens	344589	732311	1.5	570	S
72	12 Baldovie Terrace	344916	732133	1.5	797	SE
73	103 Balunie Drive	343899	732676	1.5	766	W
74	37a Balunie Avenue	344092	732265	1.5	821	SW
75	64 Strachan Avenue	344067	731975	1.5	1,069	SW
76	66 Balunie Avenue	344412	732216	1.5	701	SW
77	32 Balmerino Road	344076	732473	1.5	693	SW
78	100 Balunie Avenue	344665	732159	1.5	721	S
79	226 Balunie Avenue	345089	732251	1.5	774	SE
80	20 Strachan Avenue	344323	732003	1.5	931	SW
81	279 Balunie Drive	344719	732382	1.5	505	S
82	72 Balmoral Gardens	344479	732430	1.5	477	SW
83	6 Balerno Street	343752	732207	1.5	1,111	SW
84	129 Balunie Drive	344180	732546	1.5	565	SW
85	266 Happyhillock Road	343315	732567	1.5	1,358	W
86	209 Balunie Drive at height	344621	732490	7.5	390	S
87	154 Balunie Drive at height	344011	732698	7.5	651	W
88	130 Balunie Drive at height	344138	732655	7.5	547	W
89	34 Balunie Crescent at height	343676	732621	7.5	995	W
90	Receptor 83 at height	343752	732207	7.5	1,111	SW
91	Receptor 84 at height	344180	732546	7.5	565	SW
92	Receptor 85 at height	343315	732567	7.5	1,358	SW
93	The Toll House	345150	733325	1.5	679	NE
94	50 Haddington Crescent	343526	733400	1.5	1,227	NW
95	71 Lothian Crescent	343672	733472	4.5	1,132	NW
96	502 Arbroath Road	345349	732079	1.5	1,072	SE
97	30 Speckled Wood Court	343874	733444	7.5	949	NW
98	32 Balmerino Road	344076	732473	7.5	693	SW

ID	Name	NGR (m)		Height (m)	Distance to site (m)	Direction from site
		X	Y			
99	1 Whitfield Cottages	343773	733005	1.5	873	W
100	28 Balbeggie Street	344198	732102	7.5	893	SW
101	DT - Baldovie/ Drumgieth Road	345088	733302	2.02	618	NE
102	DT - Drumgeith Road	344696	733290	2.08	415	N
103	DT - Britannia Drive	344167	733328	2.12	649	NE
104	DT - Whitfield Cottage	343903	733028	2.04	748	NE
105	DT - Kellas Road - BG	345517	734449	1.96	1,799	NE
106	DT - Balmerino Road	344190	732616	2.04	518	SW
107	DT - Balunie Drive	345349	732079	2.01	1,072	SE
108	DT - Baldovie Road	344504	732934	2.12	144	Onsite
109	DT - Meadowside Automatic Monitor	340245	730655	1.97	4,923	SW
110	DT - 326 Arbroath Road	344236	731786	2.05	1,164	SW
111	DT - 4 Bro'ty Ferry	345272	732430	2.1	778	SE

The assessment of emissions from the stack of the proposed EfW CHP facility have also been predicted at locations over a Cartesian grid of 15km x 15km with a nested 5km x 5km grid area with a refined spatial resolution. Each grid has the proposed EfW CHP facility stack location as its central point. The gridded output has been used for contour plotting of modelled concentrations.

For the 15km grid the modelled grid extent was: NGR (337137, 725379) to (352137, 740379), at a height of 1.5m and with a resolution of 150m. For the 5km grid the modelled grid extent was: NGR (342137, 730379) to (347137, 735379), at a height of 1.5m, with a resolution of 50m. The proposed model grid areas are shown in Figure 5.

Figure 5: Model output grid domains



Discrete ecological receptors have been selected based on their designation. Special protection areas (SPAs), special areas of conservation (SACs), Ramsar sites (protected wetlands) and sites of special scientific interest (SSSIs) have been selected within 15km of the EfW CHP and local nature sites (ancient woodland, woodland, heathland, local wildlife sites, waterbodies and watercourses, and national and local nature reserves) have been selected within 2km of the proposed EfW CHP facility. The location of the ecological receptors are shown in Figure 6 and details are presented in Table 7.

Table 7: Ecological receptors

ID	Name	Designation	NGR (m)		Distance to site (km)
			X	Y	
1	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	331361	725517	15.2
2	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	332176	726237	14.1
3	Inner Tay Estuary	Ramsar / SSSI / SPA / SAC / LNR	332176	726237	14.1
4	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	332919	726941	13.1
5	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	332952	723261	15.1
6	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	333762	727643	12.1
7	Inner Tay Estuary	Ramsar / SSSI / SPA / SAC / LNR	333762	727643	12.1
8	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	334683	725583	12.3
9	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	334806	728350	10.8
10	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	335280	724600	12.5
11	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	336022	728728	9.6
12	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	337066	727139	9.5
13	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	337137	726031	10.2
14	Gallowhill/Cawmill Woods	Ancient Woodland	337204	733145	7.4
15	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	337324	729003	8.3
16	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	337818	726383	9.4
17	Ancient Woodland	Ancient Woodland	338046	730799	6.9
18	Baldrogon Wood	Ancient Woodland	338086	734379	6.7

ID	Name	Designation	NGR (m)		Distance to site (km)
			X	Y	
19	Wynton Wood	Ancient Woodland	338169	736631	7.5
20	Heathland	Heathland	338239	740196	9.7
21	Firth of Tay and Eden Estuary	Ramsar / SSSI / SPA / SAC / LNR	339025	729230	6.7
22	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	339062	728494	7.1
23	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	339285	727290	7.7
24	Ancient Woodland	Ancient Woodland	339670	734774	5.3
25	Ancient Woodland	Ancient Woodland	340306	733935	4.5
26	Balmerino - Wormit Shore	SSSI	340309	726927	7.4
27	Trottick Mill Ponds	LNR	340725	733667	4.0
28	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	340882	729713	4.9
29	East/West Links Wood	Ancient Woodland	341104	725253	8.4
30	North Hill	Ancient Woodland	341125	726392	7.4
31	River Tay	SAC	341236	747717	15.2
32	Woodland	Woodland	341292	733058	3.3
33	Heathland	Heathland	341369	740096	7.9
34	Waterbody	Waterbody	341568	732125	3.2
35	Balmuir Wood	Ancient Woodland	341935	737135	5.0
36	River Tay	SAC	341956	746714	14.1
37	Dighty Water	Watercourse	342106	733032	2.5
38	Knockhill Wood	Ancient Woodland	342176	725765	7.5
39	Ancient Woodland	Ancient Woodland	342302	735173	3.3
40	Dighty Water	Watercourse	342606	732930	2.0
41	Waterbody	Waterbody	342639	734747	2.7
42	Whitehouse Den	SSSI	342671	739606	7.0
43	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	342834	730790	2.8
44	River Tay	SAC	342834	745988	13.2
45	Dighty Water	Watercourse	342835	732759	1.8
46	Waterbody	Waterbody	342861	734110	2.2
47	Morendy Wood	Ancient Woodland	342917	725014	8.1
48	Corbie Den	Ancient Woodland	342935	740351	7.7
49	Sheihill Wood	Ancient Woodland	343120	736795	4.2
50	Laverock Law	Ancient Woodland	343149	728042	5.1

ID	Name	Designation	NGR (m)		Distance to site (km)
			X	Y	
51	Woodland	Woodland	343272	735616	3.1
52	Dighty Water	Watercourse	343376	732603	1.3
53	Ancient Woodland	Ancient Woodland	343419	740206	7.4
54	Roseberry Wood	Ancient Woodland	343438	726816	6.2
55	Heathland	Heathland	343597	739365	6.6
56	Craig Law	Ancient Woodland	343700	728975	4.0
57	Fithie Burn	Watercourse	343712	734899	2.2
58	Woodland	Woodland	343716	734994	2.3
59	River Tay	SAC	343817	745422	12.6
60	Dighty Water	Watercourse	343821	732762	0.8
61	Woodland	Woodland	343869	733955	1.3
62	Woodland	Woodland	343989	734791	2.0
63	Fithie Burn	Watercourse	344035	734827	2.0
64	Woodland	Woodland	344066	734940	2.1
65	Corbie Den	Ancient Woodland	344108	740667	7.8
66	Woodland	Woodland	344132	734372	1.6
67	Corbie Den	Ancient Woodland	344135	741744	8.9
68	Pickletillem Marsh	SSSI	344152	724936	8.0
69	Woodland	Woodland	344213	734777	1.9
70	Dighty Water	Watercourse	344302	732675	0.4
71	Fithie Burn	Watercourse	344344	734738	1.9
72	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	344412	731011	1.9
73	Woodland	Woodland	344415	735022	2.2
74	East Muirhouse Strip	Ancient Woodland	344448	735936	3.1
75	Brighty Wood	Ancient Woodland	344453	737557	4.7
76	Woodland	Woodland	344475	734035	1.2
77	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	344476	729299	3.6
78	Gallowfauld Burn	Watercourse	344505	742576	9.7
79	Woodland	Woodland	344656	734502	1.6
80	Waterbody	Waterbody	344699	734194	1.3
81	Fithie Burn	Watercourse	344713	734533	1.7
82	Duntrune/Glack Hills	Ancient Woodland	344713	734981	2.1
83	Dighty Water	Watercourse	344729	732565	0.3
84	River Tay	SAC	344741	744657	11.8
85	Woodland	Woodland	344838	728265	4.6

ID	Name	Designation	NGR (m)		Distance to site (km)
			X	Y	
86	Ancient Woodland	Ancient Woodland	344868	742455	9.6
87	St Michael's Wood Marshes	SSSI	344913	723813	9.1
88	St Michael's Wood	Ancient Woodland	344913	723813	9.1
89	Fithie Burn	Watercourse	344938	733516	0.7
90	Gagie Marsh	SSSI	344951	736907	4.0
91	Waterbody	Waterbody	344963	733940	1.1
92	Fithie Burn	Watercourse	344977	733141	0.4
93	Heathland	Heathland	344978	739558	6.7
94	Woodland	Woodland	344997	734203	1.4
95	Woodland	Woodland	344997	734203	1.4
96	Fithie Burn	Watercourse	345008	733857	1.0
97	Fithie Burn	Watercourse	345034	734239	1.4
98	Kirkton Wood	Ancient Woodland	345038	726037	6.9
99	Big Latch	Ancient Woodland	345063	738264	5.4
100	Fithie Burn	Watercourse	345081	732780	0.5
101	Woodland	Woodland	345142	733606	0.9
102	Eden Estuary	LNR	345144	719447	13.4
103	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	345187	729388	3.5
104	Tayport - Tentsmuir Coast	SSSI	345187	729388	3.5
105	Woodland	Woodland	345211	733978	1.2
106	Dighty Water	Watercourse	345275	732517	0.7
107	Woodland	Woodland	345277	733632	1.0
108	Murroes Burn	Watercourse	345319	733591	1.0
109	Waterbody	Waterbody	345361	733560	1.0
110	Murroes Burn	Watercourse	345431	733889	1.3
111	Woodland	Woodland	345446	733343	0.9
112	Murroes Burn	Watercourse	345481	733343	1.0
113	Woodland	Woodland	345484	732978	0.9
114	Murroes Burn	Watercourse	345513	732943	0.9
115	Kellas Wood	Ancient Woodland	345617	735922	3.2
116	Dighty Water	Watercourse	345678	732660	1.1
117	Little Latch	Ancient Woodland	345697	738028	5.3
118	Waterbody	Waterbody	345716	733876	1.5
119	Murroes Burn	Watercourse	345751	733927	1.5
120	River Tay	SAC	345794	743718	10.9

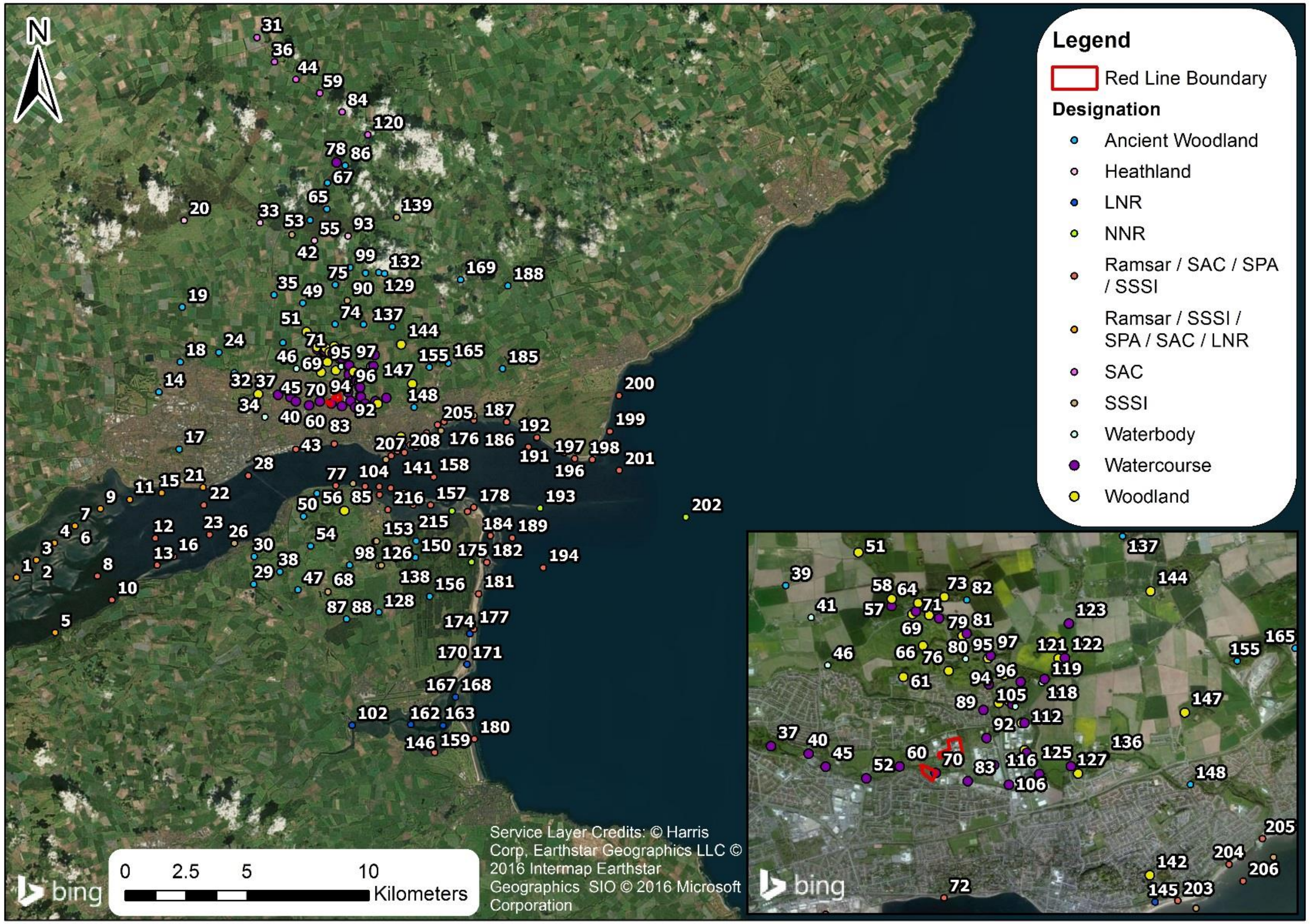
ID	Name	Designation	NGR (m)		Distance to site (km)
			X	Y	
121	Woodland	Woodland	345935	734200	1.9
122	Murroes Burn	Watercourse	346021	734210	1.9
123	Murroes Burn	Watercourse	346075	734667	2.3
124	Tentsmuir	NNR	346082	727002	6.1
125	Dighty Water	Watercourse	346104	732765	1.5
126	Morton Lochs	SSSI	346145	727014	6.1
127	Woodland	Woodland	346199	732667	1.6
128	Rhynd Wood	Ancient Woodland	346238	724097	8.9
129	West Wood	Ancient Woodland	346247	738049	5.4
130	Tentsmuir	NNR	346257	726009	7.1
131	Morton Lochs	SSSI	346348	726021	7.1
132	West Wood	Ancient Woodland	346480	738009	5.5
133	Buckler Heads Wood	Ancient Woodland	346506	736207	3.8
134	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	346535	730366	3.1
135	Monifeth Bay	SSSI	346535	730366	3.1
136	Dighty Water	Watercourse	346553	732905	1.9
137	Woodside Wood	Ancient Woodland	346792	735832	3.7
138	Morton Links	Ancient Woodland	346933	726303	7.0
139	Carrot Hill Meadow	SSSI	346970	740324	7.8
140	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	346975	728783	4.7
141	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	347000	730720	3.2
142	Woodland	Woodland	347155	731311	3
143	Tentsmuir	NNR	347165	727580	5.9
144	FID:59 x	Woodland	347165	735095	3.4
145	Broughty Ferry	LNR	347224	730956	3.2
146	Eden Estuary	LNR	347556	719481	13.7
147	Woodland	Woodland	347621	733479	3.0
148	Ancient Woodland	Ancient Woodland	347694	732521	3.1
149	Broughty Ferry	LNR	347713	731205	3.5
150	Tentsmuir	Ancient Woodland	347748	726340	7.2
151	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	347771	730870	3.7
152	Monifeth Bay	SSSI	347771	730870	3.7
153	Tentsmuir	Ancient Woodland	347779	727026	6.6
154	Tentsmuir	NNR	348301	727996	6.1

ID	Name	Designation	NGR (m)		Distance to site (km)
			X	Y	
155	Gallow Hill	Ancient Woodland	348319	734167	3.9
156	Tentsmuir	Ancient Woodland	348330	724749	8.9
157	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348375	728496	5.8
158	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348498	729658	5.0
159	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348541	718339	15.1
160	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348804	731554	4.4
161	Monifeth Bay	SSSI	348804	731554	4.4
162	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348887	719446	14.1
163	Eden Estuary	LNR	348887	719446	14.1
164	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348923	731935	4.4
165	Laws Hill	Ancient Woodland	349092	734336	4.7
166	Tentsmuir	NNR	349254	728256	6.5
167	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	349396	720613	13.2
168	Eden Estuary	LNR	349396	720613	13.2
169	Denfind Plantation	Ancient Woodland	349602	737762	7.0
170	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	349866	721954	12.1
171	Eden Estuary	LNR	349866	721954	12.1
172	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	349885	728238	7.0
173	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	349973	732102	5.4
174	Eden Estuary	LNR	349977	723213	11.0
175	Tentsmuir	NNR	350051	726158	8.6
176	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	350147	731985	5.6
177	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	350147	723403	11.0
178	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	350153	728412	7.1
179	Barry Links	SSSI	350160	732168	5.6
180	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	350174	718885	15.1

ID	Name	Designation	NGR (m)		Distance to site (km)
			X	Y	
181	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	350350	724855	9.9
182	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	350685	726143	9.1
183	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	350712	731356	6.3
184	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	350824	727242	8.4
185	Ancient Woodland	Woodland	351330	734104	6.8
186	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	351496	731934	6.9
187	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	351499	731916	6.9
188	Weet's/Camustane/+ Woods	Ancient Woodland	351551	737509	8.3
189	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	351729	727153	9.1
190	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	352384	730891	8.0
191	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	352728	731261	8.3
192	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	352740	731277	8.3
193	Tentsmuir	NNR	352870	728368	9.4
194	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	353004	725930	10.9
195	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	353859	730664	9.5
196	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	353861	730651	9.5
197	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	354291	730412	10.0
198	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	355011	730365	10.7
199	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	355735	731527	11.2
200	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	356109	733000	11.5
201	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	356118	729922	11.9
202	Tentsmuir	NNR	358863	728006	15.0
203	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	347525	730974	3.5

ID	Name	Designation	NGR (m)		Distance to site (km)
			X	Y	
204	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348209	731458	3.8
205	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348654	731799	4.2
206	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	348398	731233	4.1
207	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	346758	730526	3.2
208	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	347301	730660	3.5
209	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	345680	729270	3.8
210	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	346265	729258	4.0
211	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	346734	729197	4.2
212	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	347258	729008	4.7
213	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	347862	728935	5.1
214	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	346271	728923	4.3
215	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	347648	728508	5.3
216	Firth of Tay and Eden Estuary	Ramsar / SAC / SPA / SSSI	346618	728307	5.0

Figure 6: Ecological receptors



4.3.2 Dispersion Model and Set-up

For assessment of emissions from the stack of the proposed EfW CHP facility, the latest ADMS 5 (version 5.1.2.0) atmospheric dispersion model has been used. ADMS has been used to predict long-term and short-term concentrations, at discrete receptors and across a gridded domain, and results have been compared with the relevant objectives.

The following sections detail the inputs and processes used in this assessment.

4.3.2.1 Meteorological Data

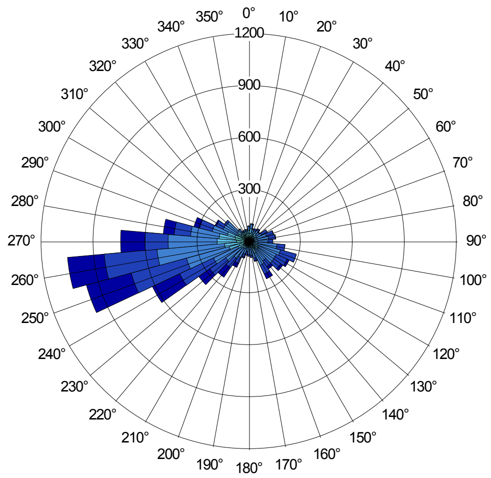
The local impacts of air pollutant releases vary widely according to the prevailing weather conditions. Meteorological data used in this assessment was measured at RAF Leuchars meteorological station over the period 1st January 2011 to 31st December 2015 (inclusive). The latest five years of data has been obtained to allow sensitivity testing and examine the variation in predicted concentrations for each year. The RAF Leuchars monitoring station lies approximately 10km to the south-east of the site and is considered to be the most appropriate site for this assessment. Hourly sequential observation data from this meteorological station has been used in the assessment. Figure 7 shows the relevant wind roses for this station in 2011 to 2015. It can be seen that the predominant wind direction is from the west/south-west.

In order for the modelling exercise to be representative of local conditions and to predict long-term averages, the dispersion model requires representative meteorological data. Most dispersion models for roads do not use meteorological data if they relate to calm winds conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS has an advanced option for treating calm conditions, but the default option treats calm wind conditions by setting the minimum wind speed to 0.75m/s. LAQM.TG16 guidance recommends that the meteorological data file is tested within a dispersion model and the relevant output log file checked to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedences. The guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 75% and preferably 90%.

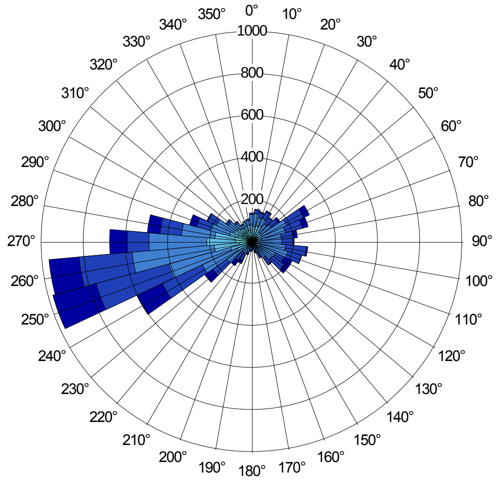
The datasets for 2011-2015 all had usable hours greater than 90% (2011: 96%; 2012: 97%; 2013: 96%; 2014: 96%; and 2015: 97%), and therefore the data meets the requirements of the Defra guidance and is adequate for use in dispersion modelling.

Figure 7: Wind roses for Leuchars, 2011 to 2015

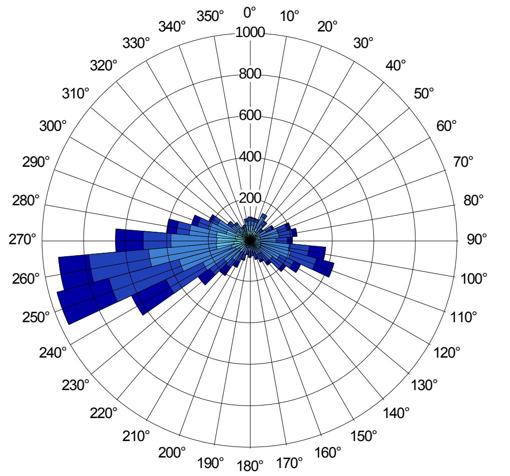
2011



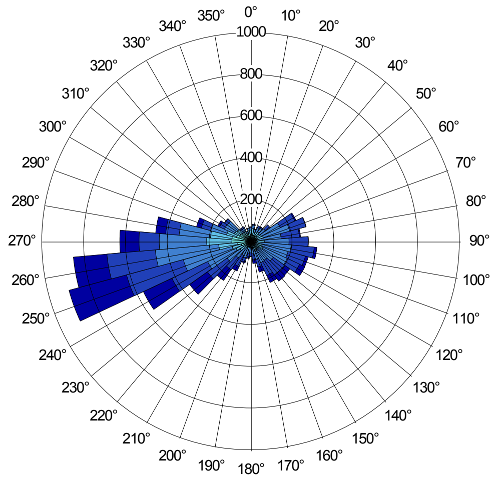
2012



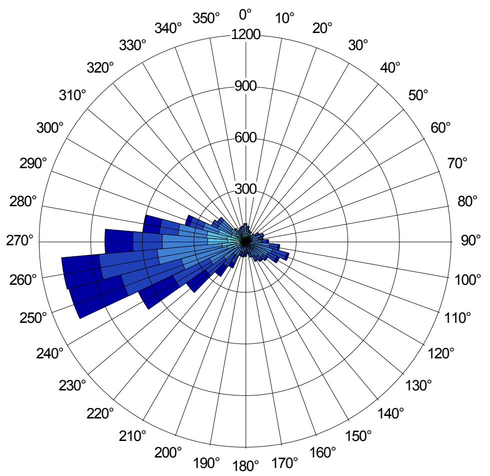
2013



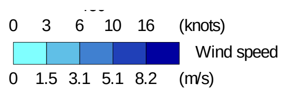
2014



2015



Legend



4.3.2.2 Surface Roughness and Minimum Monin-Obukhov Length

The extent of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the surface/ground over which the air is passing. Typical surface roughness values range from 1.5m (for cities, forests and industrial areas) to 0.0001m (for water or sandy deserts). In this assessment, the general land-use in the local study area can be described as “parkland, open suburbia” with a corresponding surface roughness of 0.5m, which has been used in the assessment.

Another model parameter is the minimum Monin-Obukhov length, which describes the minimum stability of the atmosphere which is limited due to the urban heat island effect. For this model a length of 30m has been used representing the “mixed urban/industrial” nature of the site and its surroundings.

4.3.2.3 Coastal Effects

The east coast of Scotland experiences a meteorological effect called Haar or sea fog, which can lead to decreased turbulence and mixing at ground level. Depending on the height of the boundary layer inversion in relation to the height of the stack during Haar conditions, this may lead to increased or decreased vertical mixing and dispersion of pollutant emissions from the proposed EfW CHP facility.

Meteorological monitoring data has been used from the RAF Leuchars monitoring site, which is approximately 10km to the south-east of the site and is known to experience Haar conditions. Therefore, the meteorological conditions occurring during the Haar, and coastal meteorology have been taken into account in the modelling assessment through the use of meteorological data measured at this site.

In addition, to investigate further whether coastal meteorological effects have an effect, sensitivity analysis has been undertaken using the coastline module in the ADMS model. The coastline module models the scenario when there is an onshore wind, meteorological conditions are convective, the sea temperature is cooler than the near ground air temperature and the emission is above the internal boundary layer.

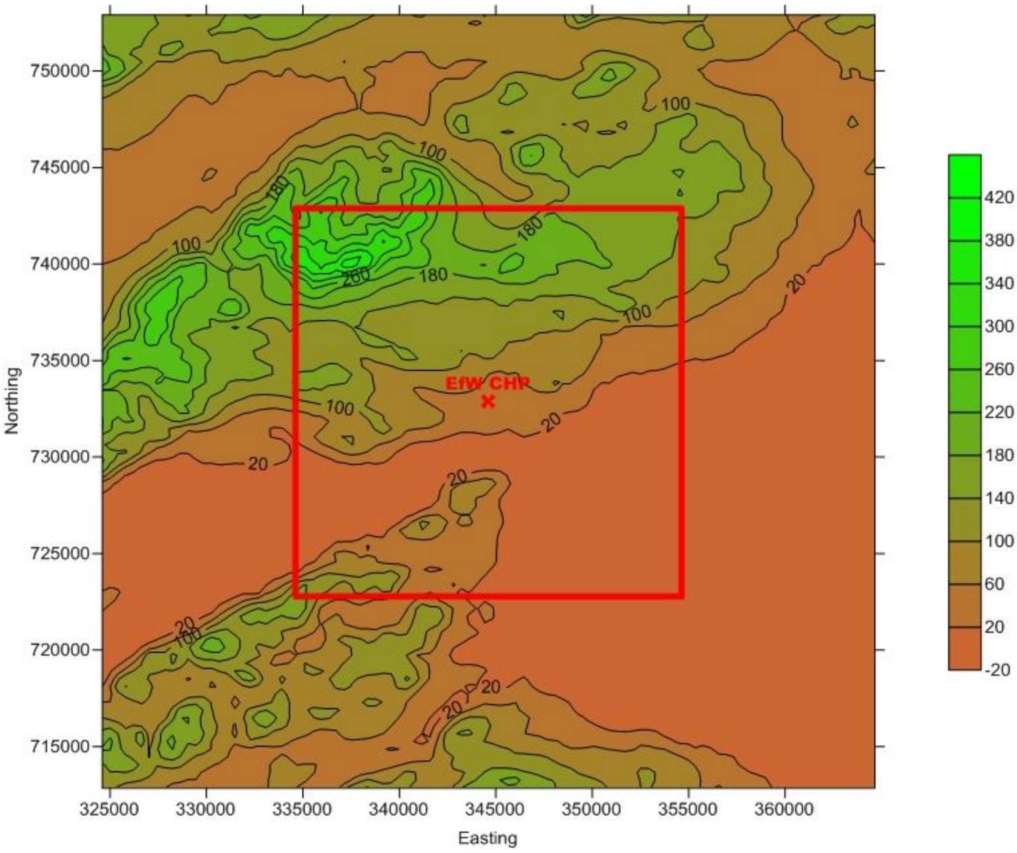
4.3.2.4 Terrain Effects

Large scale terrain effects are also captured by the RAF Leuchars meteorological data. To determine whether more local terrain has an effect, sensitivity analysis has been carried out using terrain data as an input to the ADMS model. Terrain data has been obtained from the Ordnance Survey (OS).

Terrain has been included in the modelling at two scales (small and large grid) as shown in Figure 8.

Following all the modelling sensitivity tests, results were compared, and those inputs generating realistic worst case outcomes have been taken forward. The results from these model runs are presented in section 7 of this report.

Figure 8: Terrain data used (red line indicates the small terrain grid)



4.3.2.5 Buildings

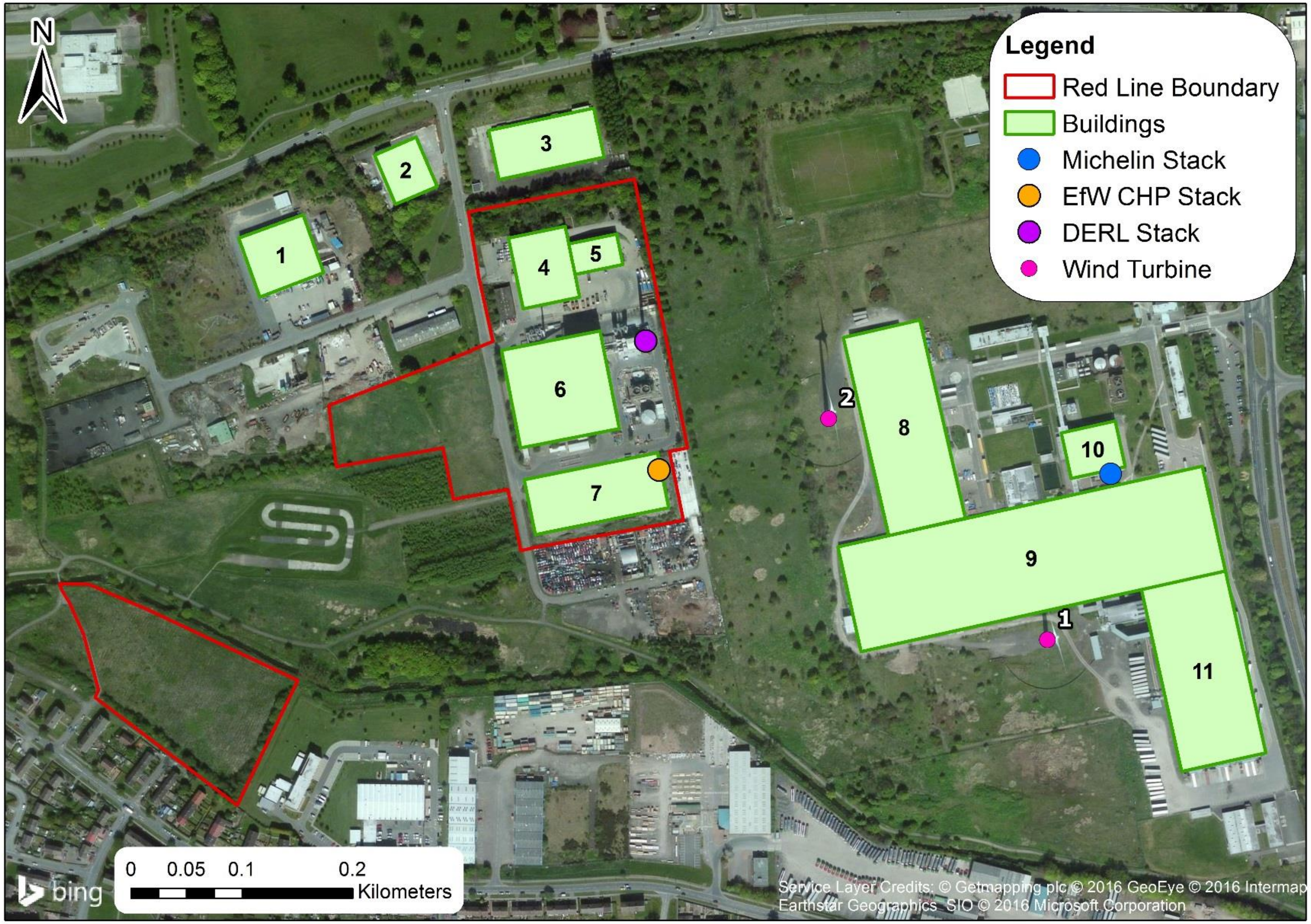
Buildings can have a significant effect on the dispersion of pollutants and have been included in the model. Building geometries on and around the site that have been used as input to the model are shown in Figure 9Figure 9: Buildings input to the model and Table 8. The complex building geometry has been simplified for input to the model which only accepts rectangular or circular building shapes.

Table 8: Building geometries

ID	Building Name	NGR* (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
1	Aerospace Tooling	344296	733073	11.8	55	60	250
2	Rembrand Timber	344408	733150	13.1	48	40	245
3	Forties Road	344535	733174	9.5	44	98	258
4	ATS 1	344533	733062	25.9	66	52	258
5	ATS 2	344580	733074	25.0	28	44	258
6	DERL 3	344548	732952	28.9	90	91	260
7	Proposed EfW CHP	344580	732858	35.0	50	122	258
8	Michelin 1	344858	732917	14.7	182	70	260
9	Michelin 2	344973	732799	14.7	96	336	260

<table>
<tr><th rowspan="2">ID</th><th rowspan="2">Building Name</th><th colspan="2">NGR* (m)</th><th rowspan="2">Height (m)</th><th rowspan="2">Length (m)</th><th rowspan="2">Width (m)</th><th rowspan="2">Angle (˚)</th></tr>
<tr><th>X</th><th>Y</th></tr>
<tr><td>10</td><td>Michelin 3</td><td>345028</td><td>732898</td><td>19.3</td><td>42</td><td>50</td><td>260</td></tr>
<tr><td>11</td><td>Michelin 4</td><td>345128</td><td>732698</td><td>15.0</td><td>165</td><td>75</td><td>260</td></tr>
<tr><td colspan="8">12 A new building to the south of the Michelin site is not shown and not included in the modelling as it is lower in height that the modelled buildings and therefore would not affect dispersion.</td></tr>
<tr><td colspan="8">Note: *NGR = National Grid Reference
In the model a “main” building is specified for each stack. For the EfW CHP stack the “Proposed EfW CHP” was defined as the main building; for the DERL stack it was the “DERL3” building; and for the Michelin boilers it was “Michelin 3”.</td></tr>
</table>

Figure 9: Buildings input to the model



4.3.2.6 Wind Turbines

Two wind turbines located on the Michelin site to the east of the Proposed Scheme, have been included in the model, to ensure their effects on pollutant dispersion are captured. The turbine parameters used by the model include the hub height, the wind speed at hub height and the thrust coefficient of the turbine. These are given in Table 9.

Table 9: Wind turbine model input parameters

Rated power output		**2,300kW**	
Make/model		Enercon E70	
Number of units		2	
Location		(344987, 732726) and (344790, 732926)	
Turbine rotor diameter		71m	
Hub height		85m	
Wind speed at hub height (m/s)	**Thrust Coefficient (Ct)**	**Wind speed at hub height (m/s)**	**Thrust Coefficient (Ct)**
1	0.00	14	0.34
2	0.10	15	0.28
3	0.27	16	0.23
4	0.36	17	0.19
5	0.42	18	0.16
6	0.46	19	0.14
7	0.48	20	0.12
8	0.50	21	0.10
9	0.50	22	0.09
10	0.50	23	0.08
11	0.49	24	0.07
12	0.45	25	0.06
13	0.39		

4.3.2.7 Stack Parameters and Emissions

The emission parameters for the proposed EfW CHP facility have been based on achieving compliance with the IED (2010/75 /EU). The legislation contains the ELVs applicable to the proposed EfW CHP facility as set out in Table 3.

The modelling of the proposed EfW CHP facility has used ELVs, the maximum emissions permitted, to ensure that a worst-case modelling scenario is considered. There will be times when the plant is non-operational in the year. However, since the times when this occurs cannot always be predicted, it is assumed that the plant operates all hours of the year as a worst case assumption.

Emissions from DERL facility and the Michelin boilers are based on monitored data reports. Table 10, Table 11 and Table 12 give the stack and efflux data used.

Table 10: DERL facility and proposed EfW CHP facility (burning waste) stack parameters

Parameter	Unit	DERL (per flue)	Prop. EfW CHP
Stack location	NGR (m)	344625E, 732996N	344637E, 732880N
Stack diameter	m	1.15	1.58
Flue gas efflux velocity	m/s	19.6	15.0
Efflux temperature	˚C	142	130
Stack height (from ground)	m	70	90
Oxygen content	% (dry)	10.9	7.0
Water content	% (volume)	13.7	16.0
NOx (as NO_2)	g/s	2.38	4.66
CO	g/s	0.0542	1.16
VOCs	g/s	0.0328	0.23
PM_{10} (assumed same as TSP)	g/s	0.0186	0.23
$PM_{2.5}$ (assumed same as TSP)	g/s	0.0186	0.23
HCl	g/s	0.212	0.23
HF	g/s	0.000133	0.023
SO_2	g/s	0.291	1.16
Cd + Tl	g/s	0.000178 (a)	0.0012 (c)
Hg	g/s	0.000059	0.0012
NH_3	g/s	0.00935	0.12
PAH (benzo(a)pyrene, BaP)	g/s	0.000158	0.000322 (b)
Group III Metals Total	**g/s**	**0.001467**	**0.001467 (d)**
- Antimony	g/s	0.000096	0.000035
- Arsenic	g/s	0.000090	0.000023
- Chromium (total)	g/s	0.000175	0.000198
- Chromium (VI)	g/s	0.0000010	0.0000012
- Cobalt	g/s	0.000028	0.000023
- Copper	g/s	0.000199	0.000175
- Lead	g/s	0.000127	0.000256
- Manganese	g/s	0.000585	0.000396
- Nickel	g/s	0.000124	0.000349
- Vanadium	g/s	0.000043	0.000012
Dioxins and furans	g/s (I-TEQ)	7.04×10^{-10}	2.33×10^{-9}
Dioxin-like PCBs	g/s (non TEQ	9.99×10^{-9}	2.03×10^{-8} (b)
Dioxin-like PCBs	g/s (WHO TEQ)	1.61×10^{-10}	3.27×10^{-10} (b)

(a) Cd was 67% and Tl 33% of the total measured value of 0.000178g/s - it has been assumed that each metal was emitted at the combined total (worst case assumption)

(b) Estimated from the monitored emissions at DERL as IED does not have emissions of these compounds

(c) It is assumed that Cd and Tl are each emitted at the IED ELV (worst case assumption)

(d) Group III metals were first assumed to be emitted at the IED ELV (0.012g/s), following guidance each metal was then multiplied by the percentages to give the following emission rates (based on mean of 18 Municpal Waste Incinerators emitting Group III metals at a total of 12.6% of the IED. The total of Group III metals for the EfW is identical to the per flue emissions rate from DERL but this is purely coincidental. The emissions of each metal are different.

Table 11: Proposed EfW CHP facility (diesel – hot commissioning) stack parameters

Parameter	Unit	EfW CHP diesel firing
Stack location	NGR (m)	344637E, 732880N
Stack diameter	m	1.58
Flue gas efflux velocity	m/s	8.7
Efflux temperature	˚C	120
Stack height (from ground)	m	90
Oxygen content	% (dry)	16.5
Water content	%	6.3
NOx (as NO_2)	g/s	0.345[(a)]
PM (as PM_{10})	g/s	0.493[(a)]
CO	g/s	0.247[(a)]
SO_2	g/s	0.011[(b)]
(a) Assuming exit volume is 60% of the exit volume when the EfW is burning waste, based on emission concentrations of NOx (as NO_2)=70mg/m^3, PM_{10}=10mg/m^3, CO=50mg/m^3 (all volumes at standard reference conditions of 273K, 11(dry)% O_2, 0% H_20, 101.3kPa) (b) Assuming 2t/hr 0.001% S diesel		

Table 12: Michelin stack parameters

Parameter	Unit	80% Load (per flue)	20% Load (per flue)
Stack location	NGR (m)	345044E, 732876N	345044E, 732876N
Stack diameter	m	0.96	0.96
Flue gas efflux velocity	m/s	13.5	3.38
Efflux temperature	˚C	185	185
Stack height (from ground)	m	53.8	53.8
Oxygen content	% (dry)	8.16	8.16
Water content	%	16.1	16.1
NOx (as NO_2)	g/s	0.342[(a)]	0.0684[(a)]
(a) Assuming emission concentration is 100mg/m^3 (at standard reference conditions)			

4.3.2.8 Trace metals

The total emissions of the nine Group III metals (Pb, As, Ni, Sb, Cr, Co, Cu, Mn and V), combined with the percentage of each metal in the emission, have been used to predict the process results for trace metals, as outlined in the Environment Agency guidance on releases from municipal waste incinerators, 2012[37]. It is considered that this guidance offers the most robust assessment of trace metal emissions. Step 1 of the guidance proposes that each Group III metal is emitted at the IED emission limit value (therefore assumed that the other 8 metals not emitted at all). This represents an unrealistic but theoretical worst case for each of

[37] Environment Agency (2012) Waste incinerators: guidance on impact assessment for group III metals stack (Version 4, June 2016)

the metals. The guidance then proposes that if any of the predicted environmental concentrations (PECs) exceed the Environmental Assessment Level (EAL) the assessment should proceed to Step 2. Step 2 assumes emissions of Group III metals are at the mean values found from an analysis of 18 municipal waste incinerators. These percentages (of the IED emission rate for Group II metals) are specified in the guidance and are as follows: Pb (2.2%), As (0.2%), Ni (3.0%), Sb (0.3%), Cr (1.7%), Co (0.2%), Cu (1.5%), Mn (3.4%) and V (0.1%). The percentage of CrVI, an isotope of Cr, is specified in the guidance as 0.01%. The nine Group III metal percentages total 12.6% indicating that the mean emissions of Group III metals is 12.6% of the IED ELV, and this is what has been assumed in the modelling and assessment of air quality (and is consistent with the method used in the HHRA).

For the Group I metals, the guidance does not specify as percentage composition and so the Group I emissions have been assumed to be 100% Cd and 100% Tl (as per Step 1 of the Guidance). Neither of the PECs exceed the EALs for these two metals so the assessment has not proceeded to Step 2. For the HHRA a Step 2-type approach (more realistic emissions) has been included and this is explained further in Appendix G)

4.3.2.9 Short Term Background Concentrations

For many pollutants there are short-term air quality limits and EALs, such as the 15-minute mean limit for SO_2 and the 24-hour mean limit for PM_{10}. There are no short-term limits for $PM_{2.5}$. The limits are given as a permitted annual number of exceedences of a threshold concentration which can be expressed as an equivalent percentile. For instance the SO_2 15-minute mean limit can be expressed as the 99.9th percentile of the predicted environmental concentration, that is, the sum of the contribution from the process and the background concentration.

99.9th percentile 15-minute mean SO_2 concentrations due to the process (EfW CHP or DERL) were obtained as a direct output from the ADMS model. The modelled concentrations of substances emitted from the plant are combined with background concentrations of the substances present in the environment for comparison with air quality standards. In the case of long-term mean concentrations, the long-term mean concentration contributions from the proposed EfW CHP facility could be added directly to long-term mean background concentrations. It is not possible to add short-term peak background concentrations and process concentrations in the same way. This is because the conditions which give rise to peak ground-level concentrations of substances emitted from an elevated source at a particular location and time are likely to be different from the conditions which give rise to peak concentrations due to emissions from other sources.

This point is addressed in SEPA's H1 guidance[26] which advises that an estimate of the maximum combined pollutant concentration can be obtained by adding the maximum short term concentration due to emissions from the source to twice the annual mean background concentration.

The same method has been applied for short-term PM_{10} concentrations and for all other pollutants with short-term limits/ELAs.

4.3.2.10 NOx to NO_2 Conversion for Stack Emissions

The air quality model predicts concentrations of nitrogen oxides which is a mixture of NO_2 and nitric oxide (NO). Both gases react in the atmosphere, particularly with ozone. In general, the nitrogen oxides are mainly emitted as nitric oxide and this converts to NO_2 in the atmosphere. The air quality standard has been set for NO_2 and therefore it is important that an appropriate conversion rate is used to calculate NO_2 from the modelled NO_X.

For stack emissions the Environment Agency advice on conversion rates has been used, which suggests 35% NO_2 for short-term (i.e. hourly average) and 70% NO_2 for long-term (i.e. annual mean) concentrations. In practice, these ratios represent conditions some distance away from a release source. Close to an industrial source, the proportion of NO_2 in nitrogen oxides is typically much lower than this. Applying these ratios therefore provides a worst case assessment.

4.3.3 Plume Visibility

Water in the emitted gases can condense and form a visible plume. There are no formal or informal standards for visible plume lengths although visible plumes that reach ground level should be avoided. It can be expected that SEPA would seek to reduce the frequency of visible plumes but as this can be at the expense of increased energy usage, a balance has to be made between visible plume length and energy use.

Plume visibility from the stack depends on ambient meteorological conditions, flue gas humidity and the efflux temperature of the stack. A visible plume is formed when the temperature of the ambient air mixed with the flue gas, is lower than the saturation temperature of the water vapour emitted with flue gas. The EfW CHP facility is likely to generate a visible plume for some periods of the year, and this has been modelled and quantified using the ADMS 5 dispersion model.
As noted, there are no standards for visible plume lengths; for this study, the frequency of visible plume lengths up to 3,000m has been examined.

4.3.4 Sensitivity Analysis of Modelling Methods

In order to define the method used to undertake the assessment a number of sensitivity analyses were undertaken to determine which modelling options should or should not be included. Emissions from the proposed EfW CHP were used and the effect of changing elements of the modelling methodology were examined. Each is discussed in detail and the results are presented in the following sections;

- selection of met station (3 stations examined);
- selection of met year from Leuchars met station (5 years examined);
- consideration of coastal effects;
- comparison of ADMS and AERMOD dispersion models;
- consideration of terrain; and

- consideration of the effect of the buildings and the two neighbouring wind turbines on dispersion (note that the buildings present are relatively short compared to the stack height and therefore this sensitivity predominantly tested the effect of the wind turbines).

The impact on ground level concentrations for a range of pollutants and averaging periods was examined using the maximum predicted on the small grid of receptors (see Figure 5) which gave higher concentrations than at discrete sensitive receptor locations.

A summary of the sensitivity tests is included in Table 13.

Table 13: Summary of sensitivity analyses

	Main Assessment	Sensitivity Study					
		Met station	Met year	Coastal Effects	Model Choice	Terrain	Turbines
Leuchars 2011	×	×	✓	×	×	×	×
Leuchars 2012	×	×	✓	×	×	×	×
Leuchars 2013	×	×	✓	×	×	×	×
Leuchars 2014	×	×	✓	×	×	×	×
Leuchars 2015	✓	✓	✓	✓	✓	✓	✓
Broughty Ferry	×	✓	×	×	×	×	×
Mains Loan	×	✓	×	×	×	×	×
Coastal effects	×	×	×	✓/×	×	×	×
ADMS	✓	✓	✓	✓	✓	✓	✓
AERMOD	×	×	×	×	✓	✓	×
Terrain	✓	✓	✓	✓	×	✓/×	✓
Turbines	✓	✓	✓	×	×	×	✓/×
Buildings	✓	✓	✓	×	×	✓	×

4.3.4.1 Selection of Met Station

ADMS and AERMOD requires certain met data parameters as input; these include wind speed and direction but also cloud cover and temperature data. Wind speed and direction data were available from Broughty Ferry and Mains Loan for 2015; these data were combined with other required parameters from the Leuchars met station. Wind roses from Broughty Ferry and Mains Loan for 2015 are shown in Figure 10 and Figure 11 respectively.

Figure 10: Wind rose from Broughty Ferry meteorological station

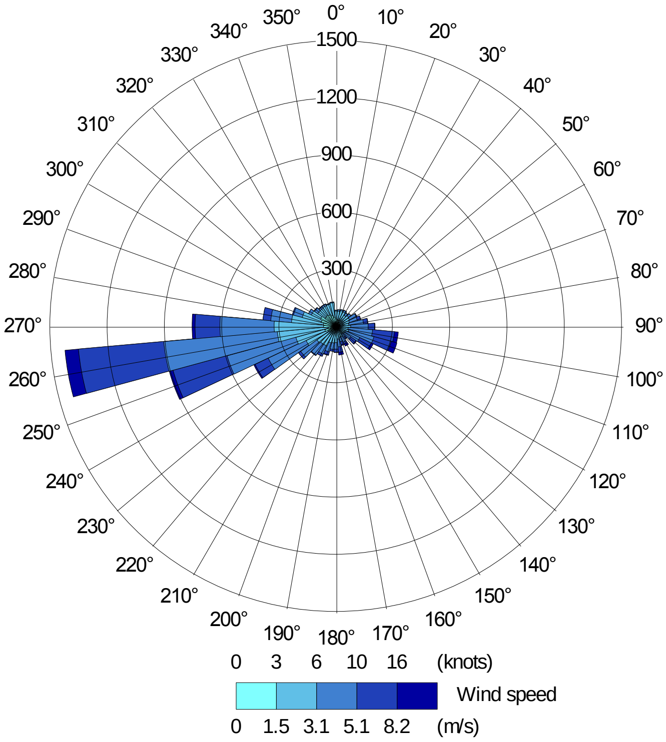
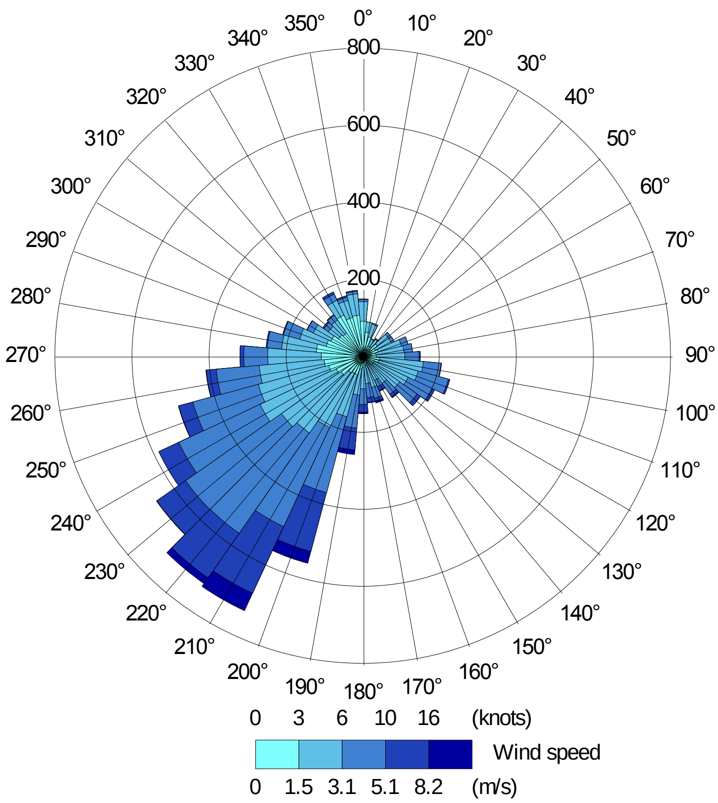


Figure 11: Wind rose from Mains Loan meteorological station



Annual mean ground level concentrations of NO_2 and PM_{10} were predicted for each of the three met stations (2015) including terrain and building effects. The maximum concentrations (from the small output grid) are presented in the table below. Bold underline indicates the maximum value in the series.

Table 14: Sensitivity of ambient concentrations to choice of met station

Met station	**Maximum annual mean concentration (µg/m³)**	
	NO_2	**PM_{10}**
Leuchars 2015	**<u>0.94</u>**	**<u>0.067</u>**
Broughty Ferry 2015	0.82	0.058
Mains Loan 2015	0.65	0.046

Table 14 shows that the selection of Leuchars 2015 met data gives rise to the maximum concentrations; the alternative met stations result in concentrations around 70-85% of those using Leuchars 2015 met data.

4.3.4.2 Selection of Met Year

The effect of using each of the five years (2011-2015) of met data from Leuchars met station on the ground level concentrations was examined for each of the following pollutants/averaging period/statistic combinations:

- Maximum 15-minute mean SO_2 for each year;
- Maximum 1-hour mean and annual mean NO_2 for each year; and
- Maximum 24 hour mean PM_{10} for each year.

It is not necessary to carry out the sensitivity for each pollutant as the sensitivity to met year will be the same for each averaging time/statistic combination. The maximum concentration (from the small output grid) are presented in Table 15 (bold underline indicates the maximum value in the series). The terrain model option was not included.

Table 15: Sensitivity of ambient concentrations to choice of met year

Maximum concentration (µg/m³)	**2011**	**2012**	**2013**	**2014**	**2015**
15 min SO_2	2.76	2.93	2.91	**<u>3.12</u>**	2.96
1 hour NO_2	11.4	14.4	12.0	12.6	**<u>15.4</u>**
24 hour PM_{10}	0.198	**<u>0.228</u>**	0.210	0.217	0.210
Annual Mean NO_2	0.78	0.68	0.75	0.68	**<u>0.85</u>**

Some of the results show higher concentrations in years other than 2015 but the differences are small and so 2015 was chosen for the assessment.

4.3.4.3 Coastal Effects

The ADMS coastal effects module has been used to examine the effect on maximum annual mean NO_2 and PM_{10} concentrations (see section 4.3.2.3 for more description of this aspect of modelling). The ADMS model requires that the coastline is a straight line and uses this to determine when the winds (using the hourly met data) are onshore. The configuration of the coastline input to ADMS is shown in Figure 12: Representation of the coastline input to ADMS

Figure 12: Representation of the coastline input to ADMS

The maximum concentrations (from the small output grid) are presented in Table 16 (bold underline indicates the maximum value in the series) using 2015 Leuchars met data.

Table 16: Sensitivity of ambient concentrations to using the ADMS coastal module

Max (µg/m³)	Without coastal module in ADMS	With coastal module in ADMS
Annual Mean NO_2	0.46	0.46
Annual Mean PM_{10}	0.033	0.033

The results show that inclusion of the coastal module in ADMS makes negligible difference to the results. This was the expected result as use of the coastline module only makes a difference to results for a small number of hours, and the impact is short-range i.e. within about 1km of the coastline. Hence, the coastal module has not been included in the main assessment.

4.3.4.4 Model Choice (ADMS/AERMOD)

The ADMS 5 model has been used for the assessment, as the model was developed for the UK and is considered appropriate for this application. ADMS 5 includes the capability to run the main model options of AERMOD[38,39], which is a similar model developed in the US.

A sensitivity analysis has been undertaken using the AERMOD model. ADMS meteorological data has been used for both model runs, and the met processor in ADMS has been used to convert the met data for use in the AERMOD model run. Modelling results from each model were compared and the realistic worst case assumptions taken forward to full assessment.

The maximum concentration (from the small output grid) are presented in Table 17 (bold underline indicates the maximum value in the series) using 2015 Leuchars met data, with terrain and buildings. Results are also presented for AERMOD with and without terrain to determine whether the AERMOD model is sensitive to terrain.

Table 17: Sensitivity of ambient concentrations to choice of dispersion model

Maximum concentration (μg/m^3)	ADMS with terrain	AERMOD with terrain	AERMOD without terrain
Annual mean NO_2	**0.94**	0.36	0.36
Annual mean PM_{10}	**0.067**	0.026	0.026

The results show that ADMS gives a higher annual mean maximum concentration by a factor of approximately 3 and that terrain makes no difference to the results using AERMOD. Hence, ADMS has been used in the main assessment.

4.3.4.5 Terrain

The effect on annual mean NO_2 and PM_{10} concentrations of including terrain in the ADMS model using 2011-2015 Leuchars met data was investigated. Terrain was found to increase concentrations and so terrain has been included in the main assessment. See section 4.3.2.3 for further details of the terrain modelled.

The maximum concentration (from the grid, concentrations at sensitive receptors were lower than those on the grid) are presented in Table 18 (bold underline indicates the maximum value in the series) using 2015 Leuchars met data, with buildings.

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[38] CERC (2016) ADMS 5 Atmospheric Dispersion Modelling System User Guide

[39] US EPA Preferred/Recommended Models https://www3.epa.gov/scram001/dispersion_prefrec.htm

Table 18: Sensitivity of ambient concentrations to inclusion of terrain

Maximum concentration ($\mu g/m^3$)	ADMS with terrain	ADMS without terrain
Annual mean NO_2	**0.94**	0.85
Annual mean PM_{10}	**0.067**	0.061

The results show terrain increases annual mean concentrations by around 10% and so terrain has been included in the main assessment.

4.3.4.6 Effect of turbines and buildings

ADMS has the ability to include the effect of wind turbines and buildings on dispersion. The effect on annual mean NO_2 and PM_{10} concentrations of including buildings and the two turbines on the Michelin site using ADMS model, Leuchars 2015 met data was investigated including the effect of terrain. See section 4.3.2.6 for further description of the buildings and wind turbine data used as input to the model.

Table 19: Sensitivity of ambient concentrations to the inclusion of the wind turbine effects on dispersion

Maximum concentration ($\mu g/m^3$)	ADMS with turbines/buildings	ADMS without turbines/ buildings
Annual mean NO_2	**0.94**	0.46
Annual mean PM_{10}	**0.067**	0.033

The results show that inclusion of the buildings and wind turbines increases annual mean concentrations by around 50% and so buildings and wind turbines have been included in the main assessment.

4.3.5 Nutrient Nitrogen Deposition and Acid Deposition

With regard to nitrogen and acid deposition, site and habitat specific critical loads and existing deposition rates have been taken from the Air Pollution Information System (APIS) website[14]. Predicted deposition at ecological receptors has been compared against the lowest critical loads to provide a worst case assessment.

The assessment has looked at the Critical Load Functions (CLFs) for acidity using the graphs on the APIS website. The CLF graphs for the most sensitive species in each designated area have been used to estimate the worst case impact.

The information on the critical loads and the most sensitive habitat for each designated for vegetation of nutrient nitrogen and acidity (nitrogen and sulphur) are given in Appendix E.

Acid deposition is assessed in terms of the Critical Load Functions (CLFs) for acidity, which are a function of nitrogen (N) and sulphur (S) deposition. The critical load functions are site- and feature/habitat-specific. Total nitrogen (N) deposition has been derived from the addition of ammonia and nitrogen dioxide deposition results. While HCl and HF give rise to acid deposition they are not assessed as part of the CLFs.

The CLFs comprise two lines on a graph, which represent two envelopes of safety (reflecting the present uncertainty in the scientific knowledge and evidence-base on the effects of acidic air pollution on sensitive species). If the total acid deposition rate falls above the higher ‘maximum CL’ graph, it is likely that there are harmful effects on the relevant habitat/features arising from the current level of acid (due to both nitrogen and sulphur) deposition. If the total acid deposition level is below the lower ‘minimum CL’ graph, it is unlikely that the feature/habitat is being harmed. If the current total acid (due to both nitrogen and sulphur) deposition level lies between the lower and upper CLFs, it is not possible to be certain that harm is occurring.

The dry deposition flux for each receptor location has been calculated based on recommended deposition velocities as shown in Table 20.

Table 20: Recommended dry deposition velocities

Chemical species	Recommended deposition velocity, m/s	
NO_2	Grassland	0.0015
	Forest	0.003
SO_2	Grassland	0.012
	Forest	0.024
NH_3	Grassland	0.020
	Forest	0.030
HCl	Grassland	0.025
	Forest	0.060

Conversion factors are used to convert dry deposition flux from units of $\mu g/m^3$ $/m^2/s$ to kg/ha/yr are shown in Table 21.

Table 21: Conversion factors to change units from $\mu g/m^2/s$ of chemical species X to kg of X/ha/yr

Chemical species	Conversion factor $\mu g\ m^2/s$ of species X to kg/ha/year	
NO_2	of N:	96
SO_2	of S:	157.7
NH_3	of N:	259.7
HCl	of HCl:	306.7

The unit of ‘equivalents’ is also used for acidification purposes, rather than a unit of mass. Essentially it means ‘moles of charge’ i.e. it is a measure of how acidifying the chemical species can be. It is denoted by ‘keq’.

To convert kg/ha/yr to keq/ha/yr multiply the deposition flux by the conversion factors shown in Table 22.

Table 22: Conversion factors to alter units from kg of N or S ha/yr to keq of N or S ha/ya

Species	Conversion factor kg/ha/year to keq/ha/year
N	0.071428
S	0.0625

For hydrogen chloride (HCl) both wet and dry deposition has been considered, and results are a sum of both deposition methods. A constant value of 0.00007 has been used for the wet deposition coefficient.

4.3.6 Assessment of Impacts and Significance of Effect

4.3.6.1 Human Health

The assessment of air quality impacts and the overall significance of effect for human health receptors has been determined following the methodology set out in the EPUK/IAQM land-use planning guidance. The full methodology and criteria is presented in section 4.2.5.

4.3.6.2 Ecology

The significance of the assessment of impacts at designated ecological sites with regard to the comparison of annual mean NOx concentrations with the annual mean NOx limit value has been undertaken based on the principles set out in the EPUK/IAQM land-use planning guidance.

SEPA's H1 guidance recommends that if the predicted contribution of the installation under investigation (Process Contribution) exceeds 1 per cent of the Critical Level, then the contribution of the installation in conjunction with the prevailing background airborne concentration (Predicted Environmental Concentration) must be assessed against the Critical Level. If the total Predicted Environmental Contribution is less than 70 per cent of the Critical Level, the installation is not likely to have a significant effect on the sensitive ecosystem.

The critical levels are concentrations below which harmful effects are unlikely to occur. The critical level for NOx applies to locations more than 20km from towns with more than 250,000 inhabitants or more than 5km from other built-up areas, industrial installations or motorways. However, SEPA's H1 guidance states that "*the critical levels should be applied at all locations as a matter of policy, as they represent a standard against which to judge ecological harm*".

For ecological sites the H1 test set out above has been used. The overall significance of effect at ecological receptors has been concluded with input from the ecologists for the Proposed Scheme.

4.4 Methodology for Odour Assessment

The SEPA H4 Technical Guidance provides 'benchmark levels' that 'indicate the likelihood of unacceptable odour pollution'. H4 proposes a range of benchmark levels that depend on the relative offensiveness of the odour and are based on the annual 98th percentile of hourly mean odour concentrations. The 98th percentile of hourly means is determined by calculating the odour concentration for every hour of the year at a point, sorting these concentrations into ascending order and then taking the value where 98% of the hourly means have lower predicted concentrations (and therefore 2% of the hourly mean have higher concentrations than the 98th percentile).

For the more unpleasant odours such as processes involving decaying animal remains a benchmark level of 1.5 ou_E/m^3 as a 98th percentile of annual hourly mean concentrations is used. Moderately offensive odours (e.g. fat frying) have a criterion of 3 ou_E/m^3. Less unpleasant odours, for example from baking, have a less stringent standard of 6 ou_E/m^3.

These benchmark values are only used where numerical odour modelling is carried out but they do highlight some general principles that are important in assessing the potential for nuisance:

- A certain level of odour is considered to be tolerable if it is below a certain intensity and frequency;
- Nuisance or annoyance is more likely when the odours are unpleasant (i.e. offensive);
- Nuisance or annoyance can occur even with odours considered to be pleasant.

4.4.1 IAQM Guidance

The Institute of Air Quality Management (IAQM) produced guidance[28] which recommends various assessment techniques including the use of a Source-Pathway-Receptor model. The risk of an adverse odour impact is determined by examining the source characteristics, how effectively the odours can travel from the Source to a receptor (i.e. the Pathway) and examining the sensitivity of the Receptor. Example risk factors presented in the guidance are shown in Table 23.

Table 23: IAQM Source-Pathway-Receptor approach

Source Odour Potential	Pathway Effectiveness	Receptor
Factors affecting the source odour potential include: • The magnitude of the odour release • How inherently odorous the compounds are • The unpleasantness of the odour	Factors affecting the odour flux to the receptor are: • Distance from source to receptor • The frequency of winds from source to receptor • The effectiveness of any mitigation in reducing flux to the receptor • The effectiveness of dispersion/dilution in reducing the odour flux to the receptor • Topography and terrain	Use professional judgement based on the expectation of the users at the receptor location (Table 24 below).

The following table has been reproduced from the IAQM Odour Guidance and relates to the sensitivity of people to odour. Professional judgement is required to identify between the spectrums of high and low receptor sensitivity, taking into account the general principles listed in Table 24.

Table 24: IAQM receptor sensitivity to odours

Receptor Sensitivity	Details
High sensitivity receptor	Surrounding land where: • users can reasonably expect enjoyment of a high level of amenity; and • people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education, tourist/cultural and food retail/processing.
Medium sensitivity receptor	Surrounding land where: • users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or • people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Low sensitivity receptor	Surrounding land where: • the enjoyment of amenity would not reasonably be expected; or • there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads.

4.4.2 Odour Impacts

The magnitude of odour impact depends on a number of factors and the potential for complaints varies due to the subjective nature of odour perception. The IAQM Odour Guidance includes information on the **FIDOL** acronym which is a useful reminder of the factors that will determine the degree of odour pollution (note this is the same FIDOL acronym used in the SEPA Odour Guidance, 2010):

- **F**requency of detection - frequent odour incidents are more likely to result in complaints;
- **I**ntensity as perceived - intense odour incidents are more likely to result in complaints;
- **D**uration of exposure - prolonged exposure is more likely to result in complaints;
- **O**ffensiveness - more offensive odours have a higher risk of resulting in complaints; and,
- **L**ocation sensitivity - sensitive areas are more likely to have a lower odour tolerance.

It is important to note that even infrequent emissions may cause loss of amenity if odours are perceived to be particularly intense or offensive. The FIDOL factors can be further considered to provide the following issues in regards to the potential for an odour emission to cause a nuisance:

- The rate of emission of the compound(s);
- The duration and frequency of emissions;
- The time of the day that this emission occurs;
- The prevailing meteorology;
- The sensitivity of receptors to the emission i.e. whether the odorous compound is more likely to cause nuisance, such as the sick or elderly, who may be more sensitive;
- The odour detection capacity of individuals to the various compound(s); and,
- The individual perception of the odour (i.e. whether the odour is regarded as unpleasant). This is greatly subjective, and may vary significantly from individual to individual. For example, some individuals may consider some odours as pleasant, such as petrol, paint and creosote.

A Source-Pathway-Receptor assessment has been undertaken having regard to the aspects of the FIDOL acronym has been undertaken to determine the likelihood of odour being generated by the Proposed Scheme.

4.4.3 Assessment of Significance

The IAQM guidance provides a matrix to determine the overall significance of a proposed scheme based on the odour impact and the sensitivity of the receptor. The matrix is shown in Table 25. The criteria set out in Table 25 have been used to determine the significance of the Proposed Scheme with regard to odour. Where the overall effect is moderate adverse or above, this is considered to be significant, otherwise the effect is considered to be not significant.

The regulation of the proposed development under an environmental permit will minimise and control odour where possible through the application of BAT. These have been considered to be embedded in the design when determining the significance of effect.

Table 25: IAQM suggested descriptors for significance of odour effects

Odour Exposure (Impact)	Receptor Sensitivity		
	Low	**Medium**	**High**
Very Large	Moderate Adverse	Substantial Adverse	Substantial Adverse
Large	Slight Adverse	Moderate Adverse	Substantial Adverse
Medium	Negligible	Slight Adverse	Moderate Adverse
Small	Negligible	Negligible	Slight Adverse
Negligible	Negligible	Negligible	Negligible

5 Baseline Assessment

The overall approach to the baseline air quality assessment comprises a review of the existing air quality conditions in the vicinity of the Proposed Scheme.

5.1 Sources of Air Pollution

The main sources of air pollution in the vicinity of the Proposed Scheme are road traffic and industrial sources.

5.1.1 Industrial Processes

Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met and ensuring that any releases to the environment are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A or Part B processes, and are regulated through the Pollution Prevention and Control (PPC) system. The larger more polluting processes are regulated by the SEPA, and the smaller less polluting ones by the local authorities. Local authorities tend also to regulate only for emissions to air, whereas the SEPA regulates emissions to air, water and land.

A review of the Scottish Pollutant Release Inventory (SPRI) shows that there are 28 processes regulated by SEPA within 16km (10miles) of the Proposed Scheme site, as shown in Figure 13 and Table 26.

The impacts of all industrial processes in the area on local air quality are taken into account in the background concentrations shown in this report, and therefore have not been explicitly modelled in this assessment with two exceptions: the existing DERL facility and the Michelin facility. These sources have been included in the baseline assessment and cumulative assessment respectively.

Figure 13: SPRI sites within 16km of the Proposed Development

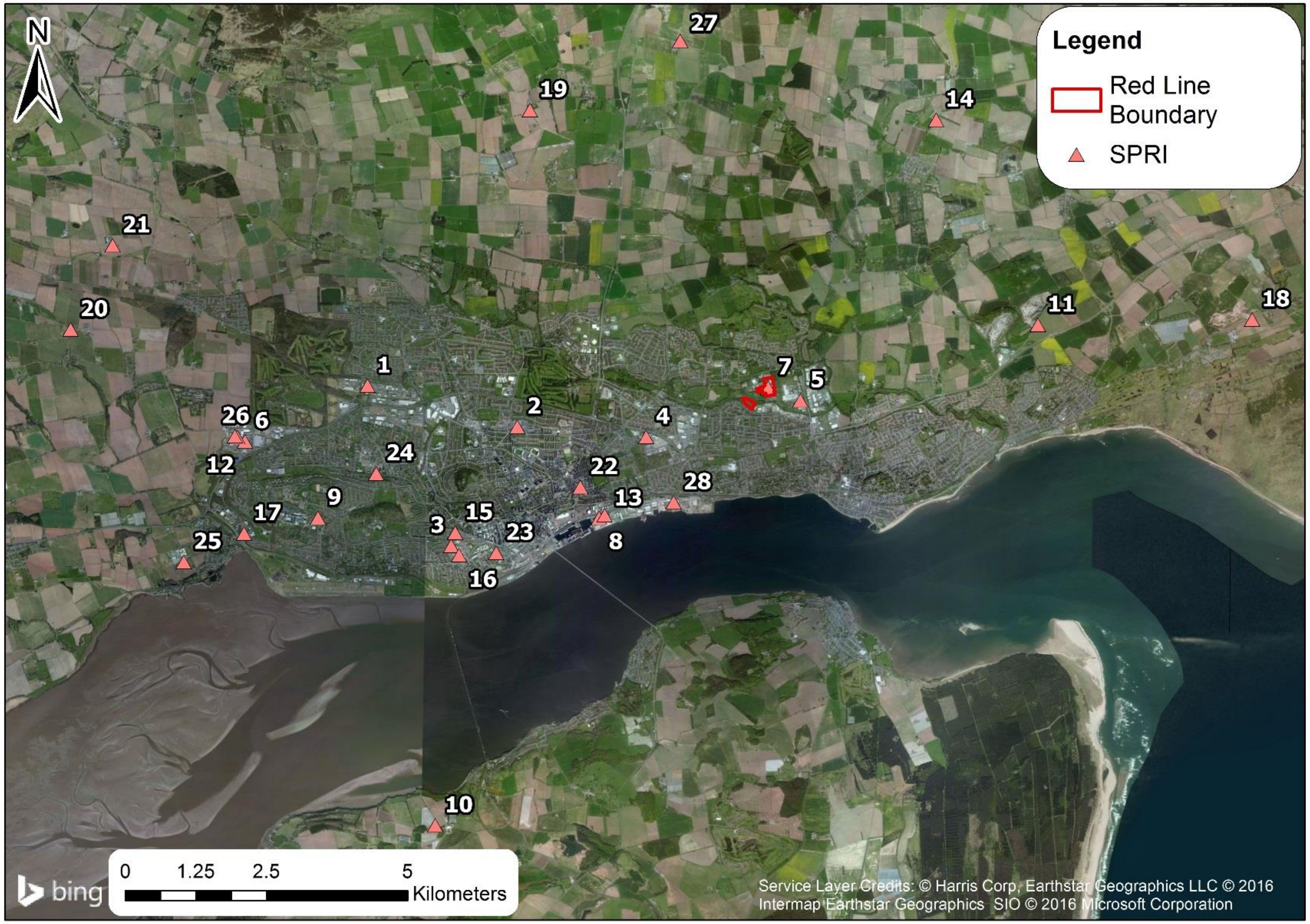


Table 26: SPRI sites within 16km of the Proposed Scheme

ID	Site name	Approximate site location (OS grid ref)		Distance from site (km) and (direction)
		x	y	
1	ASKA Energy	337449	732996	7.1 (E)
2	Day International	340102	732264	4.5 (E)
3	Halley Stevenson (Dyers & Finishers)	338933	730157	6.3 (SW)
4	D C Thomson & Company	342386	732087	2.3 (SW)
5	Michelin Tyres	345118	732736	0.6 (E)
6	Rockwell Solutions	335280	732011	9.3 (E)
7	Dundee Energy Recycling	344545	732960	0.1 (N)
8	GRC Skip Hire & Waste Management	341551	730652	3.8 (SW)
9	Ninewells Medical School, NHS Tayside	336570	730654	8.3 (SW)
10	Peacehill Farm, T D Forster & Son	338648	725206	9.7 (SW)
11	Ardownie Quarry, D Geddes (Contractors)	349323	734071	4.9 (E)
12	Healthcare Environmental Services	335144	732081	9.4 (E)
13	Nynas UK	341650	730701	3.7 (SW)
14	Wellbank Landfill Site, UK Waste Management	347520	737702	5.6 (NE)
15	Ninewells Hospital, NHS Tayside	339005	730390	6.1 (SW)
16	University of Dundee Incubator Building	339072	729992	6.2 (SW)
17	Millipore	335260	730373	9.6 (SW)
18	Poultry Farm, Ian Jamieson & Partners	353117	734167	8.7 (E)
19	Tealing Poultry Farm	340326	737875	6.5 (SW)
20	Cransley First Broiler Farm	332191	733988	12.4 (E)
21	East Adamston Poultry Farm	332936	735482	11.9 (NE)
22	Discovery Flexibles	341216	731199	3.8 (SW)
23	University Of Dundee	339727	730031	5.6 (SW)
24	Ramsay McBain	337605	731437	7.1 (SW)
25	The James Hutton Institute	334196	729871	10.8 (SW)
26	D J Laing (Contracts)	335099	732101	9.5 (E)
27	Petterden Waste Recycling	342988	739105	6.4 (N)
28	The British Millerain Co	342872	730928	2.6 (SW)

Notes: N = north, E = east, S = south, W = west

5.2 Local Air Quality

All of Dundee City council area was declared an AQMA in 2013. The AQMA was declared due to exceedences of the 1-hour and annual mean NO_2 air quality objectives, and the annual mean PM_{10} air quality objective. Figure 14 shows the site location and the boundaries of the AQMA.

5.2.1 Local Air Quality Monitoring

The city of Dundee carries out automatic monitoring of NO_2 and PM_{10} concentrations at seven monitoring sites in the city. Details of the monitoring sites are outlined in Table 27. Automatic monitoring involves the use of instruments which continuously draw air through the instrument, and provide data on short averaging periods such as 15 minutes.

Local monitoring data on the Air Quality Scotland website has been reviewed, and data from all automatic air quality sites in Dundee is shown in Table 28 and Table 29 for 2013, 2014 and 2015, with site locations shown in Figure 15. Annual mean concentrations of NO_2 and PM_{10} are shown in Table 28. There are no sites monitoring $PM_{2.5}$ in Dundee. Annual mean concentrations of NO_2 exceeded the air quality objective of 40 µg/m^3 at the two kerbside sites (DUN5 Seagate and DUN6 Lochee Road) in 2015. Annual mean concentrations of PM_{10} exceeded the air quality objective of 18 µg/m^3 at one of the kerbside sites, DUN6 Lochee Road, in 2015.

The number of exceedences of the short-term air quality objectives for NO_2 and PM_{10} are shown in Table 29. For PM_{10} daily mean concentrations of 50 µg/m^3 are not to be exceeded more than 7 times a year, and for NO_2 hourly mean concentrations of 200 µg/m^3 are not to be exceeded more than 18 times a year. There were no sites which exceeded the PM_{10} objective in 2013, 2014 or 2015. One site (DUN6 Lochee Road) which is a kerbside site, exceeded the NO_2 objective in 2013; no other automatic sites in Dundee exceeded the NO_2 objective in 2013, 2014 or 2015.

Concentrations at the background monitoring sites (DUN1 Mains Loan, DUN4 Broughty Ferry) met the relevant air quality objectives for NO_2 and PM_{10} in 2013, 2014 and 2015.

Table 27: Automatic air quality monitoring sites in Dundee City

Site ID	**Site name**	**Site type**	**OS grid reference**	
			x	**y**
DUN1	Mains Loan	Urban background	340970	731892
DUN3	Union Street	Roadside	340234	730091
DUN5	Seagate	Kerbside	340486	730446
DUN4	Broughty Ferry Road	Urban industrial	341970	730976
DUNM	Meadowside	Roadside	340243	730658
DUN6	Lochee Road	Kerbside	338859	730774
DUN7	Whitehall Street	Roadside	340277	730154

Table 28: Long-term automatic air quality monitoring data in Dundee City

Site ID	Site name	Annual mean NO_2 concentration (μg/m^3)			Annual mean PM_{10} concentration (μg/m^3)		
		2013	**2014**	**2015**	**2013**	**2014**	**2015**
DUN1	Mains Loan	*	13	11	12	13	12
DUN3	Union Street	31	29	28	15	16	17
DUN5	Seagate	55	55	50	16	18	14
DUN4	Broughty Ferry Road	-	-	-	16	15	13
DUNM	Meadowside	49	40	38	**19**	17	16
DUN6	Lochee Road	52	46	48	18	**19**	**20**
DUN7	Whitehall Street	41	43	36	-	-	-
Notes: '-' no monitoring of this pollutant is undertaken at this site. '*' indicates data capture less than 75% at the monitoring site in this year. Concentrations in bold exceed the relevant air quality objectives.							

Table 29: Short-term automatic air quality monitoring data in Dundee City

Site ID	Site name	No. of exceedences of the hourly mean NO_2 air quality objective of 200 μg/m^3			No. of exceedences of the daily mean PM_{10} air quality objective of 50 μg/m^3		
		2013	**2014**	**2015**	**2013**	**2014**	**2015**
DUN1	Mains Loan	*	0	0	1	1	1
DUN3	Union Street	0	0	0	1	2	7
DUN5	Seagate	10	0	0	4	2	3
DUN4	Broughty Ferry Road	-	-	-	4	1	2
DUNM	Meadowside	0	0	0	4	2	4
DUN6	Lochee Road	100	1	6	3	1	5
DUN7	Whitehall Street	0	0	0	-	-	-
Notes: '-' indicates no monitoring of this pollutant is undertaken at this site. '*' indicates data capture less than 75% at the monitoring site in this year. Concentrations in bold exceed the relevant air quality objectives.							

Figure 14: Dundee AQMA

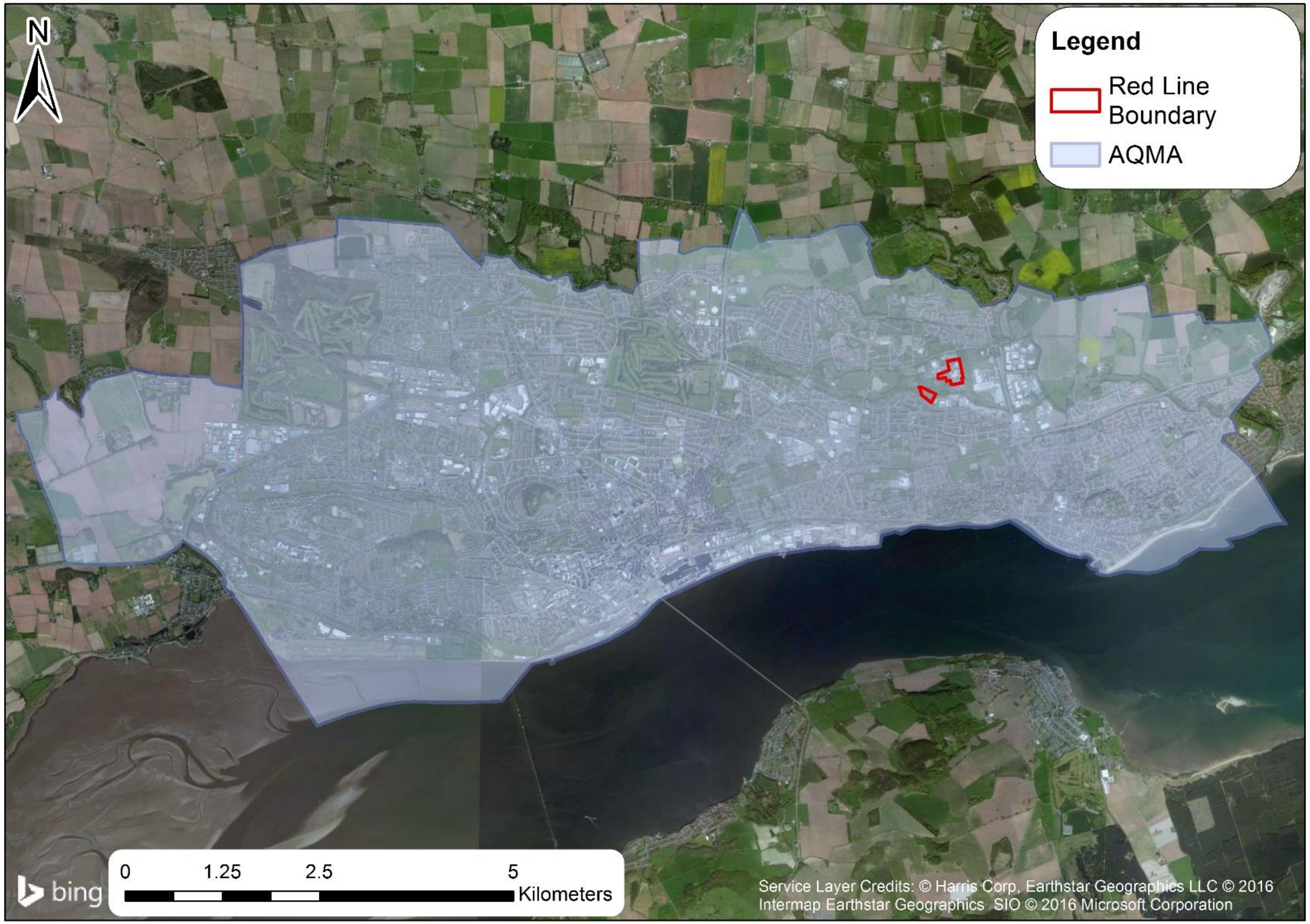


Figure 15: Dundee City Council automatic air quality monitoring sites

5.2.2 Project-specific Monitoring

A baseline monitoring survey of NO_2 in the area has been carried out, between November 2015 and 2016 to complement the baseline assessment of existing air quality conditions in the area.

Monitoring has been undertaken using diffusion tubes, which are a passive monitoring method widely used in the UK for measuring ambient concentrations of NO_2. Diffusion tubes consist of a small plastic tube containing a chemical reagent which absorbs the pollutant to be measured (in this case NO_2) directly from the air. Eleven monitoring points were selected, including one adjacent to the DERL facility, eight locations close to residential properties, one background location and one co-located with an automatic monitor operated by DCC. The monitoring locations are shown in Figure 15 and details are provided in the Table 30.

Table 30: Project-specific monitoring locations

Site ID	Site Name	Site Type	OS Grid Ref	
			x	y
1	Baldovie/Drumgieth Road	Roadside	345088	733302
2	Drumgeith Road	Roadside	344696	733290
3	Britannia Drive	Roadside	344167	733328
4	Britannia Drive	Roadside	343903	733028
5	Kellas Road	Background	345517	734449
6	Balmerino Road	Roadside	344190	732616
7	Balunie Drive	Roadside	345349	732079
8	Forties Road (Proposed Site)	Roadside	344504	732934
9	Meadowside Automatic Monitor	Roadside	340245	730655
10	Arbroath Road/ Gotterstone Avenue	Roadside	344236	731786
11	4 Brot'y Ferry Court	Roadside	345272	732430

Diffusion tubes were attached to street furniture, fixed at a height representative of human exposure. Duplicate or triplicate tubes are used at each location and, following a four-week monitoring period, they are sent to a UKAS accredited laboratory for analysis.

A full year of monitoring has been carried out, with the exception of three locations. Where necessary, results have been annualised and all results have been bias-adjusted based on the comparison of data from diffusion tubes co-located at the Meadowside automatic monitor. Bias-adjustment accounts for uncertainty associated with using a passive monitoring method. The results are shown in Table 31 and the sites are shown in Figure 16. Average concentrations at all monitoring sites close to the Application Site are below the annual mean NO_2 objective.

Figure 16: MVV air quality monitoring sites

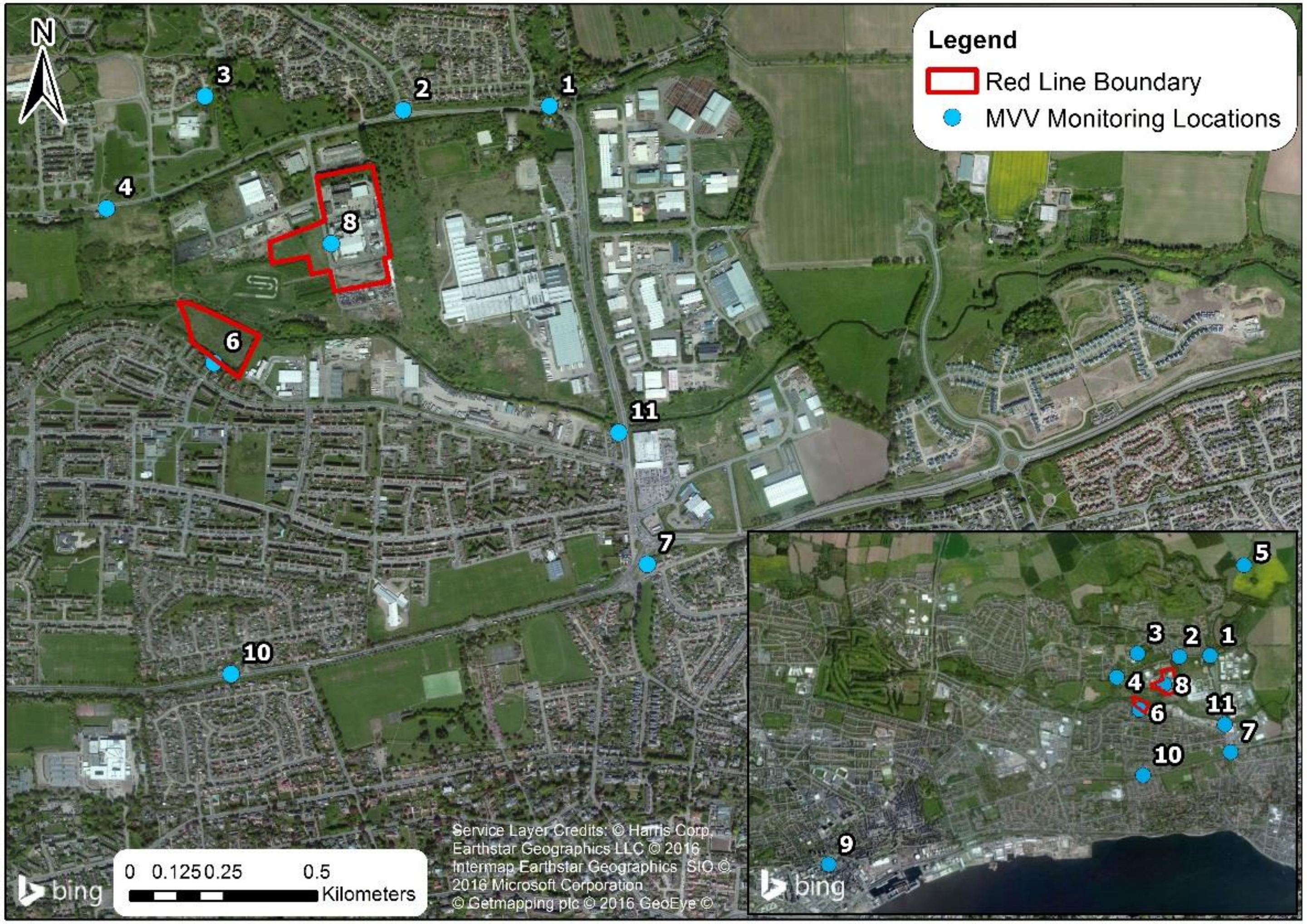


Table 31: MVV air quality monitoring data

Site ID	Site name	Mean NO_2 concentration ($\mu g/m^3$)												
		Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**	**Period 7**	**Period 8**	**Period 9**	**Period 10**	**Period 11**	**Period 12**	**Bias-adjusted annual average**
1	Baldovie/Drumgieth Road	39.0	25.2	34.5	32.0	24.5	22.2	24.5	21.5	21.3	26.0	28.4	38.5	24.4
2	Drumgeith Road	41.0	24.6	34.3	32.2	23.0	18.1	19.3	18.8	17.7	22.4	26.2	38.7	22.9
3	Britannia Drive	20.7	15.5	18.7	15.6	8.6	6.4	-	8.7	-	12.7	11.6	21.1	12.1
4	Britannia Drive	33.2	21.1	30.3	28.5	16.5	13.2	13.9	15.1	13.5	15.2	20.1	33.7	18.4
5	Kellas Road	21.4	16.9	17.9	16.9	9.7	8.9	8.0	9.9	9.4	14.3	11.6	21.1	12.0
6	Balmerino Road	22.2	16.3	21.4	20.0	9.3	6.9	6.1	-	8.6	13.5	12.0	23.3	12.6
7	Balunie Drive	24.6	29.8	37.9	37.5	24.7	19.2	18.9	23.2	22.4	26.7	26.7	45.7	24.4
8	Forties Road (Proposed Site)	22.8	17.8	21.6	21.4	12.0	9.7	9.8	7.9	11.0	13.0	15.7	25.0	13.6
9	Meadowside Automatic Monitor	51.2	40.1	46.5	45.1	39.1	36.3	34.7	33.9	33.0	-	36.0	48.7	35.1
10	Arbroath Road/ Gotterstone Avenue	-	-	-	42.4	29.1	24.1	27.3	25.7	30.7	34.6	35.1	53.6	29.2
11	4 Brot'y Ferry Court	-	-	-	31.9	21.0	17.1	21.0	20.3	-	28.9	26.2	40.7	23.2

Notes: '-' denotes no monitoring undertaken at that site during that period.
A bias-adjustment factor of 0.87 was derived and applied to the monitored annual average concentrations at each location

5.2.3 Defra's Background Pollutant Concentrations

Background concentrations refer to the existing levels of pollution in the atmosphere, due to a variety of sources, such as roads and industrial processes.

The Scottish Air website[40] includes estimated background air pollution data for NOx, NO_2 and PM_{10} for each 1km by 1km OS grid square in Scotland. Background maps, created using a base year of 2013, are available for the years 2013 to 2030. Scotland-specific maps are not currently available for $PM_{2.5}$. The Scottish Government advise that for $PM_{2.5}$, the Defra UK-wide background maps[41] are used instead. Scottish map data has been used to predict NOx, NO_2 and PM_{10} concentrations, and Defra map data has been used to predict $PM_{2.5}$ concentrations.

The main Proposed Scheme (areas A, C, D and E) crosses two 1km grid squares (centred on 344500, 733500 and 344500, 732500). The estimated pollutant concentrations for 2015 (baseline) and 2020 (opening year for the Proposed Scheme) for these grid squares are shown in Table 32. All estimated background pollutant concentrations are below the relevant air quality objectives.

Table 32: Estimated annual mean background pollutant concentrations

Grid Ref		**Annual mean concentration (µg/m³)**							
		2015				**2020**			
X	**Y**	**NO_x**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
344500	733500	13.8	9.2	11.1	7.2	10.9	7.3	10.7	6.9
344500	732500	16.5	11.0	10.8	7.2	13.5	9.0	10.8	7.2
Air quality objective		30	40	18	10	30	40	18	10

5.2.4 Summary of Monitoring Data of Background Concentrations

Background concentrations for each pollutant are shown in Table 33. This shows the selected background concentrations for the Proposed Scheme site for each pollutant and the reasoning behind the choice. The Defra background concentrations, section 5.2.3, were not used as they were lower than monitored concentrations. Full details of all data considered is outlined in Appendix A. Appropriate locations have been selected based on data availability and proximity to the Application Site. As described in section 4.3.2.9, background concentrations for short-term limits and EALs will be calculated as twice the annual mean background concentration.

[40] Air Quality in Scotland (2016) Data for Local Authority Review and Assessment purposes. Available at: http://www.scottishairquality.co.uk/data/mapping?view=data
[41] Defra (2016) Background Mapping data for local authorities – 2013
Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013

Table 33: Summary of background air quality monitoring data

Pollutant	Averaging period	Concentration	Units	Year	Reasoning
Nitrogen oxides (NOx)	Annual mean	15.7	µg/m^3	2014-2015	Data from Dundee Mains Loan automatic urban background monitoring site, for average of 2014 and 2015 (2013 has data capture <75%).
Nitrogen dioxide (NO_2)	Annual mean	11.6	µg/m^3	2014-2015	Data from Dundee Mains Loan automatic urban background monitoring site, for average of 2014 and 2015 (2013 has data capture <75%).
Carbon monoxide (CO)	Max 8-hour running mean	0.8	mg/m^3	2013-2015	Data from Edinburgh St Leonards urban background monitoring site, for average of 2013 to 2015. This is the nearest background monitoring site to the Proposed Scheme site, which monitors for CO.
Total organic carbon (TOC) as benzene (C_6H_6)	Annual mean	0.3	µg/m^3	2013	Data from Auchencorth Moss rural background monitoring site. This is the nearest automatic benzene monitoring site to the Proposed Scheme site. 2013 data selected, as data capture for 2014 and 2015 was <75%.
Sulphur dioxide (SO_2)	Annual mean	1.5	µg/m^3	2013-2015	Data from Edinburgh St Leonards urban background monitoring site, for average of 2013 to 2015. This is the nearest background monitoring site to the Proposed Scheme site, which monitors for SO_2.
Fine particulate matter (PM_{10})	Annual mean	12.3	µg/m^3	2013-2015	Data from Dundee Mains Loan automatic urban background monitoring site, for average of 2013 to 2015.
Ultra-fine particulate matter ($PM_{2.5}$)	Annual mean	7.2	µg/m^3	2013, 2015	Data from Edinburgh St Leonards urban background monitoring site, for average of 2013 and 2015, as data capture for 2014 is <75%. No monitoring for $PM_{2.5}$ is carried out in Dundee.
Hydrogen fluoride (HF)	Monthly average	None	-	-	No background monitoring carried out in the UK.

Hydrogen chloride (HCl)	Max 1-hour mean	3.4	µg/m^3	2013-2014	Data from Auchencorth Moss rural background monitoring site. This is the nearest automatic monitoring site to the Proposed Scheme site. Data for average of 2013 and 2014 has been selected, as 2015 has data capture <75%.
Ammonia (NH_3)	Annual mean	1.2	µg/m^3	2013-2014	Data from Auchencorth Moss rural background monitoring site. This is one of the nearest automatic monitoring sites to the Proposed Scheme site, and has recorded concentrations higher than at Edinburgh St Leonards. Data for average of 2013 and 2014 has been selected, as 2015 has data capture <75%.
Dioxins and furans	Annual mean	19.1	fg TEQ/m^3	2010	Data from Auchencorth Moss rural background monitoring site. This is the nearest Toxic Organic Micro Pollutants (TOMPs) monitoring site to the Proposed Scheme site. 2010 is the most recent data available.
Polychlorinated biphenyls (PCB)	Annual mean	0.000038	µg/m^3	2010	Data from Auchencorth Moss rural background monitoring site. This is the nearest Toxic Organic Micro Pollutants (TOMPs) monitoring site to the Proposed Scheme site. 2010 is the most recent data available. Max 1-hour mean has been calculated as twice the annual mean concentration.
Polycyclic aromatic hydrocarbons (PAHs) as benzo(a)pyrene	Annual mean	0.1	ng/m^3	2013-2015	Data from Edinburgh St Leonards urban background monitoring site, for average of 2013 to 2015. Recorded concentrations were higher than at Auchencorth Moss.
Lead (Pb)	Annual mean	0.2	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site.
Arsenic (As)	Annual mean	0.03	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site.

Cadmium (Cd)	Annual mean	1.3	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site.
Nickel (Ni)	Annual mean	0.4	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site.
Thallium (Ti)	Annual mean	None	-	-	No background monitoring carried out in the UK.
Mercury (Hg)	Annual mean	0.9	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site. Max 1-hour mean has been calculated as twice the annual mean concentration.
Antimony (Sb)	Annual mean	0.2	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site. Max 1-hour mean has been calculated as twice the annual mean concentration.
Chromium (Cr)	Annual mean	1.1	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for 2015. Concentrations in 2015 were greater than average concentrations over the period from 2013 to 2015, therefore data for 2015 has been used as a worst case assessment. This is the nearest heavy metals monitoring site to the Application Site. Max 1-hour mean has been calculated as twice the annual mean concentration.
Hexavalent chromium (CrVI),	Annual mean	0.2	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site.
Cobalt (Co)	Annual mean	0.02	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site.

Copper (Cu)	Annual mean	0.9	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site. Max 1-hour mean has been calculated as twice the annual mean concentration.
Manganese (Mn)	Annual mean	0.9	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site. Max 1-hour mean has been calculated as twice the annual mean concentration.
Vanadium (V)	Annual mean	0.4	ng/m^3	2013-2015	Data from Auchencorth Moss rural background monitoring site, for average of 2013 to 2015. This is the nearest heavy metals monitoring site to the Proposed Scheme site. Max 1-hour mean has been calculated as twice the annual mean concentration.

6 Construction Assessment

6.1 Construction Dust

The outcome of construction dust assessment is presented in Appendix B which is reproduced from the Environmental Statement submitted as part of the planning application for the Proposed Scheme.

6.2 Construction Traffic

6.2.1 Predicted Pollutant Concentrations

Annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations have been predicted at each of the sensitive receptors shown in Figure 4, following the methodology outlined in section 4.2.2 of this report.

Model verification refers to the comparison of modelled pollutant concentrations with measured concentrations at the same points to determine the performance of the model. Should the model results for NO_2 be largely within ±25% of the measured values and there is no systematic over or under-prediction of concentrations, then no adjustment is necessary according to LAQM.TG16.

The model verification exercise has been undertaken using those locations available from the project-specific monitoring survey. At the request of DCC, monitored concentrations have been used as the background concentrations used in the model verification. As shown in Table 34, modelled concentrations are predicted to be greater than monitoring locations, probably due to the use of the monitored background concentrations rather than Defra gridded background concentrations (section 5.2.3). As modelled concentrations are greater than monitored concentrations and at the majority of location modelled concentrations are in 25% of monitored concentrations, no adjustment of modelled concentrations has been undertaken. This should provide a conservative (pessimistic) estimate of concentration impacts due to construction traffic.

Table 34: Comparison of modelled and monitored annual mean NO_2 concentrations

Monitoring location	Monitored NO_2 concentration (µg/m^3)	Modelled NO_2 concentration (µg/m^3)	Difference (modelled–monitored)/monitored (%)
Baldovie/Drumgieth Road	24.4	31.0	27%
Drumgeith Road	22.9	30.2	32%
Britannia Drive	12.1	12.5	3%
Britannia Drive	18.4	24.4	32%
Kellas Road	12.0	12.1	0%
Balmerino Road	12.6	13.6	8%
Balunie Drive	24.4	32.0	31%

Monitoring location	Monitored NO_2 concentration (µg/m^3)	Modelled NO_2 concentration (µg/m^3)	Difference (modelled–monitored)/monitored (%)
Forties Road (Proposed Site)	13.6	14.5	7%
Meadowside Automatic Monitor	35.1	35.1	0%
Arbroath Road/ Gotterstone Avenue	29.2	36.4	25%
4 Brot'y Ferry Court	23.2	26.0	12%

6.2.1.1 Nitrogen Dioxide (NO_2)

Annual mean NO_2 concentrations at each of the assessed receptors are shown in Table 35. An impact descriptor has also been derived using the criteria in Table 5. At each of the assessed receptors, additional vehicles during the construction phase are predicted to have a negligible impact on annual mean NO_2 concentrations and the annual mean NO_2 objective would be met at all locations.

Table 35: Predicted annual mean NO_2 concentrations (µg/m^3) and impact descriptor

ID	Name	Annual mean NO_2 concentrations (µg/m^3)			Impact descriptor
		Existing	Construction	Change	
1	2 Silver Link Avenue	12.5	12.5	<0.1	Negligible
2	41 Ashkirk Gardens	12.9	12.9	<0.1	Negligible
3	24 Ashkirk Gardens	13.0	13.0	<0.1	Negligible
4	2 Montpellier Gardens	13.5	13.6	0.1	Negligible
5	1 Montpellier Gardens	26.3	26.4	0.1	Negligible
6	Baldovie Cottage West	28.0	28.2	0.1	Negligible
7	105 Hawick Drive	15.0	15.0	0.1	Negligible
8	42 Chirnside Place	15.0	15.0	<0.1	Negligible
9	Michelin Athletic Club	14.6	14.6	<0.1	Negligible
10	Baldovie Cottage	27.8	27.9	0.1	Negligible
11	Jubilee Cottage	28.4	28.5	0.1	Negligible
12	Drumsturdy Road	14.2	14.3	<0.1	Negligible
13	13 Kellas Road	13.9	14.0	<0.1	Negligible
16	1 Bro'ty Ferry Court	27.2	27.2	0.1	Negligible
17	433 Balunie Drive	22.4	22.4	<0.1	Negligible
18	305 Balunie Drive	22.6	22.6	<0.1	Negligible
19	211 Balunie Drive	22.9	22.9	<0.1	Negligible
20	193 Balunie Drive	22.6	22.6	<0.1	Negligible

ID	Name	Annual mean NO_2 concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
21	Tayside Police	21.5	21.5	<0.1	Negligible
22	222 Balunie Rd	23.4	23.4	<0.1	Negligible
23	158 Balunie Drive	14.1	14.1	<0.1	Negligible
24	168 Balunie Drive	21.9	21.9	<0.1	Negligible
25	18 Balunie Drive	15.7	15.7	<0.1	Negligible
26	34 Balunie Crescent	19.2	19.2	<0.1	Negligible
27	Greenfield Cottage, Drumgeith Road	22.4	22.6	0.1	Negligible
28	Rowanbank, Drumgeith Road	15.3	15.4	0.1	Negligible
29	Saint Saviour's High School	13.1	13.2	<0.1	Negligible
30	Braeview Academy	12.2	12.2	<0.1	Negligible
31	Ballumbie Primary School	12.3	12.3	<0.1	Negligible
32	Longhaugh Primary School	12.2	12.2	<0.1	Negligible
34	St Pius RC Primary School	12.4	12.4	<0.1	Negligible
35	Claypotts Castle Primary School	12.7	12.7	<0.1	Negligible
36	1 Kilwinning Place	14.7	14.7	<0.1	Negligible
37	BMX Track	14.0	14.0	<0.1	Negligible
38	Civic Amenity Site	14.2	14.2	<0.1	Negligible
39	Football Pitch	13.0	13.0	<0.1	Negligible
40	25 Hawick Drive	12.9	12.9	<0.1	Negligible
41	24 Spartleton Place	12.6	12.6	<0.1	Negligible
42	30 Speckled Wood Court	12.3	12.3	<0.1	Negligible
43	15 Kirkconnel Terrace	12.4	12.4	<0.1	Negligible
44	4 Strathaven Terrace	12.9	12.9	<0.1	Negligible
45	27 Duns Crescent	12.4	12.4	<0.1	Negligible
46	8 Old Toll Loan	12.7	12.7	<0.1	Negligible
47	101 Hawick Drive	14.4	14.5	0.1	Negligible
48	71 Hawick Drive	13.0	13.0	<0.1	Negligible
49	63 Hawick Drive	12.9	12.9	<0.1	Negligible
50	42 Coldstream Drive	14.0	14.1	0.1	Negligible
51	20 Coldstream Drive	13.8	13.8	<0.1	Negligible

ID	Name	Annual mean NO_2 concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
52	13 Selkirk Gardens	13.8	13.8	<0.1	Negligible
53	17 Ballumbie Road	13.1	13.1	<0.1	Negligible
54	13 Ardminish Place	12.4	12.4	<0.1	Negligible
55	6 Machrie Place	12.4	12.4	<0.1	Negligible
56	36 Traquair Gardens	12.3	12.3	<0.1	Negligible
57	21 Traquair Gardens	12.3	12.3	<0.1	Negligible
58	16 Ballumbie Braes	12.3	12.3	<0.1	Negligible
59	21 Ballumbie Meadows	12.7	12.7	<0.1	Negligible
60	24 Peebles Drive	12.4	12.5	<0.1	Negligible
61	170 Aberlady Crescent	12.3	12.3	<0.1	Negligible
62	23 Silver Link Avenue	12.4	12.4	<0.1	Negligible
63	516 Arbroath Road	31.9	32.0	0.1	Negligible
64	22 Baldovie Road	26.6	26.6	0.1	Negligible
65	54 Gotterstone Drive	13.0	13.0	<0.1	Negligible
66	28 Balbeggie Street	12.5	12.5	<0.1	Negligible
67	17 Balunie Avenue	12.4	12.4	<0.1	Negligible
68	11 Ballantrae Road	12.5	12.5	<0.1	Negligible
69	55 Ballantrae Place	12.6	12.6	<0.1	Negligible
70	68 Balunie Street	12.6	12.6	<0.1	Negligible
71	35 Balmoral Gardens	12.5	12.5	<0.1	Negligible
72	12 Baldovie Terrace	12.7	12.7	<0.1	Negligible
73	103 Balunie Drive	14.6	14.6	<0.1	Negligible
74	37a Balunie Avenue	12.9	12.9	<0.1	Negligible
75	64 Strachan Avenue	13.0	13.0	<0.1	Negligible
76	66 Balunie Avenue	12.9	12.9	<0.1	Negligible
77	32 Balmerino Road	13.0	13.0	<0.1	Negligible
78	100 Balunie Avenue	13.0	13.0	<0.1	Negligible
79	226 Balunie Avenue	13.3	13.3	<0.1	Negligible
80	20 Strachan Avenue	13.1	13.1	<0.1	Negligible
81	279 Balunie Drive	13.1	13.1	<0.1	Negligible
82	72 Balmoral Gardens	13.2	13.2	<0.1	Negligible
83	6 Balerno Street	12.8	12.8	<0.1	Negligible
84	129 Balunie Drive	22.5	22.5	<0.1	Negligible
85	266 Happyhillock Road	13.8	13.8	<0.1	Negligible
86	209 Balunie Drive at height	21.8	21.8	<0.1	Negligible

ID	Name	Annual mean NO_2 concentrations (µg/m^3)			Impact descriptor
		Existing	Construction	Change	
87	154 Balunie Drive at height	21.8	21.9	<0.1	Negligible
88	130 Balunie Drive at height	13.4	13.4	<0.1	Negligible
89	34 Balunie Crescent at height	13.3	13.3	<0.1	Negligible
90	Receptor 83 at height	12.8	12.8	<0.1	Negligible
91	Receptor 84 at height	21.5	21.6	<0.1	Negligible
92	Receptor 85 at height	13.4	13.4	<0.1	Negligible
93	The Toll House	28.6	28.7	0.1	Negligible
94	50 Haddington Crescent	12.3	12.3	<0.1	Negligible
95	71 Lothian Crescent	12.3	12.3	<0.1	Negligible
96	502 Arbroath Road	31.6	31.7	0.1	Negligible
97	30 Speckled Wood Court	12.3	12.3	<0.1	Negligible
98	32 Balmerino Road	13.0	13.0	<0.1	Negligible
99	1 Whitfield Cottages	22.4	22.6	0.1	Negligible
100	28 Balbeggie Street	12.9	12.9	<0.1	Negligible
101	12 Baldovie Terrace	13.1	13.1	<0.1	Negligible
102	100 Balunie Avenue	13.0	13.0	<0.1	Negligible
103	226 Balunie Avenue	13.2	13.3	<0.1	Negligible
104	DT - Baldovie/Drumgieth Road	31.0	31.2	0.2	Negligible
105	DT - Drumgeith Road	30.2	30.4	0.2	Negligible
106	DT - Britannia Drive	12.5	12.5	<0.1	Negligible
107	DT - Whitfield Cottage	24.4	24.6	0.2	Negligible
108	DT - Kellas Road - BG	12.1	12.1	<0.1	Negligible
109	DT - Balmerino Road	13.6	13.6	<0.1	Negligible
110	DT - Balunie Drive	32.0	32.1	0.1	Negligible
111	DT - Baldovie Road	14.5	14.5	<0.1	Negligible

6.2.1.2 Particulate Matter (PM_{10})

Annual mean PM_{10} concentrations at each of the assessed receptors are shown in Table 36. An impact descriptor has also been derived using the criteria in Table 5. The annual mean PM_{10} objective would be met at all locations with the exception of two receptors which are located at the junction of the A92 and Baldovie Road. It should be noted however, that at these receptors the objective is predicted to be exceeded without construction traffic. Additional construction vehicles do not lead to a significant increase in pollutant concentrations at these locations and therefore the impact of additional construction vehicles on annual mean PM_{10} concentrations is negligible.

Table 36: Predicted Annual Mean PM_{10} Concentrations (μg/m^3) and Impact Descriptor

ID	Name	Annual mean PM_{10} concentrations (μg/m^3)			Impact descriptor
		Existing	Construction	Change	
1	2 Silver Link Avenue	12.1	12.1	<0.1	Negligible
2	41 Ashkirk Gardens	12.1	12.1	<0.1	Negligible
3	24 Ashkirk Gardens	12.1	12.1	<0.1	Negligible
4	2 Montpellier Gardens	12.2	12.2	<0.1	Negligible
5	1 Montpellier Gardens	12.5	12.5	<0.1	Negligible
6	Baldovie Cottage West	12.8	12.8	<0.1	Negligible
7	105 Hawick Drive	12.4	12.4	<0.1	Negligible
8	42 Chirnside Place	12.5	12.5	<0.1	Negligible
9	Michelin Athletic Club	12.1	12.1	<0.1	Negligible
10	Baldovie Cottage	12.5	12.5	<0.1	Negligible
11	Jubilee Cottage	12.6	12.6	<0.1	Negligible
12	Drumsturdy Road	12.3	12.3	<0.1	Negligible
13	13 Kellas Road	12.3	12.3	<0.1	Negligible
16	1 Bro'ty Ferry Court	14.1	14.1	<0.1	Negligible
17	433 Balunie Drive	12.0	12.0	<0.1	Negligible
18	305 Balunie Drive	12.1	12.1	<0.1	Negligible
19	211 Balunie Drive	12.1	12.1	<0.1	Negligible
20	193 Balunie Drive	12.1	12.1	<0.1	Negligible
21	Tayside Police	11.9	11.9	<0.1	Negligible
22	222 Balunie Rd	12.2	12.2	<0.1	Negligible
23	158 Balunie Drive	12.3	12.3	<0.1	Negligible
24	168 Balunie Drive	12.0	12.0	<0.1	Negligible
25	18 Balunie Drive	12.4	12.4	<0.1	Negligible
26	34 Balunie Crescent	12.1	12.1	<0.1	Negligible
27	Greenfield Cottage, Drumgeith Road	12.6	12.7	<0.1	Negligible
28	Rowanbank, Drumgeith Road	12.2	12.2	<0.1	Negligible
29	Saint Saviour's High School	12.1	12.2	<0.1	Negligible

ID	Name	Annual mean PM_{10} concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
30	Braeview Academy	12.0	12.0	<0.1	Negligible
31	Ballumbie Primary School	12.0	12.0	<0.1	Negligible
32	Longhaugh Primary School	12.0	12.0	<0.1	Negligible
34	St Pius RC Primary School	12.0	12.0	<0.1	Negligible
35	Claypotts Castle Primary School	12.1	12.1	<0.1	Negligible
36	1 Kilwinning Place	12.2	12.2	<0.1	Negligible
37	BMX Track	12.1	12.1	<0.1	Negligible
38	Civic Amenity Site	12.1	12.1	<0.1	Negligible
39	Football Pitch	12.1	12.1	<0.1	Negligible
40	25 Hawick Drive	12.1	12.1	<0.1	Negligible
41	24 Spartleton Place	12.1	12.1	<0.1	Negligible
42	30 Speckled Wood Court	12.0	12.0	<0.1	Negligible
43	15 Kirkconnel Terrace	12.0	12.0	<0.1	Negligible
44	4 Strathaven Terrace	12.1	12.1	<0.1	Negligible
45	27 Duns Crescent	12.0	12.0	<0.1	Negligible
46	8 Old Toll Loan	12.1	12.1	<0.1	Negligible
47	101 Hawick Drive	12.3	12.4	<0.1	Negligible
48	71 Hawick Drive	12.1	12.1	<0.1	Negligible
49	63 Hawick Drive	12.1	12.1	<0.1	Negligible
50	42 Coldstream Drive	12.3	12.3	<0.1	Negligible
51	20 Coldstream Drive	12.3	12.3	<0.1	Negligible
52	13 Selkirk Gardens	12.3	12.3	<0.1	Negligible
53	17 Ballumbie Road	12.2	12.2	<0.1	Negligible
54	13 Ardminish Place	12.0	12.0	<0.1	Negligible
55	6 Machrie Place	12.0	12.0	<0.1	Negligible
56	36 Traquair Gardens	12.0	12.0	<0.1	Negligible
57	21 Traquair Gardens	12.0	12.0	<0.1	Negligible
58	16 Ballumbie Braes	12.0	12.0	<0.1	Negligible
59	21 Ballumbie Meadows	12.1	12.1	<0.1	Negligible
60	24 Peebles Drive	12.0	12.0	<0.1	Negligible
61	170 Aberlady Crescent	12.0	12.0	<0.1	Negligible
62	23 Silver Link Avenue	12.0	12.0	<0.1	Negligible

ID	Name	Annual mean PM_{10} concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
63	516 Arbroath Road	16.1	16.1	<0.1	Negligible
64	22 Baldovie Road	14.2	14.2	<0.1	Negligible
65	54 Gotterstone Drive	12.1	12.1	<0.1	Negligible
66	28 Balbeggie Street	12.1	12.1	<0.1	Negligible
67	17 Balunie Avenue	12.0	12.0	<0.1	Negligible
68	11 Ballantrae Road	12.1	12.1	<0.1	Negligible
69	55 Ballantrae Place	12.1	12.1	<0.1	Negligible
70	68 Balunie Street	12.1	12.1	<0.1	Negligible
71	35 Balmoral Gardens	12.1	12.1	<0.1	Negligible
72	12 Baldovie Terrace	12.1	12.1	<0.1	Negligible
73	103 Balunie Drive	12.3	12.3	<0.1	Negligible
74	37a Balunie Avenue	12.0	12.0	<0.1	Negligible
75	64 Strachan Avenue	12.1	12.1	<0.1	Negligible
76	66 Balunie Avenue	12.1	12.1	<0.1	Negligible
77	32 Balmerino Road	12.1	12.1	<0.1	Negligible
78	100 Balunie Avenue	12.1	12.1	<0.1	Negligible
79	226 Balunie Avenue	12.1	12.1	<0.1	Negligible
80	20 Strachan Avenue	12.1	12.1	<0.1	Negligible
81	279 Balunie Drive	12.1	12.1	<0.1	Negligible
82	72 Balmoral Gardens	12.1	12.1	<0.1	Negligible
83	6 Balerno Street	12.0	12.0	<0.1	Negligible
84	129 Balunie Drive	12.0	12.0	<0.1	Negligible
85	266 Happyhillock Road	12.1	12.1	<0.1	Negligible
86	209 Balunie Drive at height	11.9	11.9	<0.1	Negligible
87	154 Balunie Drive at height	11.9	11.9	<0.1	Negligible
88	130 Balunie Drive at height	12.1	12.1	<0.1	Negligible
89	34 Balunie Crescent at height	12.1	12.1	<0.1	Negligible
90	Receptor 83 at height	12.0	12.0	<0.1	Negligible
91	Receptor 84 at height	11.9	11.9	<0.1	Negligible
92	Receptor 85 at height	12.1	12.1	<0.1	Negligible
93	The Toll House	12.7	12.7	<0.1	Negligible
94	50 Haddington Crescent	12.0	12.0	<0.1	Negligible

ID	Name	Annual mean PM_{10} concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
95	71 Lothian Crescent	12.0	12.0	<0.1	Negligible
96	502 Arbroath Road	19.5	19.5	<0.1	Negligible
97	30 Speckled Wood Court	12.0	12.0	<0.1	Negligible
98	32 Balmerino Road	12.1	12.1	<0.1	Negligible
99	1 Whitfield Cottages	12.6	12.7	<0.1	Negligible
100	28 Balbeggie Street	12.1	12.1	<0.1	Negligible
101	12 Baldovie Terrace	12.1	12.1	<0.1	Negligible
102	100 Balunie Avenue	12.1	12.1	<0.1	Negligible
103	226 Balunie Avenue	12.2	12.2	<0.1	Negligible
104	DT - Baldovie/Drumgieth Road	13.0	13.0	<0.1	Negligible
105	DT - Drumgeith Road	13.0	13.1	<0.1	Negligible
106	DT - Britannia Drive	12.1	12.1	<0.1	Negligible
107	DT - Whitfield Cottage	13.0	13.0	<0.1	Negligible
108	DT - Kellas Road - BG	12.0	12.0	<0.1	Negligible
109	DT - Balmerino Road	12.1	12.1	<0.1	Negligible
110	DT - Balunie Drive	19.6	19.6	<0.1	Negligible
111	DT - Baldovie Road	12.1	12.1	<0.1	Negligible

6.2.1.3 Fine Particulate Matter ($PM_{2.5}$)

Annual mean $PM_{2.5}$ concentrations at each of the assessed receptors are shown in Table 37. An impact descriptor has also been derived using the criteria in Table 5. At each of the assessed receptors, additional vehicles during the construction phase are predicted to have a negligible impact on annual mean $PM_{2.5}$ concentrations and the annual mean $PM_{2.5}$ objective would be met at all locations.

Table 37: Predicted annual mean $PM_{2.5}$ concentrations ($\mu g/m^3$) and impact descriptor

ID	Name	Annual mean $PM_{2.5}$ concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
1	2 Silver Link Avenue	6.0	6.0	<0.1	Negligible
2	41 Ashkirk Gardens	6.1	6.1	<0.1	Negligible
3	24 Ashkirk Gardens	6.1	6.1	<0.1	Negligible
4	2 Montpellier Gardens	6.1	6.1	<0.1	Negligible

ID	Name	Annual mean $PM_{2.5}$ concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
5	1 Montpellier Gardens	6.3	6.3	<0.1	Negligible
6	Baldovie Cottage West	6.5	6.5	<0.1	Negligible
7	105 Hawick Drive	6.3	6.3	<0.1	Negligible
8	42 Chirnside Place	6.3	6.3	<0.1	Negligible
9	Michelin Athletic Club	6.1	6.1	<0.1	Negligible
10	Baldovie Cottage	6.3	6.3	<0.1	Negligible
11	Jubilee Cottage	6.4	6.4	<0.1	Negligible
12	Drumsturdy Road	6.2	6.2	<0.1	Negligible
13	13 Kellas Road	6.2	6.2	<0.1	Negligible
16	1 Bro'ty Ferry Court	6.3	6.3	<0.1	Negligible
17	433 Balunie Drive	6.1	6.1	<0.1	Negligible
18	305 Balunie Drive	6.2	6.2	<0.1	Negligible
19	211 Balunie Drive	6.2	6.2	<0.1	Negligible
20	193 Balunie Drive	6.2	6.2	<0.1	Negligible
21	Tayside Police	6.1	6.1	<0.1	Negligible
22	222 Balunie Rd	6.2	6.2	<0.1	Negligible
23	158 Balunie Drive	6.2	6.2	<0.1	Negligible
24	168 Balunie Drive	6.1	6.1	<0.1	Negligible
25	18 Balunie Drive	6.2	6.2	<0.1	Negligible
26	34 Balunie Crescent	6.1	6.1	<0.1	Negligible
27	Greenfield Cottage, Drumgeith Road	6.4	6.4	<0.1	Negligible
28	Rowanbank, Drumgeith Road	6.1	6.1	<0.1	Negligible
29	Saint Saviour's High School	6.1	6.1	<0.1	Negligible
30	Braeview Academy	6.0	6.0	<0.1	Negligible
31	Ballumbie Primary School	6.0	6.0	<0.1	Negligible
32	Longhaugh Primary School	6.0	6.0	<0.1	Negligible
34	St Pius RC Primary School	6.0	6.0	<0.1	Negligible
35	Claypotts Castle Primary School	6.1	6.1	<0.1	Negligible
36	1 Kilwinning Place	6.1	6.1	<0.1	Negligible
37	BMX Track	6.0	6.0	<0.1	Negligible

ID	Name	Annual mean $PM_{2.5}$ concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
38	Civic Amenity Site	6.1	6.1	<0.1	Negligible
39	Football Pitch	6.1	6.1	<0.1	Negligible
40	25 Hawick Drive	6.1	6.1	<0.1	Negligible
41	24 Spartleton Place	6.0	6.0	<0.1	Negligible
42	30 Speckled Wood Court	6.0	6.0	<0.1	Negligible
43	15 Kirkconnel Terrace	6.0	6.0	<0.1	Negligible
44	4 Strathaven Terrace	6.1	6.1	<0.1	Negligible
45	27 Duns Crescent	6.0	6.0	<0.1	Negligible
46	8 Old Toll Loan	6.0	6.1	<0.1	Negligible
47	101 Hawick Drive	6.2	6.2	<0.1	Negligible
48	71 Hawick Drive	6.1	6.1	<0.1	Negligible
49	63 Hawick Drive	6.1	6.1	<0.1	Negligible
50	42 Coldstream Drive	6.2	6.2	<0.1	Negligible
51	20 Coldstream Drive	6.2	6.2	<0.1	Negligible
52	13 Selkirk Gardens	6.2	6.2	<0.1	Negligible
53	17 Ballumbie Road	6.1	6.1	<0.1	Negligible
54	13 Ardminish Place	6.0	6.0	<0.1	Negligible
55	6 Machrie Place	6.0	6.0	<0.1	Negligible
56	36 Traquair Gardens	6.0	6.0	<0.1	Negligible
57	21 Traquair Gardens	6.0	6.0	<0.1	Negligible
58	16 Ballumbie Braes	6.0	6.0	<0.1	Negligible
59	21 Ballumbie Meadows	6.1	6.1	<0.1	Negligible
60	24 Peebles Drive	6.0	6.0	<0.1	Negligible
61	170 Aberlady Crescent	6.0	6.0	<0.1	Negligible
62	23 Silver Link Avenue	6.0	6.0	<0.1	Negligible
63	516 Arbroath Road	6.4	6.4	<0.1	Negligible
64	22 Baldovie Road	6.2	6.2	<0.1	Negligible
65	54 Gotterstone Drive	6.1	6.1	<0.1	Negligible
66	28 Balbeggie Street	6.0	6.0	<0.1	Negligible
67	17 Balunie Avenue	6.0	6.0	<0.1	Negligible
68	11 Ballantrae Road	6.0	6.0	<0.1	Negligible
69	55 Ballantrae Place	6.0	6.0	<0.1	Negligible
70	68 Balunie Street	6.0	6.0	<0.1	Negligible
71	35 Balmoral Gardens	6.0	6.0	<0.1	Negligible

ID	Name	Annual mean $PM_{2.5}$ concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
72	12 Baldovie Terrace	6.1	6.1	<0.1	Negligible
73	103 Balunie Drive	6.2	6.2	<0.1	Negligible
74	37a Balunie Avenue	6.0	6.0	<0.1	Negligible
75	64 Strachan Avenue	6.0	6.0	<0.1	Negligible
76	66 Balunie Avenue	6.0	6.0	<0.1	Negligible
77	32 Balmerino Road	6.0	6.0	<0.1	Negligible
78	100 Balunie Avenue	6.0	6.0	<0.1	Negligible
79	226 Balunie Avenue	6.1	6.1	<0.1	Negligible
80	20 Strachan Avenue	6.0	6.0	<0.1	Negligible
81	279 Balunie Drive	6.0	6.0	<0.1	Negligible
82	72 Balmoral Gardens	6.0	6.1	<0.1	Negligible
83	6 Balerno Street	6.0	6.0	<0.1	Negligible
84	129 Balunie Drive	6.1	6.1	<0.1	Negligible
85	266 Happyhillock Road	6.1	6.1	<0.1	Negligible
86	209 Balunie Drive at height	6.1	6.1	<0.1	Negligible
87	154 Balunie Drive at height	6.1	6.1	<0.1	Negligible
88	130 Balunie Drive at height	6.1	6.1	<0.1	Negligible
89	34 Balunie Crescent at height	6.1	6.1	<0.1	Negligible
90	Receptor 83 at height	6.0	6.0	<0.1	Negligible
91	Receptor 84 at height	6.1	6.1	<0.1	Negligible
92	Receptor 85 at height	6.1	6.1	<0.1	Negligible
93	The Toll House	6.4	6.4	<0.1	Negligible
94	50 Haddington Crescent	6.0	6.0	<0.1	Negligible
95	71 Lothian Crescent	6.0	6.0	<0.1	Negligible
96	502 Arbroath Road	6.6	6.6	<0.1	Negligible
97	30 Speckled Wood Court	6.0	6.0	<0.1	Negligible
98	32 Balmerino Road	6.0	6.0	<0.1	Negligible
99	1 Whitfield Cottages	6.4	6.4	<0.1	Negligible
100	28 Balbeggie Street	6.0	6.0	<0.1	Negligible
101	12 Baldovie Terrace	6.1	6.1	<0.1	Negligible
102	100 Balunie Avenue	6.0	6.0	<0.1	Negligible

ID	Name	Annual mean $PM_{2.5}$ concentrations ($\mu g/m^3$)			Impact descriptor
		Existing	Construction	Change	
103	226 Balunie Avenue	6.1	6.1	<0.1	Negligible
104	DT - Baldovie/ Drumgieth Road	6.6	6.6	<0.1	Negligible
105	DT - Drumgeith Road	6.6	6.6	<0.1	Negligible
106	DT - Britannia Drive	6.0	6.0	<0.1	Negligible
107	DT - Whitfield Cottage	6.6	6.6	<0.1	Negligible
108	DT - Kellas Road - BG	6.0	6.0	<0.1	Negligible
109	DT - Balmerino Road	6.1	6.1	<0.1	Negligible
110	DT - Balunie Drive	6.6	6.6	<0.1	Negligible
111	DT - Baldovie Road	6.1	6.1	<0.1	Negligible

6.2.2 Assessment of significance

As shown above, the impact descriptor for all pollutants assessed as a result of the increase in vehicles associated with the construction phase of the Proposed Scheme was predicted to be negligible at all sensitive receptors. The annual mean NO_2 and $PM_{2.5}$ objectives are predicted to be met at all locations. The annual mean PM_{10} objective is predicted to be met at the majority of locations with the exception of receptors located at the junction of the A92 and Baldovie Road at which the objective is predicted to be exceeded without construction traffic.

Based on this, the significance of the predicted change in air quality as a result of additional traffic during the construction phase is considered to be **not significant**.

7 Operational Assessment

7.1 Impact of EfW CHP Emissions

This section presents the predicted environmental concentrations (PEC) resulting from the operation of the proposed EfW CHP facility under normal operating conditions.

A summary of results at human receptors is presented in Table 38 and detailed results are presented in Appendix D. A summary of model predictions at ecological receptors is presented in Table 39 with detailed results given in Appendix E. Appendix F shows colour shade contour plots of the PEC for key long-term and short-term pollutant limits.

All concentrations resulting from emissions from the DERL facility (current situation) and the proposed EfW CHP facility are below the relevant standards. The impact on air quality of the proposed EfW CHP facility, compared to the current operations of the DERL facility, results in a beneficial impact to air quality in terms of NO_2, HCl, PAHs/B(a)P, PCBs and all Group III trace metals, and negligible negative impact for the other pollutants. The impact on human receptors is therefore not significant.

At ecological receptors the maximum PECs are all well below 70% of the standard and therefore the impact at ecological receptors is negligible and the effect is not significant. The maximum 24-hour mean concentration is predicted to decrease with EfW CHP facility operation compared with the DERL facility operation.

At ecological receptors the process contribution to nutrient nitrogen deposition is no more than 0.26% (which is predicted at Barry Links) and acid deposition is no more than 8% of the critical load (which is also predicted at Barry Links). The Predicted Environmental Deposition rate (PEDR), the sum of the process contribution to deposition and the background deposition rate, exceeds 70% of the critical load only where the background on its own exceeds. The effect is therefore considered not significant.

Dioxins and furans do not have an EAL so cannot be assessed in the same way but impacts are reduced as a result of the proposed EfW CHP facility compared to the current impact from the existing DERL facility and the impact of this on human health is presented in the human health risk assessment (Appendix G).

It should be noted that while actual emissions from the DERL facility have been used for the assessment, the emissions used for the EfW CHP facility are those given by the IED limit values and they therefore represent the worst case emissions. Actual emissions would be no greater than then IED emission limit values and could be less. The assessment of the EfW CHP facility therefore represents a worst case.

Table 38: Predicted maximum impact to air quality concentrations (µg/m^3) resulting from emissions from DERL and the Proposed EfW CHP

Pollutant	Averaging period	Standard (µg/m^3)	Background concentration (µg/m^3)	DERL PEC concentration (µg/m^3)		Proposed EfW CHP PEC concentration (µg/m^3)		Change in conc. (µg/m^3)		Impact Descriptor
				Grid receptor	Sensitive receptor	Grid receptor	Sensitive receptor	Grid receptor	Sensitive Receptor	
NO_2	1-hour	200	23.2	38.6	34.1	35.0	33.6	-3.6	-0.5	Beneficial
	Annual	40	11.6	13.3	13.0	12.5	12.1	-0.8	-0.9	Beneficial
CO	8-hr running	10,000	840.0	840.4	840.2	842.3	841.7	1.9	1.5	Negligible
	1-hour	30,000	1,203.7	1,204.7	1,204.4	1,212.2	1,211.2	7.5	6.8	Negligible
VOCs: Benzene	1-hour	195	0.5	1.1	0.9	2.2	2.0	1.1	1.1	Negligible
	Annual	3.25	0.3	0.3	0.3	0.3	0.3	<0.1	<0.1	Negligible
SO_2	15-minute	266	2.9	6.3	6.0	6.4	6.0	0.2	0.1	Negligible
	1-hour	350	2.9	8.3	6.8	11.4	10.4	3.1	3.7	Negligible
	24-hour	125	2.9	4.2	4.2	4.3	3.8	0.1	-0.4	Negligible
PM_{10}	24-hour	50	24.5	24.6	24.6	24.7	24.7	0.2	0.1	Negligible
	Annual	18	12.3	12.3	12.3	12.3	12.3	<0.1	<0.1	Negligible
$PM_{2.5}$	Annual	10	7.2	7.2	7.2	7.2	7.2	0.0	0.0	Negligible
HF	1-hour	160	None	0.002	0.002	0.169	0.150	0.2	0.1	Negligible
HCl	1-hour	750	3.4	7.3	6.2	5.1	4.9	-2.2	-1.3	Beneficial
NH_3	1-hour	2500	2.4	2.5	2.5	3.2	3.1	0.7	0.6	Negligible
	Annual	180	1.2	1.2	1.2	1.2	1.2	0.02	0.01	Negligible
Benzo(a)pyrene	Annual	0.00025	0.00007	0.0002	0.0002	0.0002	0.0001	-0.0001	-0.0001	Beneficial
PCBs	1-hour	6	0.00008	.00008	0.00008	0.00008	0.00008	-0.00000004	-0.000000001	Beneficial
	Annual	0.2	0.00004	0.00004	0.00004	0.00004	0.00004	-0.000000005	-0.00000001	Beneficial

Pollutant	Averaging period	Standard (µg/m³)	Background concentration (µg/m³)	DERL PEC concentration (µg/m³)		Proposed EfW CHP PEC concentration (µg/m³)		Change in conc. (µg/m³)		Impact Descriptor
				Grid receptor	Sensitive receptor	Grid receptor	Sensitive receptor	Grid receptor	Sensitive Receptor	
Arsenic (As)	Annual	0.006	0.0002	0.0003	0.0003	0.0002	0.0002	-0.0001	-0.0001	Beneficial
Cadmium (Cd)	Annual	0.005	0.00003	0.0002	0.0002	0.0004	0.0002	0.0001	0.00004	Negligible
Lead (Pb)	Annual	0.25	0.0013	0.0014	0.0014	0.0013	0.0013	-0.0001	-0.0001	Beneficial
Nickel (Ni)	Annual	0.02	0.0004	0.0005	0.0005	0.0005	0.0005	-0.00002	-0.00004	Beneficial
Thallium (Tl)	Annual	100	None	0.0002	0.0002	0.0003	0.0002	0.0001	0.00004	Negligible
Mercury (Hg)	Annual	0.25	0.0009	0.0010	0.0009	0.0012	0.0011	0.0003	0.0001	Negligible
	1-hour	7.5	0.0018	0.0029	0.0026	0.0103	0.0093	0.0074	0.0067	Negligible
Antimony (Sb)	Annual	5	0.0002	0.0003	0.0003	0.0002	0.0002	-0.0001	-0.0001	Beneficial
	1-hour	150	0.0005	0.0024	0.0018	0.0007	0.0007	-0.0017	-0.0011	Beneficial
Cr II and III	Annual	5	0.0011	0.0012	0.0012	0.0011	0.0011	-0.0001	-0.0001	Beneficial
	1-hour	150	0.0021	0.0054	0.0044	0.0035	0.0034	-0.0018	-0.0010	Beneficial
Cr VI	Annual	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	-0.000001	-0.000001	Beneficial
Cobalt (Co)	Annual	1	0.00002	0.0001	0.0000	0.0000	0.0000	-0.00002	-0.00002	Beneficial
Copper (Cu)	Annual	10	0.00086	0.0011	0.0010	0.0009	0.0009	-0.0002	-0.0001	Beneficial
	1-hour	200	0.002	0.0055	0.0044	0.0030	0.0028	-0.0025	-0.0016	Beneficial
Manganese (Mn)	Annual	0.15	0.001	0.0016	0.0014	0.0011	0.0010	-0.0005	-0.0004	Beneficial
	1-hour	1500	0.002	0.0128	0.0096	0.0048	0.0044	-0.0080	-0.0052	Beneficial
Vanadium (V)	Annual	5	0.36	0.3559	0.3558	0.3558	0.3558	-0.00004	-0.00004	Beneficial
	1-hour	1	0.71	0.7124	0.7122	0.7117	0.7117	-0.0007	-0.0005	Beneficial

Table 39: Predicted maximum impact to air quality concentrations (µg/m^3) at ecological receptors resulting from emissions from DERL and the Proposed EfW CHP

				DERL		EfW CHP		
Pollutant	**Averaging period**	**Standard (µg/m^3)**	**Background concentration (µg/m^3)**	**PEC concentration (µg/m^3)**	**PEC/Standard (%)**	**PEC concentration (µg/m^3)**	**PEC/Standard (%)**	**Change in concentration (µg/m^3)**
NOx	Annual mean	30	15.7	16.2	54.0%	16.7	55.7%	0.5
SO_2	Annual mean	10 (lichens or bryophytes)	1.5	1.5	15.0%	1.7	17.0%	0.2
NH_3	Annual mean	1 (lichens or bryophytes), 3* (other sites)	1.2	1.2	40.0%	1.2	40.0%	0.02
HF	Max weekly mean	0.5	None	0.0004	0.1%	0.014	2.8%	0.013
HF	Max 24-hour mean	5	None	0.0006	0.0%	0.022	0.4%	0.021
NO_2	Max 24-hour mean	75	23.2	30.6	40.8%	26.2	34.9%	-4.4

Note: *PEC/Standard calculated using 3µg/m^3

7.2 Plume Visibility

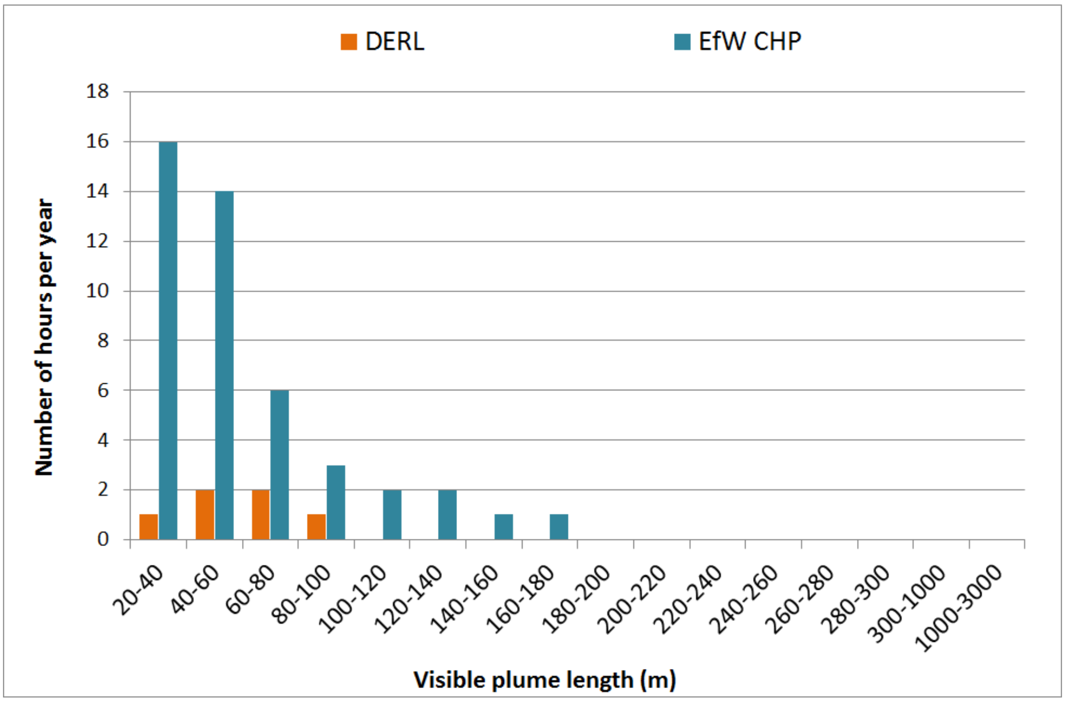
Water in the emitted gases from the proposed EfW CHP can condense and form a visible plume. The ADMS model calculates the occurrence of visible plumes and their length using the efflux parameters and mixing ratio: the kg of water in the plume per kg of dry air. The mixing ratios used in the modelling were:

- DERL: 0.0931 kg/kg
- EfW CHP facility: 0.0993 kg/kg

The predicted plume lengths are shown in Figure 17 for the existing DERL plant and the proposed EfW CHP. The chart shows the frequency of predicted plume lengths at various increments of plume length. It is predicted that from the EfW CHP facility there would be visible plumes greater than 20m in length during 45 hours of the year compared with 5 hours of the year for the existing DERL facility. Although there is a predicted increase in the number of visible plumes over 20m, they are predicted to occur for just 0.5% of the time.

There is no guidance available from an air quality perspective for the assessment of significance of a visible plume. Significance of the plume has been discussed in the Landscape and Visual Impact chapter of the Environmental Statement.

Figure 17: Visible plume length by number of hours per year



7.3 Assessment of Significance

Taking into consideration the existing air quality conditions in the area, the predicted changes in pollutant concentrations due to the Proposed Scheme and the associated impacts, it is likely that effects on local air quality will arise from the operation of the EfW CHP will be **not significant**.

8 Odour Assessment

A qualitative assessment has been undertaken, following the IAQM guidance, to determine the impact of the proposed development on odour. The area immediately surrounding the proposed development is predominantly industrial with some odour likely generated due to existing activities. There are community facilities such as the cycle racing track and sports ground within 120m of the proposed site boundary where amenity could be impacted as a result of the proposed development. The closest residential properties to the Application Site boundary are approximately 150m to the north of the site, but the residential receptors 320m to the south, are closer to the potential odour source, the waste reception buildings.

Typical wind conditions in the area have been established using meteorological data from the RAF Leuchars as discussed in section 4.3.2.1. This shows that the predominant wind direction is westerly/south-westerly. Locations downwind of odorous sources at the proposed development are therefore more likely to be affected. Meteorological conditions will affect frequency, duration and intensity of odours for receptors depending on their direction from the proposed development.

8.1 Odour Sources

Potential odour emission sources from the proposed development comprise:

- The waste reception buildings;
- The DERL tipping hall for bulky waste; and
- The EfW CHP tipping hall and adjacent waste storage bunker.

Waste tipping will be carried out within a contained environment. Vehicles delivering waste to the proposed development will enter the tipping hall and tip waste into a chute into the waste bunker.

Odour emissions from the waste reception building may occur from the air released when the main doors are opened to admit the waste vehicles, however, the building is designed to be kept under negative pressure, created by the internal air extraction for use in the combustion process. The air for combustion will be drawn from the waste bunker, which will in turn draw the air from the tipping hall. During periods when no waste delivery is programmed, including during the night-time, the tipping hall roller shutter door will be kept closed.

The air flow will pass from the openings in the tipping hall, including the vehicle access door and wall vents, through the waste tipping chutes into the waste storage bunker and then into the combustion process, via the primary combustion air system. The combustion process would destroy any odorous compounds.

Bunker management procedures will be employed to avoid the development of anaerobic conditions. This will include mixing and periodic emptying of parts of the tipping bunker so that waste does not accumulate. Waste will be well mixed to ensure minimum time in the bunker which reduces the potential for generation of odour.

The waste bunker is equipped with an off-line ventilation facility which provides an air change rate of up to twice the storage area volume per hour. The air is drawn into the waste bunker via the tipping hall, and therefore provides containment of odour from the tipping area. The air is cleaned by a separate activated carbon and dust filter and vented from a discharge at the top of the facility building, to ensure no odour or dust release to the environment.

8.2 Pathway

The potentially odorous sources associated with the proposed development are located to the south of the site. The predominant wind direction in this area is westerly/south-westerly so the most affected areas are to the east/north-east of the Application Site.

8.3 Receptor

The closest residential receptors to the waste reception buildings lie approximately 320m to the south, to the south of Ballunie Drive and 270m to the north, north of Drumgeith Road. A high level of amenity would be afforded to residents therefore the receptor sensitivity is high.

There are commercial/industrial properties and community facilities within 150m of potentially odorous sources. These locations are considered to be of medium sensitivity and are expected to enjoy a reasonable level of amenity.

A greater distance of sensitive properties from the proposed development is beneficial as this provides areas where dispersion of odours can occur prior to amenity of properties being affected.

8.4 FIDOL assessment

The aspects of an odour impact considering described by the FIDOL acronym have been assessed by application of the Source-Pathway-Receptor model.

8.4.1 Frequency

The process of receiving, sorting[42] and storing waste will be undertaken in the enclosed DERL tipping hall for bulky waste and the EfW tipping hall/waste bunker for non-bulky waste. There is the potential for the release of odours when vehicles are delivering waste to the site which occurs throughout the day.

[42] There will be only minimal sorting of e.g. bulky and trade waste – which is a small proportion of the overall waste handled.

8.4.2 Intensity

The majority of processes on site will not emit odours. Where odorous activities are undertaken on site, these will be controlled where possible, and undertaken in an enclosed area. The air extraction system will exhaust the extracted air via the combustion process or via an activated carbon filter. In both cases the intensity of the odours released from the site is likely to be low.

8.4.3 Duration

Waste vehicles would arrive at the proposed development to deliver waste up to 7 days a week (not at night). However, the potential for odour during these times is reduced by the mitigation (such as negative pressure and the door being closed when deliveries are not expected).

8.4.4 Offensiveness

The main potential source of odour is the tipping hall and waste bunker. Odours from waste could be considered unpleasant and to be moderately offensive.

8.4.5 Location Sensitivity

Residential receptors are high sensitivity receptors. The closest lie 320m to the south and 270m to the north of odorous sources within the Proposed Scheme. Commercial/industrial properties and community facilities are medium sensitivity receptors. The closest lie 150m to the north.

8.5 Summary

The assessment of odour effects has identified that the impact of odour is likely to be small, assuming that odour is minimised at source by use of good bunker management procedures and controlled through the application of Best Available Techniques (BAT), as required by the environmental permit, for instance use of the proposed odour control unit. An Odour Management Plan will be produced as part of the environmental permit application. The derivation of odour impact used the Source-Pathway-Receptor model which take into account the FIDOL qualitative method.

Using the criteria set out in Table 25, the Proposed Development is considered to be small in impact when the planned mitigation is required. The receptors have a high sensitivity and are relatively far from the source. The operation would therefore have a negligible effect on odour concentrations at sensitivity receptors. The changes in odour as a result of the Proposed Development are considered to be **not significant**.

9 Cumulative effects

9.1 Introduction

The cumulative assessment considers two future scenarios as described in section 4.3:

(C) the proposed EfW CHP facility operating on diesel during hot commissioning and the DERL facility burning waste; and

(D) the proposed EfW CHP facility and Michelin boiler plant, running together.

9.2 Proposed EfW CHP during hot commissioning and DERL burning waste

This assessment considers the cumulative impact on pollutants that would arise from the combustion of diesel (i.e. NO_2, CO, PM_{10} and SO_2) at the proposed EfW CHP facility. Other pollutants that are emitted by the DERL facility would not be emitted from the proposed EfW CHP facility operating on diesel and so there would be no cumulative impact. Only short term statistics (not annual means) are presented as the hot commissioning will only last around 1.5 months. The results are shown in Table 40. It shows:

a) estimated background concentrations;

b) background + DERL; and

c) background + DERL + proposed EfW CHP.

The results are presented for the maximum resulting concentration (background + DERL + proposed EfW CHP) for the gridded and sensitive receptors - not the maximum change as a result of the emissions from the proposed EfW CHP.

The impact of adding the hot commissioning emissions to those of DERL operating on waste is **negligible** and all concentrations are below the relevant air quality standards. The impact is therefore not significant.

9.3 Proposed EfW CHP Facility plus Michelin Boilers

This assessment considers the cumulative impact of operation of the proposed EfW CHP facility in combination with boilers operating at Michelin (i.e. one boiler operating at 80% load and one on standby at 20% load with the 3rd not operating).

This is a worst-case assessment as most of the time when the proposed EfW CHP is operating it will deliver steam to the Michelin works and therefore the boilers at Michelin will not be operating or may be on standby. The only potential for cumulative impact is from emissions of NOx as the Michelin boilers are gas-fired.

Emissions of other pollutants (e.g. PM_{10}) will be negligible from Michelin. The results are shown in Table 41.

The impact of operating the Michelin boilers running concurrently with the proposed EfW CHP results in a **beneficial** predicted impact to air quality, compared to the current situation of DERL + Michelin.

Table 40: Cumulative impact: Hot-commissioning of the proposed EfW CHP

Pollutant	Averaging period (max)	Standard (µg/m³)	Background concentration (µg/m³)	DERL		DERL + EfW CHP				Impact descriptor
				Total conc. (µg/m³)		Total conc. (µg/m³)		Change in conc. (µg/m³)		
				Grid	Discrete	Grid	Discrete	Grid	Discrete	
NO_2	1-hour	200	23.2	38.6	34.1	39.9	35.1	1.3	1.0	Negligible
CO	1-hour	30,000	0.84	840.0	840.3	840.9	840.8	0.9	0.5	Negligible
	8-hour	10,000	1,204	1204.7	1204.3	1208.3	1207.6	3.6	3.3	Negligible
PM_{10}	24-hour	50	24.5	24.58	24.58	24.59	24.59	<0.01	<0.01	Negligible
SO_2	15-min	266	2.9	6.28	5.96	6.32	6.00	0.04	0.04	Negligible
	1-hour	350	2.9	8.3	6.3	12.0	9.6	3.6	3.3	Negligible
	24-hour	125	2.9	4.19	4.19	4.20	4.21	0.01	0.01	Negligible

Table 41: Cumulative impact: DERL + Michelin compared to EfW CHP + Michelin

Pollutant	Averaging period (max)	Standard (µg/m³)	Background concentration (µg/m³)	DERL + Michelin		EfW CHP + Michelin				Impact descriptor
				Total conc. (µg/m³)		Total conc. (µg/m³)		Change in Conc. (µg/m³)		
				Grid	Discrete	Grid	Grid	Discrete	Grid	
NO_2	1-hour	200	23.2	39.35	35.13	36.05	34.64	-3.30	-0.48	Beneficial
	Annual	40	11.6	13.35	13.04	12.65	12.15	-0.70	-0.89	Beneficial

10 Mitigation

10.1 Construction

All appropriate mitigation measures have been included in the Construction Environmental Management Plan (CEMP) for the Proposed Scheme.

10.2 Operation

No additional mitigation measures have been proposed with respect to effects from operation of the proposed EfW CHP facility, as the predicted impacts are negligible or beneficial.

The abatement which is proposed for the EfW CHP facility is set out below:

- The use of modern combustion technology and effective combustion control to limit carbon monoxide and oxides of nitrogen emissions;
- The use of Selective Non Catalytic Reduction (SNCR) to control the generation of emissions oxides of nitrogen, when necessary as indicated by the continuous monitoring;
- The use of activated carbon to control heavy metals and dioxins and furans, when necessary as a consequence of the fuel being burned;
- The use of lime injection to control acid gases, when necessary; and
- A high efficiency dust collection system (fabric-filters) which will control emissions of particulates on a constant basis.

11 Conclusion

An assessment of likely air quality and odour effects arising as a result of the construction and operation of the Proposed Scheme has been undertaken. A review of current legislation and planning policy, a baseline assessment describing the current air quality conditions in the vicinity of the Proposed Scheme and an assessment of air quality impacts associated with the construction and operation of the scheme have been undertaken.

All concentrations resulting from emissions from the DERL facility (current situation) and the proposed EfW CHP facility are below the relevant standards. The impact on air quality of the proposed EfW CHP facility, compared to the current operations of the DERL facility, results in a beneficial impact to air quality in terms of NO_2, HCl, PAHs/B(a)P, PCBs and all Group III trace metals, and negligible negative impact for the other pollutants. The impact on human receptors is therefore **not significant**.

At ecological receptors the maximum PECs are all well below 70% of the standard and therefore the impact at ecological receptors is negligible and the effect is not significant. The maximum 24-hour mean concentration is predicted to decrease with EfW CHP facility operation compared with the DERL facility operation.

At ecological receptors the process contribution to nutrient nitrogen deposition is no more than 0.26% (which is predicted at Barry Links) and acid deposition is no more than 8% of the critical load (which is also predicted at Barry Links). The Predicted Environmental Deposition rate (PEDR), the sum of the process contribution to deposition and the background deposition rate, exceeds 70% of the critical load only where the background on its own exceeds. The effect is therefore considered **not significant**.

Dioxins and furans, trace metals and PCBs have been considered in the human health risk assessment. For the proposed EfW CHP facility and the cumulative impacts of the proposed EfW CHP facility and existing DERL plant, it has been demonstrated that the maximally exposed individual is not subject to a significant carcinogenic risk or non-carcinogenic hazard, arising from exposures via both inhalation and the ingestion of foods.

The cumulative assessment considered two scenarios, the proposed EfW CHP operating on diesel during hot commissioning and the DERL burning waste, and the proposed EfW CHP and Michelin installation, running together. A negligible impact has been predicted under both scenarios, with some beneficial impacts predicted with operation of the proposed EfW CHP.It should be noted that while actual emissions from the DERL facility have been used for the assessment, the emissions used for the EfW CHP facility are those given by the IED limit values and they therefore represent the worst case emissions. Actual emissions would be no greater than then IED emission limit values and could be less. The assessment of the EfW CHP facility therefore represents a worst case.

The impact of the EfW CHP facility on odour nuisance was also found to be **not significant**.

Appendix A

Baseline Assessment

A1 Baseline Assessment

This section contains full details of the background monitoring data and assumptions made to determine the likely background concentrations at the Application Site for the following pollutants:

- Nitrogen oxides (NOx) and Nitrogen Dioxide (NO_2);
- Carbon monoxide (CO);
- Total organic carbon (TOC) as benzene;
- Sulphur dioxide (SO_2);
- Fine particulate matter (PM_{10} and $PM_{2.5}$);
- Hydrogen fluoride (HF) and Hydrogen chloride (HCl);
- Ammonia (NH_3);
- Dioxins and furans;
- Polychlorinated biphenyls (PCBs) and Polycyclic Aromatic Hydrocarbons (PAHs) as benzo(a)pyrene; and
- Trace metals: lead (Pb), arsenic (As), cadmium (Cd), nickel (Ni), thallium (Ti), mercury (Hg), antimony (Sb), chromium (Cr and CrVI), cobalt (Co), copper (Cu), manganese (Mn) and vanadium (V).

Background data has been obtained from a variety of sources, and these are outlined in the following sections.

A1.1.1 Nitrogen Oxides (NOx) and Nitrogen Dioxide (NO_2)

The city of Dundee carries out automatic monitoring of NOx and NO_2 at seven monitoring sites in the city. Automatic monitoring involves the use of instruments which continuously draw air through the instrument, and provide data on short averaging periods such as 15 minutes.

One of the monitoring sites, Mains Loan, is in an urban background monitoring location, and this is therefore considered to best represent background concentrations in the local area. Details of the monitoring site are outlined in Table 42.

Average concentrations for NOx and NO_2 in 2013, 2014 and 2015 at the Mains Loan monitoring site are shown in Table 43. Data capture in 2013 was below the recommended 75% rate in 2013, and therefore these concentration have not been used in the averaging of the years.

Concentrations at the Mains Loan background monitoring site have met the applicable air quality objectives for NOx and NO_2 in 2014 and 2015.

Table 42: Mains Loan automatic monitoring site details

Site ID	Site name	Site type	OS grid reference	
			x	y
DUN1	Mains Loan	Urban background	340970	731892

Table 43: Mains Loan NOx and NO_2 monitoring data

Pollutant	Averaging period	Standard (µg/m^3)	Concentration (µg/m^3)			
			2013	2014	2015	Average
NOx	Annual mean	30	*	16.5	14.9	15.7
NO_2	Max 1-hour mean	200	*	103.0	82.0	92.5
	Annual mean	40	*	12.6	10.5	11.6
	Max 24-hour mean	75	*	45.0	38.0	41.5

Notes: '*' indicates data capture less than 75% at the monitoring site in this year.

A1.1.2 Carbon Monoxide (CO)

Monitoring of CO is not carried out in Dundee. The closest monitoring site to the Proposed Scheme which carries out automatic monitoring for CO is Edinburgh St Leonards which is located in an urban background location in the south of Edinburgh. Site details are shown in Table 44. Monitoring data for 2013, 2014 and 2015 has been reviewed and is presented in Table 45. Concentrations of CO are shown to be well below the relevant standards for all years.

Table 44: Edinburgh St Leonards automatic monitoring site details

Site ID	Site name	Site type	OS grid reference	
			x	y
UKA00454	Edinburgh St Leonards	Urban background	326264	673136

Table 45: Edinburgh CO monitoring data

Pollutant	Averaging period	Standard (mg/m^3)	Concentration (mg/m^3)			
			2013	2014	2015	Average
CO	Max 1-hour mean	30	0.96	1.53	1.12	1.20
	Max 8-hour mean	10	0.73	1.00	0.79	0.84

A1.1.3 Total Organic Carbon (TOC) as Benzene

Monitoring of benzene is not carried out in Dundee. The closest monitoring site to the Proposed Scheme which carries out automatic monitoring for benzene is Auchencorth Moss which is located in a rural background location, 18km south of Edinburgh city centre. Site details are shown in Table 46. Monitoring data for benzene has been reviewed and is presented in Table 47. Data capture in 2014 and 2015 was less than 40% for benzene at the Auchencorth Moss site, and therefore 2013 data has been selected for inclusion in the assessment. Concentrations of benzene are shown to be below the relevant standards in 2013.

Table 46: Auchencorth Moss automatic monitoring site details

Site ID	Site name	Site type	OS grid reference	
			x	y
UKA00451	Auchencorth Moss	Rural background	322166	656128

Table 47: Auchencorth Moss benzene monitoring data

Pollutant	Averaging period	Standard (μg/m³)	Concentration (μg/m³)		
			2013	2014	2015
Benzene	Max 1-hour mean	195	5.0	*	*
	Annual mean	3.25	0.25	*	*

Notes: '*' indicates data capture less than 75% at the monitoring site in this year.

A1.1.4 Sulphur Dioxide (SO_2)

The nearest urban background monitoring site to Dundee which measures SO_2 in the Edinburgh St Leonards site. Details of the monitoring site are given in Table 44, and this is considered to best represent background SO_2 concentrations at the Application Site.

Concentrations for SO_2 in 2013, 2014 and 2015 at the Edinburgh St Leonards monitoring site are shown in Table 48, and an average of the 2013 to 2015 monitoring data has been selected for inclusion in the assessment. All measured SO_2 concentrations are below the relevant standards.

Table 48: Edinburgh St Leonards SO_2 monitoring data

Pollutant	Averaging period	Standard (μg/m³)	Concentration (μg/m³)			
			2013	2014	2015	Average
SO_2	Max 15-minute mean	266	61.0	65.0	80.0	68.7
	Max 1-hour mean	350	42.0	51.0	38.0	43.7
	Max 24-hour mean	125	11.0	11.0	7.0	9.7
	Annual mean	20	1.4	1.4	1.6	1.5

A1.1.5 Fine Particulate Matter (PM_{10} and $PM_{2.5}$)

The Mains Loan urban background monitoring site in Dundee also measures PM_{10}, and this is therefore considered to best represent background PM_{10} concentrations in the local area. Details of the monitoring site are given in Table 42. Average concentrations for PM_{10} in 2013, 2014 and 2015 at the Mains Loan monitoring site are shown in Table 49.

There is no $PM_{2.5}$ monitoring carried out at a background location in Dundee, and therefore monitoring data from Edinburgh St Leonards is considered to best represent background $PM_{2.5}$ concentrations. Details of the monitoring site are given in Table 44. Average concentrations for $PM_{2.5}$ in 2013, 2014 and 2015 at the Edinburgh St Leonards monitoring site are shown in Table 50. Data capture in

2014 was less than 75%, and therefore 2013 and 2015 $PM_{2.5}$ data has been selected for inclusion in the assessment.

Table 49: Mains Loan PM_{10} monitoring data

Pollutant	Averaging period	Standard ($\mu g/m^3$)	Concentration ($\mu g/m^3$)			
			2013	2014	2015	Average
PM_{10}	Max 24-hour mean	50 (7 exceedences allowed)	52.0	56.0	51.0	53.0
	Annual mean	18	11.8	12.9	12.1	12.3

Table 50: Edinburgh St Leonards $PM_{2.5}$ monitoring data

Pollutant	Averaging period	Standard ($\mu g/m^3$)	Concentration ($\mu g/m^3$)			
			2013	2014	2015	Average
$PM_{2.5}$	Annual mean	10	7.7	*	6.6	7.2

Notes: '*' indicates data capture less than 75% at the monitoring site in this year.

A1.1.6 Hydrogen Fluoride (HF) and Hydrogen Chloride (HCl)

There is no background monitoring carried out in the UK of HF, as HF is emitted by industrial sources which are regulated[43], and there is no monitoring for HCl carried out in Dundee. The closest monitoring site to the Application Site which carries out automatic monitoring for HCl is Auchencorth Moss, which is located in a rural background location. Site details are shown in Table 46.

Monitoring data for HCl been reviewed and is presented in Table 51. Data capture in 2015 was less than 65% for HCl at the Auchencorth Moss site, and therefore 2013 and 2014 data has been selected for inclusion in the assessment. Concentrations of HCl are shown to be well below the 1-hour mean standard in 2013 and 2014.

Table 51: Auchencorth Moss HCl monitoring data

Pollutant	Averaging period	Standard ($\mu g/m^3$)	Concentration ($\mu g/m^3$)			
			2013	2014	2015	Average
HCl	Max 1-hour mean	750	4.8	1.9	*	3.4

Notes: '*' indicates data capture less than 75% at the monitoring site in this year.

A1.1.7 Ammonia (NH_3)

There is no monitoring carried out of ammonia in Dundee. The nearest automatic monitoring site which measures for ammonia is Auchencorth Moss. A review of ammonia concentrations by the gaseous active method at Edinburgh St Leonards in 2013 to 2015 showed that concentrations were lower at this site than at the Auchencorth Moss site, therefore concentrations from Auchencorth Moss have been used as a worst case assessment. Site details are shown in Table 46 and monitoring data is presented in Table 52.

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43 SEPA (2016) SPRI http://apps.sepa.org.uk/spripa/Pages/SubstanceInformation.aspx?pid=7

Data capture in 2015 at the Auchencorth Moss was below 75%, therefore concentrations from 2013 and 2014 have been used in the assessment. Concentrations of ammonia are shown to be well below the relevant standards for 2013 and 2014.

Table 52: Auchencorth Moss NH_3 monitoring data

Pollutant	Averaging period	Standard (µg/m^3)	Concentration (µg/m^3)			
			2013	2014	2015	Average
NH_3	Max 1-hour mean	2,500	20.0	20.8	*	20.4
	Annual mean	180	1.2	1.2	*	1.2

Notes: '*' indicates data capture less than 75% at the monitoring site in this year.

A1.1.8 Dioxins and Furans

There is no monitoring carried out of dioxins and furans in Dundee. The nearest monitoring site which measures for dioxins and furans is Auchencorth Moss, and the latest year of monitoring data is 2010. Site details are shown in Table 46 and monitoring data is presented in Table 53. Concentrations of dioxins and furans in 2010 have been used in the assessment.

Table 53: Auchencorth Moss dioxins and furans monitoring data

Pollutant	Averaging period	Standard (fg TEQ/m^3)	Concentration (fg TEQ/m^3)
			2010
Dioxins and furans	Annual mean	None	19.1

A1.1.9 Polychlorinated Biphenyls (PCBs)

There is no monitoring carried out of PCBs in Dundee. The nearest monitoring site which measures for PCBs is Auchencorth Moss, and site details are shown in Table 46. The latest year of monitoring data for PCBs is 2010, and therefore concentrations of PCBs in 2010 have been used in the assessment.

Monitoring data is presented in Table 54 and concentrations of PCBs are shown to be well below the relevant standards for 2010. The max 1-hour mean has been calculated as twice the annual mean concentration.

Table 54: Auchencorth Moss PCBs monitoring data

Pollutant	Averaging period	Standard (µg/m^3)	Concentration (µg/m^3)
			2010
PCBs	Max 1-hour mean	6	0.000076
	Annual mean	0.2	0.000038

A1.1.10 Polycyclic Aromatic Hydrocarbons (PAH)

Polycyclic Aromatic Hydrocarbons (PAHs) are measured as benzo(a)pyrene, as representative of total PAH concentrations. There is no monitoring carried out in

Dundee of PAH, and therefore monitoring data from Edinburgh St Leonards is considered to best represent background PAH concentrations at Application Site. A review of PAH concentrations at Edinburgh St Leonards in 2013 to 2015 showed that concentrations were higher at this site than at the Auchencorth Moss site, therefore concentrations from Edinburgh St Leonards have been used as a worst case assessment.

Details of the monitoring site are given in Table 44 and average concentrations for PAH are shown in Table 55. Average concentrations for 2013 to 2015 has been selected for inclusion in the assessment. Concentrations of benzo(a)pyrene are shown to be well below the annual mean standard in 2013 to 2014.

Table 55: Edinburgh St Leonards PAH monitoring data

Pollutant	Averaging period	Standard (ng/m^3)	Concentration (ng/m^3)			
			2013	2014	2015	Average
PAH (benzo(a)pyrene)	Annual mean	0.25	0.08	0.06	0.07	0.07

A1.1.11 Trace Metals

Trace metals included in this assessment are: lead (Pb), arsenic (As), cadmium (Cd), nickel (Ni), thallium (Ti), mercury (Hg), antimony (Sb), chromium (Cr and CrVI), cobalt (Co), copper (Cu), manganese (Mn) and vanadium (V).

There is no monitoring carried out of trace metals in Dundee. The nearest monitoring site which measures for trace metals is Auchencorth Moss, and site details are shown in Table 46.

Concentrations for trace metals are shown in Table 56, and average concentrations for 2013 to 2015 has been selected for inclusion in the assessment. The max 1-hour mean has been calculated as twice the annual mean concentration.

For antimony and mercury, data was only available for 2013, and therefore this has been used in the assessment. For chromium, concentrations in 2015 were greater than average concentrations over the period from 2013 to 2015, therefore data for 2015 has been used as a worst case assessment. Concentrations of CrVI are assumed to be 20% of total Cr, as recommended in the Environment Agency (EA) guidance[44].

Monitoring data is presented in Table 56. Concentrations of all trace metals are shown to be well below the relevant objectives, except for CrVI, however, this is an estimate of the background concentrations.

[44] Environment Agency (2012) Releases from municipal waste incinerators: Guidance to applicants on impact assessment for group 3 metals stack.

Table 56: Auchencorth Moss trace metals monitoring data

Pollutant	Averaging period	Standard (ng/m^3)	Concentration (ng/m^3)			
			2013	2014	2015	Average
Arsenic (As)	Annual mean	3	0.21	0.30	0.14	0.22
Antimony (Sb)	Annual mean	5000	0.23	*	*	-
	Max 1-hour mean	150,000	0.46	*	*	-
Cadmium (Cd)	Annual mean	5	0.02	0.04	0.03	0.03
Lead (Pb)	Annual mean	250	1.27	1.30	1.23	1.27
Nickel (Ni)	Annual mean	20	0.28	0.47	0.47	0.40
Thallium (Tl),	Annual mean	1,000	None			
Mercury (Hg)	Max 1-hour mean	7,500	1.8	*	*	-
	Annual mean	250	0.9	*	*	-
Chromium (Cr) II and III	Max 1-hour mean	150,000	1.56	1.45	2.10	2.10
	Annual mean	5,000	0.78	0.73	1.05	1.05
Chromium (Cr) VI	Annual mean	0.2	0.16	0.15	0.21	0.21
Cobalt (Co)	Annual mean	1,000	0.02	0.03	0.02	0.02
Copper (Cu)	Max 1-hour mean	200,000	1.98	1.61	1.58	1.72
	Annual mean	10,000	0.99	0.80	0.79	0.86
Manganese (Mn)	Max 1-hour mean	1,500,000	2.00	1.73	1.93	1.88
	Annual mean	150	1.00	0.86	0.96	0.94
Vanadium (V)	Max 1-hour mean	1,000	0.83	0.78	0.52	0.71
	Annual mean	5,000	0.42	0.39	0.26	0.36

Notes: ‘*’ indicates no data at the monitoring site in this year.

Appendix B

Construction Dust Assessment

B1 Construction Dust Assessment

B1.1 Method of Construction Assessment

The effects of dust emissions arising from construction have been assessed using the qualitative approach described in the latest guidance[45] by the Institute of Air Quality Management (IAQM). Emissions from NRMM are likely to be small and so have not been assessed in this report. The use of machinery that is compliant with current standards for emissions will be adequate to ensure that impacts from this equipment will be negligible.

An ‘impact’ is described as a change in pollutant concentrations or dust deposition, while an ‘effect’ is described as the consequence of an impact. The main impacts that may arise during construction of the Proposed Scheme are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes;
- Elevated PM_{10} (and $PM_{2.5}$) concentrations as a result of dust generating activities on site; and
- An increase in NO_2 and PM_{10} concentrations due to exhaust emissions from non-road mobile machinery and vehicles accessing the site.

The IAQM guidance considers the potential for dust emissions from dust-generating activities, such as demolition of existing structures, earthworks, construction of new structures and trackout. Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping, while trackout is the transport of dust and dirt from a site onto the public road network where it may be deposited and then re-suspended by vehicles using the network. This arises when vehicles leave a site with dusty materials, which may then spill onto the road, or when they travel over muddy ground on site and then transfer dust and dirt onto the road network.

For each of these dust-generating activities, the guidance considers three separate effects: annoyance due to dust soiling; harm to ecological receptors; and the risk of health effects due to a significant increase in PM_{10} exposure. The receptors can be human or ecological and are chosen based on their sensitivity to dust soiling and PM_{10} exposure.

The methodology takes into account the scale on which the above effects are likely to be generated (classed as small, medium or large), the levels of background PM_{10} concentrations and the distance to the closest receptor, in order to determine the sensitivity of the area. These factors are then taken into consideration when deriving the overall risk for the site. Suitable mitigation measures are also proposed to reduce the risk of the site.

[45] Institute of Air Quality Management (2014); Guidance on the assessment of dust from demolition and construction

There are five steps in the assessment process described in the IAQM guidance. These are summarised in Figure 18 and a further description is provided in the following sections.

B1.1.1 Step 1: Need for Assessment

The first step is the initial screening for the need for a detailed assessment. According to the IAQM guidance, an assessment is required where there are sensitive receptors within 350m of the site boundary (for ecological receptors that is 50m) and/or within 50m of the route(s) used by the construction vehicles on the public highway and up to 500m from the site entrance(s).

B1.1.2 Step 2: Assess Risk of Dust Impacts

This step is split into three sections as follows:

2A. Define the potential dust emission magnitude;

2B. Define the sensitivity of the area; and

2C. Define the risk of impacts.

Each of the dust-generating activities is given a dust emission magnitude depending on the scale and nature of the works (step 2A) based on the criteria shown in Table.

Figure 18: IAQM dust assessment methodology

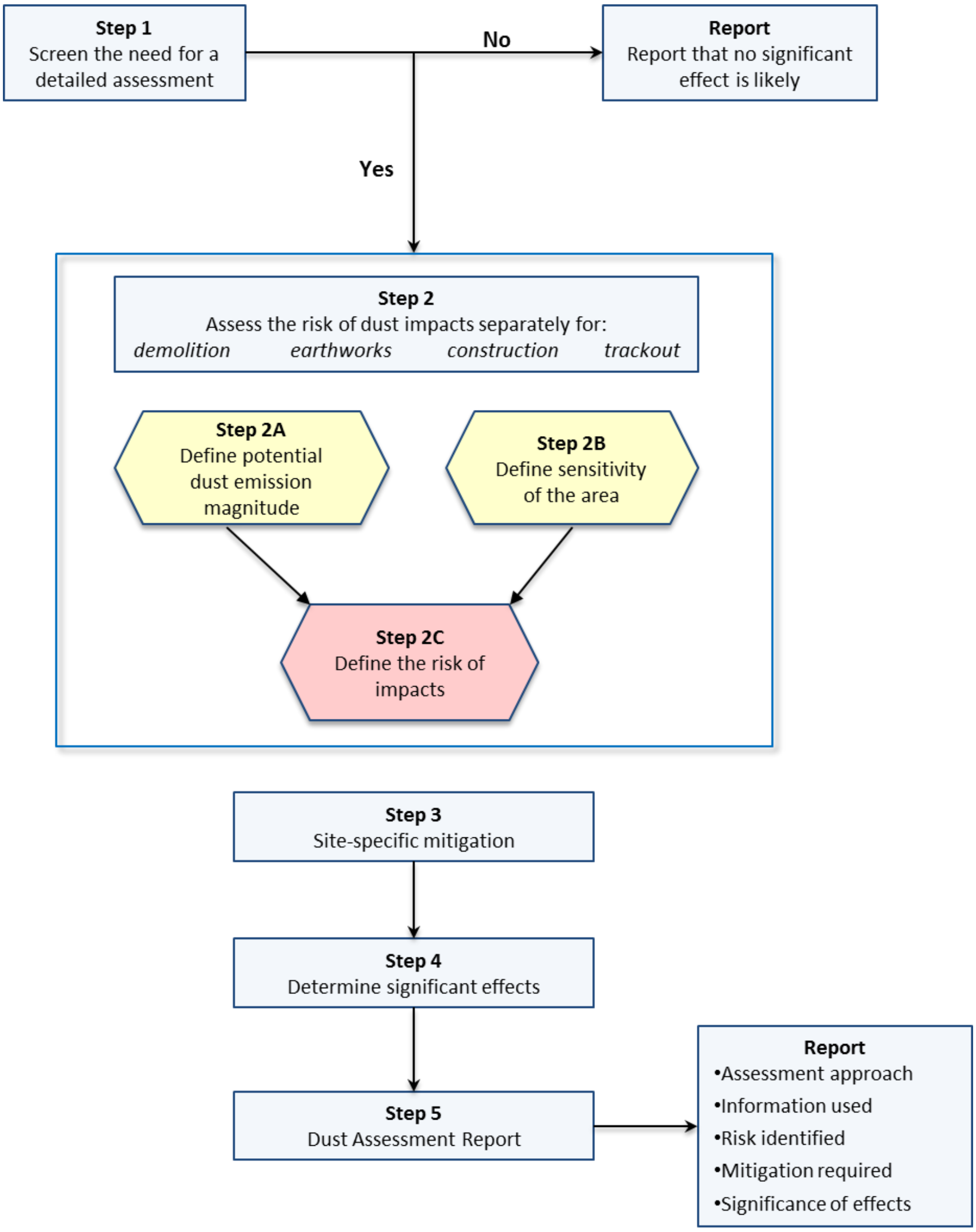


Table B1 Categorisation of dust emission magnitude

Dust Emission Magnitude		
Small	**Medium**	**Large**
Demolition		
• total building volume <20,000m^3 • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <10m above ground • demolition during wetter months	• total building volume 20,000 - 50,000m^3 • potentially dusty construction material • demolition activities 10 - 20m above ground level	• total building volume >50,000m^3 • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >20m above ground level
Earthworks		
• total site area <2,500m^2 • soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • formation of bunds <4m in height • total material moved <10,000 tonnes • earthworks during wetter months	• total site area 2,500m^2 - 10,000m^2 • moderately dusty soil type (e.g. silt) • 5 – 10 heavy earth moving vehicles active at any one time • formation of bunds 4 - 8m in height • total material moved 20,000 - 100,000 tonnes	• total site area >10,000m^2 • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >8m in height • total material moved >100,000 tonnes
Construction		
• total building volume <25,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)	• total building volume 25,000 - 100,000m^3 • potentially dusty construction material (e.g. concrete) • on-site concrete batching	• total building volume >100,000m^3 • on-site concrete batching • sandblasting
Trackout		
• <10 HDV (>3.5t) outward movements in any one day • surface material with low potential for dust release • unpaved road length <50m	• 10 – 50 HDV (>3.5t) outward movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50 – 100m;	• >50 HDV (>3.5t) outward movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100m

The sensitivity of the surrounding area is then determined (step 2B) for each dust effect from the above dust-generating activities, based on the proximity and number of receptors, their sensitivity to dust, the local PM_{10} background concentrations and any other site-specific factors. Tables B2 and B3 show the criteria for defining the sensitivity of the area to different dust effects.

Table B2: Sensitivity of the area to dust soiling effects on people and property

<table>
<tr><th rowspan="2">Receptor sensitivity</th><th rowspan="2">Number of receptors</th><th colspan="4">Distance from the source (m)</th></tr>
<tr><th>< 20</th><th>< 50</th><th>< 100</th><th>< 350</th></tr>
<tr><td rowspan="3">High</td><td>> 100</td><td>High</td><td>High</td><td>Medium</td><td>Low</td></tr>
<tr><td>10 – 100</td><td>High</td><td>Medium</td><td>Low</td><td>Low</td></tr>
<tr><td>< 10</td><td>Medium</td><td>Low</td><td>Low</td><td>Low</td></tr>
<tr><td>Medium</td><td>> 1</td><td>Medium</td><td>Low</td><td>Low</td><td>Low</td></tr>
<tr><td>Low</td><td>> 1</td><td>Low</td><td>Low</td><td>Low</td><td>Low</td></tr>
</table>

Table B3: Sensitivity of the area to human health impacts

<table>
<tr><th rowspan="2">Background PM10 concentrations (annual mean)</th><th rowspan="2">Number of receptors</th><th colspan="5">Distance from the source (m)</th></tr>
<tr><th>< 20</th><th>< 50</th><th>< 100</th><th>< 200</th><th>< 350</th></tr>
<tr><th colspan="7">High receptor sensitivity</th></tr>
<tr><td rowspan="3">> 18μg/m³</td><td>> 100</td><td rowspan="3">High</td><td rowspan="2">High</td><td>High</td><td>Medium</td><td rowspan="3">Low</td></tr>
<tr><td>10 – 100</td><td>Medium</td><td rowspan="2">Low</td></tr>
<tr><td>< 10</td><td>Medium</td><td>Low</td></tr>
<tr><td rowspan="3">16 – 18μg/m³</td><td>> 100</td><td rowspan="3">High</td><td>High</td><td>Medium</td><td rowspan="3">Low</td><td rowspan="3">Low</td></tr>
<tr><td>10 – 100</td><td rowspan="2">Medium</td><td rowspan="2">Low</td></tr>
<tr><td>< 10</td></tr>
<tr><td rowspan="3">14 – 16μg/m³</td><td>> 100</td><td rowspan="2">High</td><td rowspan="2">Medium</td><td rowspan="3">Low</td><td rowspan="3">Low</td><td rowspan="3">Low</td></tr>
<tr><td>10 – 100</td></tr>
<tr><td>< 10</td><td>Medium</td><td>Low</td></tr>
<tr><td rowspan="3">< 14μg/m³</td><td>> 100</td><td>Medium</td><td rowspan="3">Low</td><td rowspan="3">Low</td><td rowspan="3">Low</td><td rowspan="3">Low</td></tr>
<tr><td>10 – 100</td><td rowspan="2">Low</td></tr>
<tr><td>< 10</td></tr>
<tr><th colspan="7">Medium receptor sensitivity</th></tr>
<tr><td rowspan="2">–</td><td>> 10</td><td>High</td><td>Medium</td><td rowspan="2">Low</td><td rowspan="2">Low</td><td rowspan="2">Low</td></tr>
<tr><td>< 10</td><td>Medium</td><td>Low</td></tr>
<tr><th colspan="7">Low receptor sensitivity</th></tr>
<tr><td>–</td><td>> 1</td><td>Low</td><td>Low</td><td>Low</td><td>Low</td><td>Low</td></tr>
</table>

The overall risk of the impacts for each activity is then determined (step 2C) prior to the identification of any necessary mitigation measures (Table B4) and an overall risk for the site is then derived.

B1.1.3 Step 3: Determine the Site-Specific Mitigation

Once each of the activities is assigned a risk rating, appropriate mitigation measures are identified. Where the risk is negligible, no mitigation measures beyond those required by legislation are necessary.

Table B4: Risk of dust impacts

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
Demolition			
High	High risk site	Medium risk site	Medium risk site
Medium	High risk site	Medium risk site	Low risk site
Low	Medium risk site	Low risk site	Negligible
Earthworks			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Construction			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Trackout			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Low risk site	Negligible
Low	Low risk site	Low risk site	Negligible

B1.1.4 Step 4: Determine Any Significant Residual Effects

After the risk of dust impacts has been determined and the appropriate dust mitigation measures identified, the final step is to determine whether there are any residual significant effects. The IAQM guidance notes that it is anticipated that with the implementation of effective site-specific mitigation measures, the environmental effect will not be significant in most cases.

B1.1.5 Step 5: Prepare a Dust Assessment Report

The last step of the assessment is the preparation of a Dust Assessment Report. This forms part of this report (see section B1.2).

B1.2 Construction Assessment

The area of the Proposed Scheme covers an area of approximately 204ha. As discussed in paragraphs B1.1.1 to B1.1.5 the IAQM guidance takes into consideration four dust generating activities: demolition, earthworks, construction and trackout. The site is currently a brownfield site which is used for processing and recycling of highway redevelopment and construction material as well as being part of the existing DERL site. The flood mitigation area and the construction compound are undeveloped land. Demolition of the existing DERL facility will be subject to separate applications and so an assessment of demolition is not required in this assessment. Potential impacts from earthworks, construction and trackout are considered in the following sections.

B1.2.1 Sensitive Receptors

Sensitive receptors are defined as those dwellings, schools and hospitals that are likely to experience a change in pollutant concentrations and/or dust nuisance due to the construction and operation of the Proposed Scheme.

A review of the areas surrounding the main EfW CHP site (Areas A, C, D and E as shown on Volume 1 Appendix C1) has been carried out, and a map is shown in Figure 19 which identifies the sensitive receptors within 20m, 50m, 100m and 350m of the Application Site boundary, following the IAQM guidance.

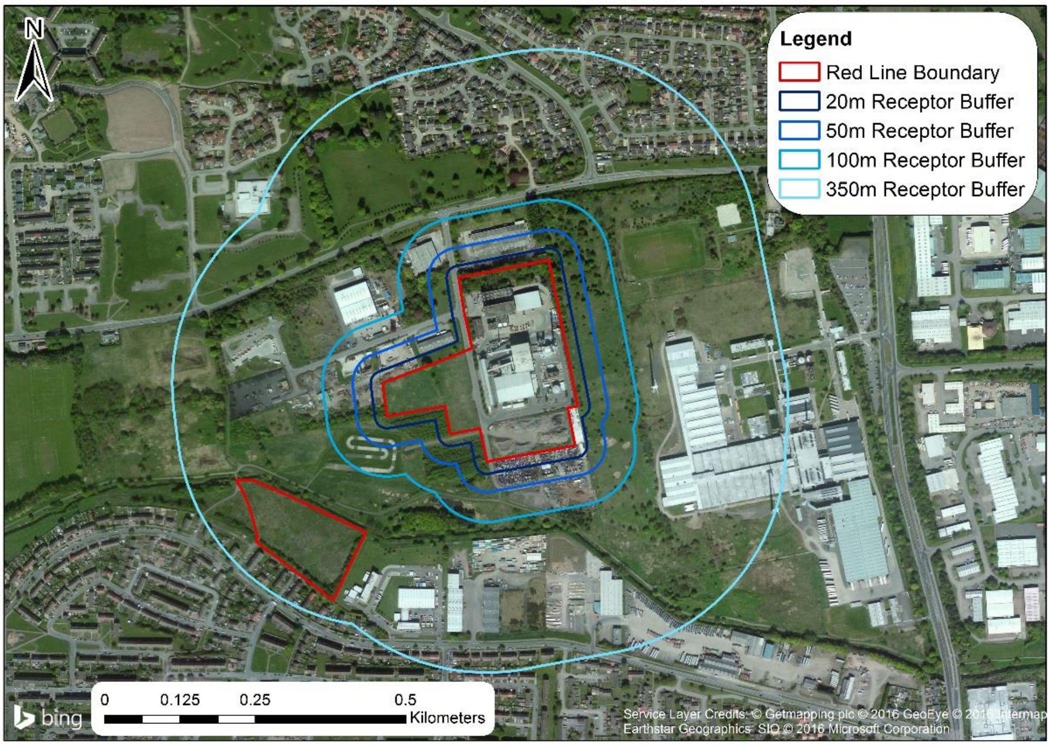
There are no receptors within 100m of the main site boundary which are considered to be of a high sensitivity, such as residential dwellings. There are fewer than 10 commercial properties within 100m which are considered to be of a medium sensitivity. Newlands Primary School lies within 350m of the Application Site, and there are residential receptors within 350m of the Proposed Scheme, to the north and south. The overall receptor sensitivity to dust soiling and PM_{10} exposure has therefore been classified as high according to the IAQM guidance, as a precautionary assumption.

For the pre-selected flood mitigation area (Area B) there are approximately 20 residential receptors within 20m of the Application Site boundary, to the south.

There are no ecological receptors sensitive to dust within 350m of the Application Site boundary, and therefore the sensitivity of the area to ecological impacts is negligible.

Transient receptors, such as users of access roads, local footpaths and other public rights of way, are not considered to be of high sensitivity as they are not exposed to emissions continuously or for extended periods.

Figure 19: Construction dust receptor buffer areas



B1.2.2 Dust Emission Magnitude

Following the methodology described in section 4.2.1, each dust generating activity has been assigned a dust emission magnitude as shown in Table B5. For the pre-selected flood mitigation area, only earthworks are expected to occur.

Table B5: Dust emission magnitude for dust generating activities

Activity	Dust emission magnitude	Reasoning
Demolition	-	No demolition will be required.
Earthworks	Large	Total site area for the main EfW CHP site (Areas A, C, D and E) is greater than 10,000m^2 (expected to be around 60,000m^2). Material is expected to be imported to raise the main site level by approximately 1m. Total site area for the pre-selected flood mitigation area (Area B) is greater than 10,000m^2 (expected to be around 20,000m^2). The area has a potentially dusty soil type (clay, silt, and gravel). No earth will be removed from Area B.
Construction	Large	Total building volume greater than 100,000m^3 (expected to be around 200,000m^3). Work on-site during construction is anticipated to include excavations, earthworks, piling, and concrete construction of foundations, buildings, roads and hard-standing areas.
Trackout	Large	Between greater than 50 HDV (>3.5t) outward movements in any one day during the peak construction period, and dusty surface material (clay). Unpaved road

Activity	Dust emission magnitude	Reasoning
		will run around the full perimeter of the main building site (estimated to be around 350m) outside of the main building footprint. No earth will be removed from Area B.

B1.2.3 Sensitivity of the Area

For the main EfW CHP site (Areas A, C, D and E), the sensitivity of the area to dust soiling has been assigned as medium, due to the presence of approximately four commercial receptors within 20m of the Application Site boundary.

For the pre-selected flood mitigation area (Area B) the sensitivity of the area to dust soiling has been assigned as high, due to the presence of approximately 20 residential receptors within 20m of the Application Site.

There will be a shallow excavation over an area of about 8,500 m^2 with the excavated material (about 2,000 m^3) forming a mound to screen the housing.

The sensitivity of the main EfW CHP site and pre-selected flood mitigation site to human health impacts has been assigned as low, due to the low background PM_{10} concentrations of 12.3µg/m^3.

B1.2.4 Risk of Impacts

Taking into consideration the dust emission magnitude and the sensitivity of the area, the main EfW CHP site (Areas A, C, D and E) has been classified as medium risk to dust soiling and low risk to human health impacts for all activities, as shown in Table B6. For earthworks at the flood mitigation area, the Application Site has been classified as high risk to dust soiling and low risk to human health impacts. Specific relevant mitigation is described in the CEMP.

Table B6: Summary of dust risks prior to mitigation

Activity	Sensitivity of the surrounding area	
	Dust soiling	**Human health**
Earthworks (main site)	Medium Risk	Low risk
Earthworks (flood mitigation area)	High Risk	Low risk
Construction	Medium Risk	Low risk
Trackout	Medium Risk	Low risk

B1.3 Construction Mitigation

The dust emitting activities assessed in Section B1.2 can be greatly reduced or eliminated by applying the site specific mitigation measures for high risk sites according to the IAQM guidance. The guidance notes that it is anticipated that with the implementation of effective site-specific mitigation measures, the environmental effect will not be significant in most cases. All appropriate mitigation measures have been included in the Construction Environmental Management Plan (CEMP) for the Proposed Scheme.

Appendix C

Baseline and Construction Traffic Data

C1 Construction Traffic

Table C1: Construction traffic data (AADT)

Id	Road_Name	Speed	2015 baseline				Baseline plus worst case construction traffic			
		kph	Car/LGV	HGVs	All vehicles	%HGVs	Car/LGV	HGVs	All vehicles	%HGVs
1	JCT Drumgeith Road west of site	20	12,537	1,254	13,791	9.1	12,801	1,324	14,195	9.3
2	BEND Drumgeith Road west	32	12,537	1,254	13,791	9.1	12,801	1,324	14,195	9.3
3	Drumgeith Road west 1	53	12,537	1,254	13,791	9.1	12,801	1,324	14,195	9.3
4	Drumgeith Road west 2	53	12,537	1,254	13,791	9.1	12,801	1,324	14,195	9.3
5	Forties Road north	42	1,616	386	2,002	19.3	2,056	503	2,675	18.8
6	Forties Road south	27	387	104	491	21.1	387	104	491	21.1
7	Drumgeith Road east 1	42	14,739	821	15,560	5.3	14,915	867	15,828	5.5
8	JCT Drumgeith Road east of site	20	14,739	821	15,560	5.3	14,915	867	15,828	5.5
9	JCT Drumgeith Road west of Ballumbie Road	20	14,739	821	15,560	5.3	14,915	867	15,828	5.5
10	JCT Drumgeith Road east of Ballumbie Road	20	16,295	719	17,014	4.2	16,433	765	17,245	4.4
11	Ballumbie Road	42	5,920	152	6,072	2.5	5,958	152	6,109	2.5
12	Drumgeith Road east	42	16,295	719	17,014	4.2	16,433	765	17,245	4.4
13	BEND Drumgeith Road east	32	16,295	719	17,014	4.2	16,433	765	17,245	4.4
14	Kellas Road	42	9,417	335	9,751	3.4	9,458	335	9,792	3.4

		Speed	2015 baseline				Baseline plus worst case construction traffic			
Id	**Road_Name**	**kph**	**Car/LGV**	**HGVs**	**All vehicles**	**%HGVs**	**Car/LGV**	**HGVs**	**All vehicles**	**%HGVs**
15	Baldovie Road	42	13,706	581	14,287	4.1	13,803	627	14,477	4.3
16	JCT Baldovie Road	20	13,706	581	14,287	4.1	13,803	627	14,477	4.3
17	JCT Balunie Drive east	20	4,849	464	5,313	8.7	4,849	464	5,313	8.7
18	Balunie Drive	47	4,849	464	5,313	8.7	4,849	464	5,313	8.7
19	JCT Balunie Drive west	20	4,849	464	5,313	8.7	4,849	464	5,313	8.7
20	RBT Drumgeith - Balunie	20	8,693	859	9,552	9.0	8,825	894	9,754	9.2
21	JCT Baldovie Rd - A92	20	13,706	581	14,287	4.1	13,803	627	14,477	4.3
22	A92 JCT East	20	21,355	1,072	22,427	4.8	21,428	1,096	22,523	4.9
23	A92 JCT West	20	20,914	1,008	21,922	4.6	20,985	1,031	22,016	4.7
24	A92 East	64	21,355	1,072	22,427	4.8	21,428	1,096	22,523	4.9
25	A92 West	64	20,914	1,008	21,922	4.6	20,985	1,031	22,016	4.7

Appendix D

Model Results at Human Receptors

Contents

D1 Introduction

This appendix presents the model results at all the 111 human receptors for comparison with each of the pollutant-averaging time-statistic combination for the standards and guidelines given in Table 1. The concentrations given are all process contributions, that is, background concentrations are not included.

The results tables below contain results for the following scenarios:

- the existing DERL facility;
- the proposed EfW CHP facility;
- the EfW boilers during hot commissioning (with DERL); and
- the Michelin boilers (with the proposed EfW CHP).

At the end of each table the concentrations are given for two locations labelled 112 and 113 which are:

- 112: the location maximum impact for the small modelled grid area; and
- 113: the location maximum impact for the large modelled grid area.

D2 Human Receptor Results

D2.1 Nitrogen oxides (NO_x) and nitrogen dioxide (NO_2)

Table D1: Process contributions of NO_x and NO_2 at the human receptors

Human receptor ID	NO_2 annual mean concentration (µg/m^3)						NO_2 99.79th percentile 1 hour mean concentration (µg/m^3)					
	DERL	EfW CHP	EfW boilers	Michelin + EfW	Michelin + DERL	Significance	DERL	EfW CHP	EfW boilers	Michelin + EfW	Michelin + DERL	Significance
	Air quality standard: 40µg/m^3						Air quality standard: 200µg/m^3 not to be exceeded more than 18 times per year (99.79th percentile)					
1	0.30	0.18	-	0.21	0.33	Negligible	7.36	7.55	8.14	8.39	8.20	Negligible
2	0.15	0.11	-	0.15	0.19	Negligible	9.92	7.01	10.55	7.97	10.88	Negligible
3	0.13	0.10	-	0.13	0.16	Negligible	7.27	6.41	8.10	7.57	8.43	Negligible
4	0.17	0.08	-	0.12	0.21	Negligible	7.76	8.79	8.91	10.18	9.15	Negligible
5	0.21	0.07	-	0.12	0.25	Negligible	9.48	8.57	10.64	10.09	11.00	Negligible
6	0.33	0.08	-	0.12	0.37	Negligible	9.05	7.71	9.83	9.34	10.69	Negligible
7	0.55	0.17	-	0.20	0.58	Negligible	8.88	6.86	9.54	8.20	10.22	Negligible
8	0.13	0.09	-	0.12	0.15	Negligible	6.90	6.76	7.65	7.54	7.68	Negligible
9	1.67	0.45	-	0.48	1.69	Negligible	6.56	5.72	7.26	7.30	8.14	Negligible
10	1.43	0.54	-	0.57	1.46	Negligible	5.60	5.16	6.32	6.82	7.26	Negligible
11	1.29	0.53	-	0.56	1.32	Negligible	5.36	4.87	6.06	6.47	6.96	Negligible
12	1.16	0.54	-	0.57	1.19	Negligible	4.87	4.54	5.52	5.99	6.32	Negligible
13	0.62	0.30	-	0.32	0.64	Negligible	5.17	5.00	5.84	6.12	6.29	Negligible
14	0.08	0.10	-	0.11	0.09	Negligible	5.71	5.41	6.24	6.05	6.36	Negligible
15	0.05	0.06	-	0.07	0.07	Negligible	4.81	5.71	5.35	6.50	5.61	Negligible
16	0.05	0.03	-	0.04	0.06	Negligible	4.29	4.73	4.75	5.43	4.99	Negligible
17	0.07	0.03	-	0.04	0.08	Negligible	5.04	5.07	5.58	5.71	5.68	Negligible
18	0.08	0.04	-	0.05	0.09	Negligible	5.05	4.75	5.55	5.30	5.60	Negligible
19	0.05	0.02	-	0.03	0.07	Negligible	5.62	5.27	6.21	6.17	6.52	Negligible
20	0.04	0.04	-	0.05	0.06	Negligible	4.28	4.02	4.66	4.78	5.04	Negligible

21	0.09	0.09	-	0.10	0.11	Negligible	4.31	3.54	4.65	4.00	4.77	Negligible
22	0.07	0.06	-	0.08	0.09	Negligible	4.06	4.20	4.45	4.68	4.54	Negligible
23	0.06	0.06	-	0.07	0.07	Negligible	2.94	3.12	3.18	3.38	3.20	Negligible
24	0.08	0.08	-	0.09	0.09	Negligible	3.54	2.68	3.79	2.97	3.83	Negligible
25	0.20	0.20	-	0.22	0.22	Negligible	4.21	5.46	4.85	6.07	4.82	Negligible
26	0.15	0.15	-	0.16	0.16	Negligible	3.58	4.07	4.04	4.53	4.04	Negligible
27	0.10	0.11	-	0.12	0.12	Negligible	2.51	3.27	2.91	3.71	2.96	Negligible
28	0.12	0.09	-	0.11	0.14	Negligible	4.58	3.84	4.93	4.25	5.00	Negligible
29	0.24	0.18	-	0.21	0.27	Negligible	8.47	4.50	8.82	5.28	9.25	Negligible
30	0.12	0.11	-	0.13	0.14	Negligible	2.58	3.07	2.86	3.45	2.96	Negligible
31	0.03	0.03	-	0.03	0.04	Negligible	4.30	3.83	4.61	4.20	4.66	Negligible
32	0.05	0.04	-	0.05	0.06	Negligible	3.90	4.45	4.28	5.01	4.45	Negligible
33	0.33	0.26	-	0.29	0.36	Negligible	10.96	10.48	11.91	11.48	11.96	Negligible
34	0.03	0.02	-	0.05	0.07	Negligible	6.71	6.00	7.35	6.92	7.63	Negligible
35	0.18	0.17	-	0.20	0.21	Negligible	4.98	5.39	5.61	6.27	5.87	Negligible
36	0.79	0.10	-	0.15	0.83	Negligible	9.78	6.35	10.46	8.51	11.94	Negligible
37	0.27	0.10	-	0.13	0.30	Negligible	7.46	7.57	8.15	8.53	8.42	Negligible
38	0.24	0.11	-	0.13	0.26	Negligible	7.06	7.34	7.69	8.68	8.41	Negligible
39	0.23	0.16	-	0.18	0.26	Negligible	5.27	5.89	5.82	6.51	5.90	Negligible
40	0.29	0.21	-	0.24	0.31	Negligible	10.18	6.25	10.67	7.14	11.06	Negligible
41	0.23	0.22	-	0.24	0.26	Negligible	5.62	7.96	6.38	8.64	6.30	Negligible
42	0.17	0.12	-	0.15	0.20	Negligible	7.33	5.33	7.77	6.19	8.19	Negligible
43	0.32	0.17	-	0.19	0.33	Negligible	5.92	6.67	6.51	8.01	7.27	Negligible
44	0.91	0.33	-	0.35	0.94	Negligible	7.24	6.07	7.97	7.82	8.98	Negligible
45	0.51	0.22	-	0.24	0.53	Negligible	6.46	6.43	7.08	8.12	8.15	Negligible
46	0.35	0.15	-	0.18	0.38	Negligible	7.06	7.29	7.74	8.86	8.63	Negligible
47	0.28	0.09	-	0.12	0.32	Negligible	8.89	8.91	9.89	10.39	10.37	Negligible
48	0.24	0.09	-	0.12	0.27	Negligible	8.41	9.46	9.49	10.77	9.72	Negligible
49	0.19	0.09	-	0.12	0.22	Negligible	9.67	9.26	10.72	10.39	10.80	Negligible
50	0.14	0.10	-	0.12	0.17	Negligible	8.01	7.66	8.91	8.59	8.94	Negligible
51	0.18	0.11	-	0.12	0.19	Negligible	6.54	6.43	7.07	7.50	7.61	Negligible
52	0.15	0.09	-	0.10	0.17	Negligible	7.00	6.33	7.52	7.42	8.09	Negligible
53	0.13	0.08	-	0.09	0.14	Negligible	6.35	6.66	6.89	7.43	7.12	Negligible

54	0.12	0.08	-	0.10	0.14	Negligible	7.96	7.14	8.69	7.76	8.59	Negligible
55	0.12	0.09	-	0.11	0.14	Negligible	6.73	6.34	7.29	6.98	7.36	Negligible
56	0.13	0.09	-	0.11	0.15	Negligible	5.85	6.03	6.50	6.78	6.59	Negligible
57	0.14	0.08	-	0.10	0.16	Negligible	8.11	8.10	8.92	8.68	8.69	Negligible
58	0.17	0.12	-	0.14	0.19	Negligible	6.49	4.95	6.91	5.66	7.19	Negligible
59	0.25	0.16	-	0.19	0.27	Negligible	6.98	6.78	7.68	7.39	7.60	Negligible
60	0.05	0.06	-	0.07	0.06	Negligible	4.78	4.89	5.20	5.60	5.49	Negligible
61	0.05	0.06	-	0.07	0.06	Negligible	5.21	5.56	5.70	6.15	5.81	Negligible
62	0.05	0.04	-	0.05	0.05	Negligible	4.44	4.72	4.85	5.21	4.93	Negligible
63	0.04	0.03	-	0.04	0.04	Negligible	5.11	5.35	5.58	5.69	5.44	Negligible
64	0.04	0.04	-	0.05	0.05	Negligible	3.09	2.53	3.35	3.00	3.57	Negligible
65	0.05	0.06	-	0.07	0.06	Negligible	2.97	3.38	3.28	3.83	3.41	Negligible
66	0.06	0.07	-	0.08	0.07	Negligible	3.72	4.04	4.12	4.54	4.22	Negligible
67	0.05	0.04	-	0.05	0.06	Negligible	4.16	3.85	4.51	4.62	4.92	Negligible
68	0.07	0.05	-	0.06	0.08	Negligible	4.34	4.11	4.78	4.68	4.91	Negligible
69	0.04	0.04	-	0.05	0.05	Negligible	4.22	3.04	4.61	3.70	4.88	Negligible
70	0.09	0.09	-	0.10	0.10	Negligible	4.34	3.25	4.65	3.64	4.73	Negligible
71	0.04	0.03	-	0.04	0.04	Negligible	5.20	4.23	5.59	4.68	5.65	Negligible
72	0.03	0.03	-	0.03	0.04	Negligible	4.65	4.86	5.05	5.14	4.94	Negligible
73	0.06	0.05	-	0.05	0.06	Negligible	4.92	4.29	5.37	4.70	5.34	Negligible
74	0.04	0.05	-	0.06	0.05	Negligible	3.57	3.27	3.84	3.91	4.20	Negligible
75	0.06	0.05	-	0.05	0.07	Negligible	3.86	4.21	4.24	4.84	4.49	Negligible
76	0.05	0.05	-	0.06	0.06	Negligible	4.78	5.39	5.29	5.98	5.37	Negligible
77	0.04	0.04	-	0.04	0.05	Negligible	4.45	4.49	4.84	4.88	4.84	Negligible
78	0.06	0.04	-	0.05	0.07	Negligible	3.99	4.39	4.42	5.04	4.64	Negligible
79	0.07	0.04	-	0.05	0.08	Negligible	4.88	4.56	5.33	5.07	5.39	Negligible
80	0.04	0.04	-	0.05	0.04	Negligible	2.67	2.90	2.93	3.31	3.08	Negligible
81	0.04	0.04	-	0.06	0.06	Negligible	4.10	3.90	4.43	4.61	4.80	Negligible
82	0.06	0.06	-	0.07	0.07	Negligible	3.21	2.92	3.44	3.15	3.45	Negligible
83	0.08	0.03	-	0.04	0.08	Negligible	5.01	5.07	5.56	5.71	5.65	Negligible
84	0.09	0.09	-	0.10	0.11	Negligible	4.40	3.54	4.74	4.00	4.86	Negligible
85	0.07	0.06	-	0.08	0.09	Negligible	4.06	4.20	4.44	4.69	4.55	Negligible
86	0.08	0.08	-	0.09	0.09	Negligible	3.57	2.71	3.83	3.00	3.86	Negligible

87	0.04	0.04	-	0.05	0.04	Negligible	2.68	2.99	2.95	3.40	3.10	Negligible
88	0.04	0.04	-	0.06	0.06	Negligible	4.09	3.90	4.43	4.61	4.81	Negligible
89	0.06	0.06	-	0.07	0.07	Negligible	3.25	2.95	3.48	3.19	3.49	Negligible
90	1.21	0.51	-	0.53	1.24	Negligible	5.34	4.92	6.03	6.45	6.87	Negligible
91	0.21	0.16	-	0.18	0.22	Negligible	6.03	4.82	6.42	5.49	6.70	Negligible
92	0.21	0.15	-	0.17	0.23	Negligible	5.53	4.25	5.90	4.88	6.16	Negligible
93	0.05	0.05	-	0.06	0.05	Negligible	4.80	5.21	5.23	5.82	5.41	Negligible
94	0.24	0.16	-	0.18	0.26	Negligible	5.28	5.96	5.83	6.59	5.91	Negligible
95	0.04	0.05	-	0.06	0.05	Negligible	3.66	3.26	3.94	3.91	4.30	Negligible
96	0.20	0.20	-	0.22	0.22	Negligible	4.21	5.46	4.85	6.07	4.82	Negligible
97	0.04	0.03	-	0.04	0.04	Negligible	5.15	5.41	5.63	5.75	5.49	Negligible
98	0.04	0.04	-	0.05	0.05	Negligible	4.31	3.04	4.71	3.71	4.98	Negligible
99	0.06	0.05	-	0.05	0.07	Negligible	3.90	4.24	4.29	4.87	4.54	Negligible
100	0.05	0.05	-	0.06	0.06	Negligible	4.84	5.46	5.36	6.08	5.46	Negligible
101	1.26	0.48	-	0.50	1.28	Negligible	5.73	5.27	6.47	6.81	7.26	Negligible
102	0.33	0.08	-	0.12	0.37	Negligible	9.12	7.92	9.88	9.60	10.79	Negligible
103	0.27	0.17	-	0.20	0.30	Negligible	8.40	8.01	9.22	8.75	9.14	Negligible
104	0.24	0.23	-	0.26	0.27	Negligible	5.25	8.07	6.08	8.81	5.98	Negligible
105	0.08	0.07	-	0.07	0.09	Negligible	2.61	2.74	2.84	3.05	2.92	Negligible
106	0.05	0.05	-	0.06	0.07	Negligible	4.42	4.41	4.81	5.04	5.05	Negligible
107	0.05	0.05	-	0.06	0.05	Negligible	4.79	5.22	5.22	5.83	5.41	Negligible
108	0.02	0.00	-	0.06	0.07	Negligible	7.35	1.25	7.55	2.53	8.63	Negligible
109	0.02	0.02	-	0.02	0.02	Negligible	1.09	1.09	1.17	1.23	1.23	Negligible
110	0.04	0.03	-	0.04	0.04	Negligible	3.74	3.93	4.05	4.27	4.08	Negligible
111	0.10	0.12	-	0.13	0.11	Negligible	5.81	5.03	6.30	5.73	6.51	Negligible
112	1.74	0.94	-	1.07	1.77	Negligible	15.47	11.85	16.74	12.88	16.19	Negligible
113	1.69	0.88	-	1.02	1.72	Negligible	13.78	11.45	14.54	12.71	14.99	Negligible

D2.2 Carbon monoxide (CO)

Table D2: Process contributions of CO at the human receptors

Human receptor ID	Maximum annual 8-hour running mean concentration (mg/m^3)					100th percentile 1 hour mean concentration (mg/m^3)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW boilers	Michelin	Significance
	Air quality standard: 10mg/m^3					EAL: 30,000 µg/m^3				
1	0.0002	0.0017	0.0007	-	Negligible	0.48	5.39	2.72	-	Negligible
2	0.0001	0.0014	0.0006	-	Negligible	0.64	5.01	2.45	-	Negligible
3	0.0001	0.0012	0.0005	-	Negligible	0.47	4.58	2.85	-	Negligible
4	0.0002	0.0012	0.0006	-	Negligible	0.50	6.28	3.78	-	Negligible
5	0.0003	0.0012	0.0006	-	Negligible	0.62	6.12	3.94	-	Negligible
6	0.0004	0.0014	0.0008	-	Negligible	0.59	5.51	2.81	-	Negligible
7	0.0003	0.0015	0.0007	-	Negligible	0.58	4.90	2.46	-	Negligible
8	0.0001	0.0011	0.0004	-	Negligible	0.45	4.83	2.59	-	Negligible
9	0.0003	0.0016	0.0008	-	Negligible	0.43	4.09	2.42	-	Negligible
10	0.0003	0.0017	0.0007	-	Negligible	0.36	3.68	2.42	-	Negligible
11	0.0003	0.0017	0.0007	-	Negligible	0.35	3.48	2.34	-	Negligible
12	0.0002	0.0016	0.0006	-	Negligible	0.32	3.24	2.17	-	Negligible
13	0.0002	0.0016	0.0006	-	Negligible	0.34	3.57	2.26	-	Negligible
14	0.0001	0.0014	0.0005	-	Negligible	0.37	3.86	1.89	-	Negligible
15	0.0001	0.0011	0.0004	-	Negligible	0.31	4.08	1.84	-	Negligible
16	0.0001	0.0015	0.0006	-	Negligible	0.28	3.38	1.61	-	Negligible
17	0.0002	0.0012	0.0006	-	Negligible	0.33	3.62	1.89	-	Negligible
18	0.0002	0.0011	0.0005	-	Negligible	0.33	3.39	1.77	-	Negligible
19	0.0002	0.0010	0.0006	-	Negligible	0.37	3.76	2.05	-	Negligible
20	0.0001	0.0012	0.0005	-	Negligible	0.28	2.87	1.36	-	Negligible
21	0.0002	0.0014	0.0006	-	Negligible	0.28	2.53	1.25	-	Negligible
22	0.0002	0.0015	0.0007	-	Negligible	0.26	3.00	1.37	-	Negligible
23	0.0001	0.0009	0.0003	-	Negligible	0.19	2.23	0.90	-	Negligible
24	0.0001	0.0011	0.0004	-	Negligible	0.23	1.92	0.95	-	Negligible
25	0.0002	0.0015	0.0005	-	Negligible	0.27	3.90	2.12	-	Negligible

26	0.0001	0.0012	0.0004	-	Negligible	0.23	2.91	1.55	-	Negligible
27	0.0001	0.0012	0.0004	-	Negligible	0.16	2.33	1.28	-	Negligible
28	0.0001	0.0011	0.0004	-	Negligible	0.30	2.74	1.28	-	Negligible
29	0.0002	0.0018	0.0006	-	Negligible	0.55	3.22	1.55	-	Negligible
30	0.0001	0.0007	0.0002	-	Negligible	0.17	2.20	0.96	-	Negligible
31	0.0001	0.0008	0.0003	-	Negligible	0.28	2.74	1.18	-	Negligible
32	0.0001	0.0010	0.0004	-	Negligible	0.25	3.18	1.33	-	Negligible
33	0.0002	0.0021	0.0007	-	Negligible	0.71	7.48	3.44	-	Negligible
34	0.0001	0.0012	0.0005	-	Negligible	0.44	4.29	2.26	-	Negligible
35	0.0002	0.0020	0.0008	-	Negligible	0.32	3.85	2.13	-	Negligible
36	0.0002	0.0012	0.0006	-	Negligible	0.64	4.54	2.60	-	Negligible
37	0.0003	0.0016	0.0007	-	Negligible	0.49	5.41	2.46	-	Negligible
38	0.0002	0.0013	0.0005	-	Negligible	0.46	5.24	2.27	-	Negligible
39	0.0002	0.0018	0.0006	-	Negligible	0.34	4.21	1.92	-	Negligible
40	0.0002	0.0019	0.0007	-	Negligible	0.66	4.47	2.09	-	Negligible
41	0.0002	0.0016	0.0006	-	Negligible	0.37	5.68	2.55	-	Negligible
42	0.0002	0.0016	0.0006	-	Negligible	0.48	3.81	1.73	-	Negligible
43	0.0002	0.0013	0.0005	-	Negligible	0.39	4.76	2.08	-	Negligible
44	0.0003	0.0017	0.0007	-	Negligible	0.47	4.34	2.57	-	Negligible
45	0.0002	0.0015	0.0006	-	Negligible	0.42	4.59	2.19	-	Negligible
46	0.0002	0.0014	0.0006	-	Negligible	0.46	5.21	2.40	-	Negligible
47	0.0003	0.0013	0.0007	-	Negligible	0.58	6.36	3.46	-	Negligible
48	0.0003	0.0013	0.0007	-	Negligible	0.55	6.76	3.65	-	Negligible
49	0.0003	0.0013	0.0006	-	Negligible	0.63	6.61	3.63	-	Negligible
50	0.0002	0.0013	0.0005	-	Negligible	0.52	5.47	3.08	-	Negligible
51	0.0001	0.0010	0.0004	-	Negligible	0.43	4.59	1.93	-	Negligible
52	0.0002	0.0013	0.0005	-	Negligible	0.46	4.52	1.93	-	Negligible
53	0.0002	0.0012	0.0005	-	Negligible	0.41	4.75	1.97	-	Negligible
54	0.0002	0.0010	0.0004	-	Negligible	0.52	5.10	2.58	-	Negligible
55	0.0001	0.0012	0.0005	-	Negligible	0.44	4.53	2.06	-	Negligible
56	0.0001	0.0012	0.0005	-	Negligible	0.38	4.31	2.25	-	Negligible
57	0.0002	0.0013	0.0005	-	Negligible	0.53	5.79	2.85	-	Negligible
58	0.0002	0.0014	0.0005	-	Negligible	0.42	3.54	1.64	-	Negligible

59	0.0002	0.0016	0.0006	-	Negligible	0.45	4.84	2.44	-	Negligible
60	0.0001	0.0009	0.0003	-	Negligible	0.31	3.49	1.49	-	Negligible
61	0.0001	0.0009	0.0003	-	Negligible	0.34	3.97	1.73	-	Negligible
62	0.0001	0.0010	0.0003	-	Negligible	0.29	3.37	1.46	-	Negligible
63	0.0001	0.0013	0.0005	-	Negligible	0.33	3.82	1.69	-	Negligible
64	0.0001	0.0011	0.0004	-	Negligible	0.20	1.80	0.93	-	Negligible
65	0.0001	0.0013	0.0005	-	Negligible	0.19	2.42	1.10	-	Negligible
66	0.0002	0.0016	0.0006	-	Negligible	0.24	2.88	1.38	-	Negligible
67	0.0001	0.0013	0.0004	-	Negligible	0.27	2.75	1.28	-	Negligible
68	0.0001	0.0012	0.0005	-	Negligible	0.28	2.93	1.54	-	Negligible
69	0.0001	0.0010	0.0004	-	Negligible	0.27	2.17	1.38	-	Negligible
70	0.0002	0.0013	0.0005	-	Negligible	0.28	2.32	1.18	-	Negligible
71	0.0001	0.0009	0.0004	-	Negligible	0.34	3.02	1.45	-	Negligible
72	0.0001	0.0010	0.0004	-	Negligible	0.30	3.47	1.44	-	Negligible
73	0.0001	0.0013	0.0005	-	Negligible	0.32	3.06	1.59	-	Negligible
74	0.0001	0.0016	0.0005	-	Negligible	0.23	2.34	1.02	-	Negligible
75	0.0001	0.0012	0.0004	-	Negligible	0.25	3.01	1.34	-	Negligible
76	0.0001	0.0011	0.0004	-	Negligible	0.31	3.85	1.77	-	Negligible
77	0.0001	0.0011	0.0004	-	Negligible	0.29	3.21	1.41	-	Negligible
78	0.0001	0.0014	0.0005	-	Negligible	0.26	3.14	1.47	-	Negligible
79	0.0002	0.0013	0.0006	-	Negligible	0.32	3.26	1.61	-	Negligible
80	0.0001	0.0009	0.0004	-	Negligible	0.17	2.07	0.91	-	Negligible
81	0.0001	0.0016	0.0005	-	Negligible	0.27	2.78	1.22	-	Negligible
82	0.0001	0.0008	0.0003	-	Negligible	0.21	2.08	0.85	-	Negligible
83	0.0002	0.0012	0.0006	-	Negligible	0.33	3.62	1.89	-	Negligible
84	0.0002	0.0014	0.0006	-	Negligible	0.29	2.53	1.26	-	Negligible
85	0.0002	0.0015	0.0007	-	Negligible	0.26	3.00	1.37	-	Negligible
86	0.0001	0.0011	0.0004	-	Negligible	0.23	1.93	0.95	-	Negligible
87	0.0001	0.0009	0.0004	-	Negligible	0.17	2.14	0.93	-	Negligible
88	0.0001	0.0016	0.0005	-	Negligible	0.27	2.78	1.22	-	Negligible
89	0.0001	0.0008	0.0003	-	Negligible	0.21	2.11	0.86	-	Negligible
90	0.0003	0.0016	0.0007	-	Negligible	0.35	3.51	2.34	-	Negligible
91	0.0001	0.0016	0.0005	-	Negligible	0.39	3.44	1.50	-	Negligible

92	0.0002	0.0017	0.0006	-	Negligible	0.36	3.04	1.40	-	Negligible
93	0.0001	0.0008	0.0003	-	Negligible	0.31	3.72	1.52	-	Negligible
94	0.0002	0.0018	0.0006	-	Negligible	0.34	4.26	1.92	-	Negligible
95	0.0001	0.0015	0.0005	-	Negligible	0.24	2.33	1.04	-	Negligible
96	0.0002	0.0015	0.0005	-	Negligible	0.27	3.90	2.12	-	Negligible
97	0.0001	0.0013	0.0005	-	Negligible	0.34	3.87	1.70	-	Negligible
98	0.0001	0.0010	0.0004	-	Negligible	0.28	2.17	1.42	-	Negligible
99	0.0001	0.0012	0.0004	-	Negligible	0.25	3.03	1.35	-	Negligible
100	0.0001	0.0011	0.0004	-	Negligible	0.31	3.90	1.79	-	Negligible
101	0.0003	0.0016	0.0007	-	Negligible	0.37	3.77	2.49	-	Negligible
102	0.0004	0.0013	0.0008	-	Negligible	0.59	5.66	2.77	-	Negligible
103	0.0002	0.0018	0.0007	-	Negligible	0.55	5.72	2.89	-	Negligible
104	0.0002	0.0017	0.0007	-	Negligible	0.34	5.77	2.72	-	Negligible
105	0.0000	0.0005	0.0002	-	Negligible	0.17	1.96	0.84	-	Negligible
106	0.0002	0.0016	0.0006	-	Negligible	0.29	3.15	1.39	-	Negligible
107	0.0001	0.0008	0.0003	-	Negligible	0.31	3.73	1.52	-	Negligible
108	0.0001	0.0001	0.0002	-	Negligible	0.48	0.89	1.06	-	Negligible
109	0.0000	0.0002	0.0001	-	Negligible	0.07	0.78	0.32	-	Negligible
110	0.0001	0.0009	0.0003	-	Negligible	0.24	2.81	1.15	-	Negligible
111	0.0001	0.0015	0.0005	-	Negligible	0.38	3.59	1.79	-	Negligible
112	0.0004	0.0023	0.0009	-	Negligible	1.01	8.47	4.62	-	Negligible
113	0.0003	0.0023	0.0009	-	Negligible	0.90	8.18	3.49	-	Negligible

D2.3 Total Organic Carbon (TOC) as benzene

Table D3: Process contributions of benzene at the human receptors

Human receptor ID	Benzene annual mean concentration (µg/m^3)					Benzene 100th percentile 1 hour concentration (µg/m^3)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW boilers	Michelin	Significance
	Air quality standard: 3.25µg/m^3					EAL: 195 µg/m^3				
1	0.006	0.013	-	-	Negligible	0.29	1.08	-	-	Negligible
2	0.003	0.008	-	-	Negligible	0.39	1.00	-	-	Negligible
3	0.002	0.007	-	-	Negligible	0.29	0.92	-	-	Negligible
4	0.003	0.006	-	-	Negligible	0.31	1.26	-	-	Negligible
5	0.004	0.005	-	-	Negligible	0.37	1.22	-	-	Negligible
6	0.006	0.006	-	-	Negligible	0.36	1.10	-	-	Negligible
7	0.011	0.012	-	-	Negligible	0.35	0.98	-	-	Negligible
8	0.003	0.007	-	-	Negligible	0.27	0.97	-	-	Negligible
9	0.033	0.032	-	-	Negligible	0.26	0.82	-	-	Negligible
10	0.028	0.039	-	-	Negligible	0.22	0.74	-	-	Negligible
11	0.025	0.038	-	-	Negligible	0.21	0.70	-	-	Negligible
12	0.023	0.038	-	-	Negligible	0.19	0.65	-	-	Negligible
13	0.012	0.021	-	-	Negligible	0.20	0.71	-	-	Negligible
14	0.002	0.007	-	-	Negligible	0.22	0.77	-	-	Negligible
15	0.001	0.004	-	-	Negligible	0.19	0.82	-	-	Negligible
16	0.001	0.002	-	-	Negligible	0.17	0.68	-	-	Negligible
17	0.001	0.002	-	-	Negligible	0.20	0.72	-	-	Negligible
18	0.002	0.003	-	-	Negligible	0.20	0.68	-	-	Negligible
19	0.001	0.001	-	-	Negligible	0.22	0.75	-	-	Negligible
20	0.001	0.003	-	-	Negligible	0.17	0.57	-	-	Negligible
21	0.002	0.006	-	-	Negligible	0.17	0.51	-	-	Negligible
22	0.001	0.005	-	-	Negligible	0.16	0.60	-	-	Negligible
23	0.001	0.004	-	-	Negligible	0.12	0.45	-	-	Negligible
24	0.002	0.006	-	-	Negligible	0.14	0.38	-	-	Negligible
25	0.004	0.014	-	-	Negligible	0.17	0.78	-	-	Negligible

26	0.003	0.011	-	-	Negligible	0.14	0.58	-	-	Negligible
27	0.002	0.008	-	-	Negligible	0.10	0.47	-	-	Negligible
28	0.002	0.007	-	-	Negligible	0.18	0.55	-	-	Negligible
29	0.005	0.013	-	-	Negligible	0.33	0.64	-	-	Negligible
30	0.002	0.008	-	-	Negligible	0.10	0.44	-	-	Negligible
31	0.001	0.002	-	-	Negligible	0.17	0.55	-	-	Negligible
32	0.001	0.003	-	-	Negligible	0.15	0.64	-	-	Negligible
33	0.007	0.018	-	-	Negligible	0.43	1.50	-	-	Negligible
34	0.001	0.001	-	-	Negligible	0.26	0.86	-	-	Negligible
35	0.004	0.012	-	-	Negligible	0.20	0.77	-	-	Negligible
36	0.016	0.007	-	-	Negligible	0.38	0.91	-	-	Negligible
37	0.005	0.007	-	-	Negligible	0.29	1.08	-	-	Negligible
38	0.005	0.008	-	-	Negligible	0.28	1.05	-	-	Negligible
39	0.005	0.011	-	-	Negligible	0.21	0.84	-	-	Negligible
40	0.006	0.015	-	-	Negligible	0.40	0.89	-	-	Negligible
41	0.005	0.015	-	-	Negligible	0.22	1.14	-	-	Negligible
42	0.003	0.009	-	-	Negligible	0.29	0.76	-	-	Negligible
43	0.006	0.012	-	-	Negligible	0.23	0.95	-	-	Negligible
44	0.018	0.023	-	-	Negligible	0.28	0.87	-	-	Negligible
45	0.010	0.016	-	-	Negligible	0.25	0.92	-	-	Negligible
46	0.007	0.011	-	-	Negligible	0.28	1.04	-	-	Negligible
47	0.006	0.006	-	-	Negligible	0.35	1.27	-	-	Negligible
48	0.005	0.007	-	-	Negligible	0.33	1.35	-	-	Negligible
49	0.004	0.007	-	-	Negligible	0.38	1.32	-	-	Negligible
50	0.003	0.007	-	-	Negligible	0.32	1.09	-	-	Negligible
51	0.004	0.008	-	-	Negligible	0.26	0.92	-	-	Negligible
52	0.003	0.006	-	-	Negligible	0.28	0.90	-	-	Negligible
53	0.002	0.006	-	-	Negligible	0.25	0.95	-	-	Negligible
54	0.002	0.006	-	-	Negligible	0.31	1.02	-	-	Negligible
55	0.002	0.007	-	-	Negligible	0.26	0.91	-	-	Negligible
56	0.002	0.007	-	-	Negligible	0.23	0.86	-	-	Negligible
57	0.003	0.006	-	-	Negligible	0.32	1.16	-	-	Negligible
58	0.003	0.008	-	-	Negligible	0.26	0.71	-	-	Negligible

59	0.005	0.012	-	-	Negligible	0.27	0.97	-	-	Negligible
60	0.001	0.005	-	-	Negligible	0.19	0.70	-	-	Negligible
61	0.001	0.004	-	-	Negligible	0.21	0.79	-	-	Negligible
62	0.001	0.003	-	-	Negligible	0.17	0.67	-	-	Negligible
63	0.001	0.002	-	-	Negligible	0.20	0.76	-	-	Negligible
64	0.001	0.003	-	-	Negligible	0.12	0.36	-	-	Negligible
65	0.001	0.004	-	-	Negligible	0.12	0.48	-	-	Negligible
66	0.001	0.005	-	-	Negligible	0.15	0.58	-	-	Negligible
67	0.001	0.003	-	-	Negligible	0.16	0.55	-	-	Negligible
68	0.001	0.003	-	-	Negligible	0.17	0.59	-	-	Negligible
69	0.001	0.003	-	-	Negligible	0.17	0.43	-	-	Negligible
70	0.002	0.006	-	-	Negligible	0.17	0.46	-	-	Negligible
71	0.001	0.002	-	-	Negligible	0.20	0.60	-	-	Negligible
72	0.001	0.002	-	-	Negligible	0.18	0.69	-	-	Negligible
73	0.001	0.003	-	-	Negligible	0.19	0.61	-	-	Negligible
74	0.001	0.003	-	-	Negligible	0.14	0.47	-	-	Negligible
75	0.001	0.003	-	-	Negligible	0.15	0.60	-	-	Negligible
76	0.001	0.004	-	-	Negligible	0.19	0.77	-	-	Negligible
77	0.001	0.003	-	-	Negligible	0.18	0.64	-	-	Negligible
78	0.001	0.003	-	-	Negligible	0.16	0.63	-	-	Negligible
79	0.001	0.003	-	-	Negligible	0.19	0.65	-	-	Negligible
80	0.001	0.003	-	-	Negligible	0.10	0.41	-	-	Negligible
81	0.001	0.003	-	-	Negligible	0.16	0.56	-	-	Negligible
82	0.001	0.004	-	-	Negligible	0.13	0.42	-	-	Negligible
83	0.001	0.002	-	-	Negligible	0.20	0.72	-	-	Negligible
84	0.002	0.006	-	-	Negligible	0.17	0.51	-	-	Negligible
85	0.001	0.005	-	-	Negligible	0.16	0.60	-	-	Negligible
86	0.002	0.006	-	-	Negligible	0.14	0.39	-	-	Negligible
87	0.001	0.003	-	-	Negligible	0.11	0.43	-	-	Negligible
88	0.001	0.003	-	-	Negligible	0.16	0.56	-	-	Negligible
89	0.001	0.004	-	-	Negligible	0.13	0.42	-	-	Negligible
90	0.024	0.036	-	-	Negligible	0.21	0.70	-	-	Negligible
91	0.004	0.012	-	-	Negligible	0.24	0.69	-	-	Negligible

92	0.004	0.011	-	-	Negligible	0.22	0.61	-	-	Negligible
93	0.001	0.004	-	-	Negligible	0.19	0.74	-	-	Negligible
94	0.005	0.011	-	-	Negligible	0.21	0.85	-	-	Negligible
95	0.001	0.003	-	-	Negligible	0.14	0.47	-	-	Negligible
96	0.004	0.014	-	-	Negligible	0.17	0.78	-	-	Negligible
97	0.001	0.002	-	-	Negligible	0.20	0.77	-	-	Negligible
98	0.001	0.003	-	-	Negligible	0.17	0.43	-	-	Negligible
99	0.001	0.003	-	-	Negligible	0.15	0.61	-	-	Negligible
100	0.001	0.004	-	-	Negligible	0.19	0.78	-	-	Negligible
101	0.025	0.034	-	-	Negligible	0.23	0.75	-	-	Negligible
102	0.007	0.006	-	-	Negligible	0.36	1.13	-	-	Negligible
103	0.005	0.012	-	-	Negligible	0.33	1.14	-	-	Negligible
104	0.005	0.017	-	-	Negligible	0.21	1.15	-	-	Negligible
105	0.002	0.005	-	-	Negligible	0.10	0.39	-	-	Negligible
106	0.001	0.004	-	-	Negligible	0.17	0.63	-	-	Negligible
107	0.001	0.004	-	-	Negligible	0.19	0.75	-	-	Negligible
108	0.000	0.000	-	-	Negligible	0.29	0.18	-	-	Negligible
109	0.000	0.001	-	-	Negligible	0.04	0.16	-	-	Negligible
110	0.001	0.002	-	-	Negligible	0.15	0.56	-	-	Negligible
111	0.002	0.008	-	-	Negligible	0.23	0.72	-	-	Negligible
112	0.034	0.067	-	-	Negligible	0.61	1.69	-	-	Negligible
113	0.033	0.063	-	-	Negligible	0.54	1.64	-	-	Negligible

D2.4 Sulphur dioxide (SO_2)

Table D4: Process contributions of SO_2 at the human receptors

Human receptor ID	SO_2 99.90th percentile of 15min average concentration (µg/m³)					SO_2 99.73th percentile of 1 hour concentration (µg/m³)					SO_2 99.18th percentile of 24 hour average concentration (µg/m³)				
	DERL	EfW CHP	EfW boilers	Michelin	Signif-icance	DERL	EfW CHP	EfW boilers	Michelin	Signif-icance	DERL	EfW CHP	EfW boilers	Michelin	Signif-icance
	Air quality standard: 266µg/m³ not to be exceeded more than 35 times per year (99.90th percentile)					Air quality standard: 350µg/m³ not to be exceeded more than 24 times per year (99.73th percentile)					Air quality standard: 125µg/m³ not to be exceeded more than 3 times per year (99.18th percentile)				
1	1.51	2.82	1.54	-	Negligible	2.57	5.39	4.81	-	Negligible	0.49	0.65	0.50	-	Negligible
2	1.77	3.21	1.81	-	Negligible	3.46	5.01	5.26	-	Negligible	0.24	0.42	0.25	-	Negligible
3	1.71	3.22	1.75	-	Negligible	2.54	4.58	4.91	-	Negligible	0.23	0.44	0.24	-	Negligible
4	2.34	2.96	2.38	-	Negligible	2.71	6.28	5.98	-	Negligible	0.36	0.40	0.37	-	Negligible
5	2.75	2.83	2.79	-	Negligible	3.31	6.12	6.63	-	Negligible	0.49	0.34	0.50	-	Negligible
6	2.77	3.03	2.81	-	Negligible	3.16	5.51	5.38	-	Negligible	0.55	0.39	0.55	-	Negligible
7	3.02	3.10	3.06	-	Negligible	3.10	4.90	4.98	-	Negligible	0.64	0.47	0.64	-	Negligible
8	1.41	2.46	1.44	-	Negligible	2.41	4.83	4.55	-	Negligible	0.25	0.46	0.26	-	Negligible
9	2.19	3.12	2.23	-	Negligible	2.29	4.09	4.28	-	Negligible	1.25	0.89	1.26	-	Negligible
10	2.09	2.77	2.12	-	Negligible	1.95	3.68	4.01	-	Negligible	1.06	1.06	1.07	-	Negligible
11	1.96	2.57	1.99	-	Negligible	1.87	3.48	3.86	-	Negligible	0.96	1.05	0.97	-	Negligible
12	1.84	2.46	1.86	-	Negligible	1.70	3.24	3.55	-	Negligible	0.84	1.02	0.85	-	Negligible
13	1.92	2.45	1.95	-	Negligible	1.80	3.57	3.73	-	Negligible	0.59	0.70	0.59	-	Negligible
14	1.03	2.22	1.05	-	Negligible	1.99	3.86	3.51	-	Negligible	0.20	0.52	0.21	-	Negligible
15	1.23	2.65	1.26	-	Negligible	1.68	4.08	3.20	-	Negligible	0.16	0.34	0.16	-	Negligible
16	1.36	2.87	1.40	-	Negligible	1.50	3.38	2.83	-	Negligible	0.22	0.40	0.23	-	Negligible
17	1.56	2.43	1.59	-	Negligible	1.76	3.62	3.32	-	Negligible	0.32	0.29	0.32	-	Negligible
18	1.68	2.49	1.72	-	Negligible	1.76	3.39	3.21	-	Negligible	0.44	0.33	0.44	-	Negligible
19	1.73	1.95	1.77	-	Negligible	1.96	3.76	3.64	-	Negligible	0.31	0.23	0.32	-	Negligible
20	1.26	1.78	1.29	-	Negligible	1.49	2.87	2.57	-	Negligible	0.19	0.31	0.19	-	Negligible
21	1.30	2.44	1.33	-	Negligible	1.50	2.53	2.48	-	Negligible	0.37	0.56	0.38	-	Negligible
22	1.37	2.25	1.39	-	Negligible	1.42	3.00	2.53	-	Negligible	0.31	0.56	0.32	-	Negligible

23	0.85	1.61	0.87	-	Negligible	1.02	2.23	1.73	-	Negligible	0.23	0.42	0.24	-	Negligible
24	0.97	1.81	0.99	-	Negligible	1.24	1.92	1.95	-	Negligible	0.29	0.46	0.30	-	Negligible
25	1.10	2.20	1.13	-	Negligible	1.47	3.90	3.31	-	Negligible	0.38	0.68	0.39	-	Negligible
26	0.85	1.69	0.87	-	Negligible	1.25	2.91	2.57	-	Negligible	0.30	0.52	0.30	-	Negligible
27	0.82	1.57	0.83	-	Negligible	0.88	2.33	1.99	-	Negligible	0.28	0.49	0.28	-	Negligible
28	0.81	1.55	0.83	-	Negligible	1.60	2.74	2.58	-	Negligible	0.21	0.31	0.21	-	Negligible
29	1.04	2.07	1.06	-	Negligible	2.96	3.22	3.95	-	Negligible	0.36	0.59	0.37	-	Negligible
30	0.77	1.39	0.78	-	Negligible	0.90	2.20	1.70	-	Negligible	0.16	0.31	0.17	-	Negligible
31	0.79	1.69	0.81	-	Negligible	1.50	2.74	2.40	-	Negligible	0.13	0.21	0.13	-	Negligible
32	1.17	2.07	1.19	-	Negligible	1.36	3.18	2.44	-	Negligible	0.21	0.34	0.21	-	Negligible
33	1.75	2.64	1.78	-	Negligible	3.82	7.48	6.55	-	Negligible	0.58	0.86	0.59	-	Negligible
34	1.06	1.41	1.08	-	Negligible	2.34	4.29	4.16	-	Negligible	0.14	0.16	0.14	-	Negligible
35	1.45	2.91	1.49	-	Negligible	1.74	3.85	3.55	-	Negligible	0.45	0.66	0.45	-	Negligible
36	2.90	3.32	2.94	-	Negligible	3.41	4.54	5.37	-	Negligible	0.80	0.38	0.80	-	Negligible
37	2.19	2.69	2.22	-	Negligible	2.60	5.41	4.58	-	Negligible	0.42	0.39	0.42	-	Negligible
38	1.97	2.29	1.99	-	Negligible	2.46	5.24	4.27	-	Negligible	0.36	0.41	0.37	-	Negligible
39	1.17	2.23	1.20	-	Negligible	1.84	4.21	3.41	-	Negligible	0.37	0.53	0.37	-	Negligible
40	1.20	2.40	1.23	-	Negligible	3.55	4.47	4.98	-	Negligible	0.45	0.70	0.45	-	Negligible
41	1.24	2.23	1.26	-	Negligible	1.96	5.68	4.14	-	Negligible	0.43	0.67	0.43	-	Negligible
42	1.55	2.67	1.58	-	Negligible	2.56	3.81	3.81	-	Negligible	0.33	0.43	0.34	-	Negligible
43	1.90	2.24	1.93	-	Negligible	2.07	4.76	3.76	-	Negligible	0.36	0.49	0.37	-	Negligible
44	2.56	2.83	2.59	-	Negligible	2.53	4.34	4.63	-	Negligible	0.85	0.78	0.86	-	Negligible
45	2.44	2.59	2.47	-	Negligible	2.25	4.59	4.03	-	Negligible	0.53	0.68	0.53	-	Negligible
46	2.45	2.67	2.48	-	Negligible	2.46	5.21	4.40	-	Negligible	0.44	0.44	0.45	-	Negligible
47	2.75	3.07	2.79	-	Negligible	3.10	6.36	5.98	-	Negligible	0.63	0.42	0.63	-	Negligible
48	2.43	2.89	2.47	-	Negligible	2.93	6.76	6.04	-	Negligible	0.53	0.39	0.54	-	Negligible
49	2.16	2.73	2.19	-	Negligible	3.38	6.61	6.38	-	Negligible	0.42	0.38	0.43	-	Negligible
50	1.62	2.62	1.65	-	Negligible	2.80	5.47	5.36	-	Negligible	0.28	0.46	0.28	-	Negligible
51	1.31	1.78	1.34	-	Negligible	2.28	4.59	3.79	-	Negligible	0.25	0.34	0.25	-	Negligible
52	1.63	2.07	1.65	-	Negligible	2.44	4.52	3.92	-	Negligible	0.27	0.32	0.28	-	Negligible
53	1.65	2.01	1.67	-	Negligible	2.22	4.75	3.77	-	Negligible	0.26	0.34	0.27	-	Negligible
54	1.40	2.10	1.42	-	Negligible	2.78	5.10	4.85	-	Negligible	0.26	0.33	0.26	-	Negligible
55	1.13	2.15	1.15	-	Negligible	2.35	4.53	3.97	-	Negligible	0.24	0.42	0.24	-	Negligible

56	1.38	2.44	1.41	-	Negligible	2.04	4.31	3.91	-	Negligible	0.26	0.43	0.27	-	Negligible
57	1.67	2.28	1.69	-	Negligible	2.83	5.79	5.15	-	Negligible	0.29	0.33	0.30	-	Negligible
58	1.23	2.23	1.25	-	Negligible	2.26	3.54	3.49	-	Negligible	0.34	0.44	0.34	-	Negligible
59	1.35	2.47	1.37	-	Negligible	2.44	4.84	4.43	-	Negligible	0.37	0.55	0.38	-	Negligible
60	0.81	1.71	0.83	-	Negligible	1.67	3.49	2.85	-	Negligible	0.13	0.31	0.14	-	Negligible
61	0.88	1.96	0.91	-	Negligible	1.82	3.97	3.21	-	Negligible	0.14	0.31	0.15	-	Negligible
62	1.00	2.02	1.02	-	Negligible	1.55	3.37	2.72	-	Negligible	0.19	0.40	0.19	-	Negligible
63	1.02	1.98	1.04	-	Negligible	1.78	3.82	3.14	-	Negligible	0.17	0.35	0.17	-	Negligible
64	0.92	1.65	0.94	-	Negligible	1.08	1.80	1.81	-	Negligible	0.14	0.33	0.15	-	Negligible
65	0.95	1.73	0.97	-	Negligible	1.04	2.42	1.94	-	Negligible	0.22	0.44	0.22	-	Negligible
66	1.13	2.00	1.15	-	Negligible	1.30	2.88	2.43	-	Negligible	0.27	0.50	0.28	-	Negligible
67	1.07	2.48	1.10	-	Negligible	1.45	2.75	2.46	-	Negligible	0.20	0.40	0.21	-	Negligible
68	1.40	2.54	1.43	-	Negligible	1.51	2.93	2.77	-	Negligible	0.30	0.46	0.30	-	Negligible
69	0.92	2.10	0.94	-	Negligible	1.47	2.17	2.58	-	Negligible	0.18	0.34	0.19	-	Negligible
70	1.16	2.09	1.19	-	Negligible	1.51	2.32	2.42	-	Negligible	0.35	0.53	0.36	-	Negligible
71	1.03	1.98	1.06	-	Negligible	1.81	3.02	2.93	-	Negligible	0.14	0.29	0.14	-	Negligible
72	0.83	1.75	0.85	-	Negligible	1.62	3.47	2.77	-	Negligible	0.14	0.23	0.14	-	Negligible
73	1.41	2.54	1.43	-	Negligible	1.72	3.06	2.99	-	Negligible	0.27	0.43	0.28	-	Negligible
74	1.09	1.88	1.11	-	Negligible	1.24	2.34	2.04	-	Negligible	0.18	0.38	0.18	-	Negligible
75	1.24	2.33	1.27	-	Negligible	1.35	3.01	2.44	-	Negligible	0.24	0.39	0.24	-	Negligible
76	1.08	2.21	1.10	-	Negligible	1.67	3.85	3.13	-	Negligible	0.15	0.31	0.15	-	Negligible
77	1.13	2.00	1.15	-	Negligible	1.55	3.21	2.67	-	Negligible	0.19	0.35	0.20	-	Negligible
78	1.34	2.53	1.37	-	Negligible	1.39	3.14	2.61	-	Negligible	0.26	0.37	0.26	-	Negligible
79	1.61	2.83	1.65	-	Negligible	1.70	3.26	2.99	-	Negligible	0.39	0.41	0.40	-	Negligible
80	0.83	1.52	0.85	-	Negligible	0.93	2.07	1.67	-	Negligible	0.14	0.32	0.14	-	Negligible
81	1.17	1.89	1.20	-	Negligible	1.43	2.78	2.39	-	Negligible	0.18	0.32	0.18	-	Negligible
82	0.73	1.35	0.75	-	Negligible	1.12	2.08	1.77	-	Negligible	0.21	0.34	0.21	-	Negligible
83	1.56	2.44	1.59	-	Negligible	1.75	3.62	3.31	-	Negligible	0.32	0.30	0.33	-	Negligible
84	1.30	2.45	1.33	-	Negligible	1.54	2.53	2.51	-	Negligible	0.38	0.56	0.38	-	Negligible
85	1.37	2.26	1.40	-	Negligible	1.42	3.00	2.53	-	Negligible	0.31	0.56	0.32	-	Negligible
86	0.97	1.81	0.99	-	Negligible	1.25	1.93	1.97	-	Negligible	0.30	0.46	0.30	-	Negligible
87	0.83	1.53	0.85	-	Negligible	0.94	2.14	1.70	-	Negligible	0.14	0.32	0.14	-	Negligible
88	1.18	1.90	1.21	-	Negligible	1.43	2.78	2.38	-	Negligible	0.18	0.33	0.18	-	Negligible

89	0.73	1.35	0.75	-	Negligible	1.13	2.11	1.79	-	Negligible	0.21	0.34	0.21	-	Negligible
90	1.87	2.56	1.90	-	Negligible	1.86	3.51	3.85	-	Negligible	0.90	0.98	0.91	-	Negligible
91	0.89	1.72	0.91	-	Negligible	2.10	3.44	3.21	-	Negligible	0.30	0.51	0.30	-	Negligible
92	0.98	2.00	1.01	-	Negligible	1.93	3.04	2.98	-	Negligible	0.32	0.49	0.32	-	Negligible
93	0.83	1.80	0.85	-	Negligible	1.68	3.72	2.88	-	Negligible	0.13	0.27	0.13	-	Negligible
94	1.17	2.23	1.20	-	Negligible	1.84	4.26	3.42	-	Negligible	0.37	0.53	0.37	-	Negligible
95	1.07	1.88	1.10	-	Negligible	1.28	2.33	2.08	-	Negligible	0.17	0.38	0.18	-	Negligible
96	1.10	2.20	1.13	-	Negligible	1.47	3.90	3.31	-	Negligible	0.38	0.68	0.39	-	Negligible
97	1.02	1.98	1.05	-	Negligible	1.80	3.87	3.16	-	Negligible	0.17	0.35	0.17	-	Negligible
98	0.93	2.10	0.95	-	Negligible	1.50	2.17	2.64	-	Negligible	0.18	0.35	0.19	-	Negligible
99	1.24	2.33	1.27	-	Negligible	1.36	3.03	2.46	-	Negligible	0.24	0.39	0.24	-	Negligible
100	1.08	2.21	1.10	-	Negligible	1.69	3.90	3.16	-	Negligible	0.15	0.31	0.15	-	Negligible
101	1.89	2.69	1.92	-	Negligible	2.00	3.77	4.12	-	Negligible	0.98	0.99	0.99	-	Negligible
102	2.82	3.00	2.86	-	Negligible	3.18	5.66	5.36	-	Negligible	0.54	0.37	0.55	-	Negligible
103	1.65	2.91	1.68	-	Negligible	2.93	5.72	5.27	-	Negligible	0.41	0.58	0.42	-	Negligible
104	1.27	2.43	1.30	-	Negligible	1.83	5.77	4.21	-	Negligible	0.43	0.74	0.44	-	Negligible
105	0.68	1.19	0.70	-	Negligible	0.91	1.96	1.58	-	Negligible	0.09	0.18	0.10	-	Negligible
106	1.23	2.22	1.25	-	Negligible	1.54	3.15	2.64	-	Negligible	0.20	0.38	0.21	-	Negligible
107	0.84	1.80	0.86	-	Negligible	1.67	3.73	2.88	-	Negligible	0.13	0.27	0.13	-	Negligible
108	0.60	0.24	0.60	-	Negligible	2.56	0.89	3.14	-	Negligible	0.08	0.04	0.08	-	Negligible
109	0.38	0.64	0.39	-	Negligible	0.38	0.78	0.63	-	Negligible	0.04	0.08	0.04	-	Negligible
110	0.93	1.72	0.95	-	Negligible	1.30	2.81	2.21	-	Negligible	0.14	0.29	0.15	-	Negligible
111	1.07	2.36	1.10	-	Negligible	2.03	3.59	3.44	-	Negligible	0.26	0.58	0.26	-	Negligible
112	3.33	3.50	3.38	-	Negligible	5.40	8.47	9.01	-	Negligible	1.25	1.32	1.26	-	Negligible
113	2.93	3.16	2.97	-	Negligible	4.81	8.18	6.98	-	Negligible	1.22	1.23	1.22	-	Negligible

D2.5 Fine particulate matter (PM_{10} and $PM_{2.5}$)

Table D5: Process contributions of PM_{10} and $PM_{2.5}$ at the human receptors

Human receptor ID	PM_{10} annual mean concentration (µg/m^3)					$PM_{2.5}$ annual mean concentration (µg/m^3)					PM_{10} 98.08th percentile 24 hour average concentration (µg/m^3)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW boilers	Michelin	Significance
	Air quality standard: 18µg/m^3					Air quality standard: 10µg/m^3					Air quality standard: 50µg/m^3 not to be exceeded more than 7 times per year (98.08th percentile)				
1	0.003	0.013	-	-	Negligible	0.003	0.013	-	-	Negligible	0.02	0.09	0.05	-	Negligible
2	0.002	0.008	-	-	Negligible	0.002	0.008	-	-	Negligible	0.01	0.07	0.03	-	Negligible
3	0.001	0.007	-	-	Negligible	0.001	0.007	-	-	Negligible	0.01	0.06	0.03	-	Negligible
4	0.002	0.006	-	-	Negligible	0.002	0.006	-	-	Negligible	0.02	0.05	0.03	-	Negligible
5	0.002	0.005	-	-	Negligible	0.002	0.005	-	-	Negligible	0.02	0.05	0.04	-	Negligible
6	0.004	0.006	-	-	Negligible	0.004	0.006	-	-	Negligible	0.03	0.05	0.05	-	Negligible
7	0.006	0.012	-	-	Negligible	0.006	0.012	-	-	Negligible	0.03	0.08	0.06	-	Negligible
8	0.001	0.007	-	-	Negligible	0.001	0.007	-	-	Negligible	0.01	0.06	0.03	-	Negligible
9	0.019	0.032	-	-	Negligible	0.019	0.032	-	-	Negligible	0.07	0.16	0.12	-	Negligible
10	0.016	0.039	-	-	Negligible	0.016	0.039	-	-	Negligible	0.06	0.19	0.11	-	Negligible
11	0.014	0.038	-	-	Negligible	0.014	0.038	-	-	Negligible	0.05	0.19	0.10	-	Negligible
12	0.013	0.038	-	-	Negligible	0.013	0.038	-	-	Negligible	0.04	0.18	0.09	-	Negligible
13	0.007	0.021	-	-	Negligible	0.007	0.021	-	-	Negligible	0.04	0.11	0.06	-	Negligible
14	0.001	0.007	-	-	Negligible	0.001	0.007	-	-	Negligible	0.01	0.07	0.03	-	Negligible
15	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.05	0.02	-	Negligible
16	0.001	0.002	-	-	Negligible	0.001	0.002	-	-	Negligible	0.01	0.03	0.02	-	Negligible
17	0.001	0.002	-	-	Negligible	0.001	0.002	-	-	Negligible	0.01	0.04	0.03	-	Negligible
18	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.05	0.03	-	Negligible
19	0.001	0.001	-	-	Negligible	0.001	0.001	-	-	Negligible	0.01	0.02	0.02	-	Negligible
20	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.01	0.03	0.02	-	Negligible
21	0.001	0.006	-	-	Negligible	0.001	0.006	-	-	Negligible	0.01	0.09	0.04	-	Negligible
22	0.001	0.005	-	-	Negligible	0.001	0.005	-	-	Negligible	0.01	0.06	0.03	-	Negligible

23	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.06	0.03	-	Negligible
24	0.001	0.006	-	-	Negligible	0.001	0.006	-	-	Negligible	0.01	0.08	0.03	-	Negligible
25	0.002	0.014	-	-	Negligible	0.002	0.014	-	-	Negligible	0.02	0.11	0.05	-	Negligible
26	0.002	0.011	-	-	Negligible	0.002	0.011	-	-	Negligible	0.01	0.08	0.03	-	Negligible
27	0.001	0.008	-	-	Negligible	0.001	0.008	-	-	Negligible	0.01	0.08	0.03	-	Negligible
28	0.001	0.007	-	-	Negligible	0.001	0.007	-	-	Negligible	0.01	0.06	0.03	-	Negligible
29	0.003	0.013	-	-	Negligible	0.003	0.013	-	-	Negligible	0.02	0.10	0.04	-	Negligible
30	0.001	0.008	-	-	Negligible	0.001	0.008	-	-	Negligible	0.01	0.06	0.02	-	Negligible
31	0.000	0.002	-	-	Negligible	0.000	0.002	-	-	Negligible	0.01	0.02	0.01	-	Negligible
32	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.05	0.02	-	Negligible
33	0.004	0.018	-	-	Negligible	0.004	0.018	-	-	Negligible	0.03	0.15	0.07	-	Negligible
34	0.000	0.001	-	-	Negligible	0.000	0.001	-	-	Negligible	0.01	0.02	0.01	-	Negligible
35	0.002	0.012	-	-	Negligible	0.002	0.012	-	-	Negligible	0.02	0.09	0.05	-	Negligible
36	0.009	0.007	-	-	Negligible	0.009	0.007	-	-	Negligible	0.05	0.05	0.07	-	Negligible
37	0.003	0.007	-	-	Negligible	0.003	0.007	-	-	Negligible	0.02	0.06	0.04	-	Negligible
38	0.003	0.008	-	-	Negligible	0.003	0.008	-	-	Negligible	0.02	0.06	0.03	-	Negligible
39	0.003	0.011	-	-	Negligible	0.003	0.011	-	-	Negligible	0.02	0.08	0.04	-	Negligible
40	0.003	0.015	-	-	Negligible	0.003	0.015	-	-	Negligible	0.02	0.11	0.05	-	Negligible
41	0.003	0.015	-	-	Negligible	0.003	0.015	-	-	Negligible	0.02	0.11	0.05	-	Negligible
42	0.002	0.009	-	-	Negligible	0.002	0.009	-	-	Negligible	0.02	0.08	0.03	-	Negligible
43	0.004	0.012	-	-	Negligible	0.004	0.012	-	-	Negligible	0.02	0.08	0.04	-	Negligible
44	0.010	0.023	-	-	Negligible	0.010	0.023	-	-	Negligible	0.05	0.12	0.08	-	Negligible
45	0.006	0.016	-	-	Negligible	0.006	0.016	-	-	Negligible	0.03	0.10	0.06	-	Negligible
46	0.004	0.011	-	-	Negligible	0.004	0.011	-	-	Negligible	0.02	0.08	0.04	-	Negligible
47	0.003	0.006	-	-	Negligible	0.003	0.006	-	-	Negligible	0.02	0.06	0.04	-	Negligible
48	0.003	0.007	-	-	Negligible	0.003	0.007	-	-	Negligible	0.02	0.07	0.04	-	Negligible
49	0.002	0.007	-	-	Negligible	0.002	0.007	-	-	Negligible	0.02	0.07	0.04	-	Negligible
50	0.002	0.007	-	-	Negligible	0.002	0.007	-	-	Negligible	0.01	0.06	0.03	-	Negligible
51	0.002	0.008	-	-	Negligible	0.002	0.008	-	-	Negligible	0.01	0.05	0.03	-	Negligible
52	0.002	0.006	-	-	Negligible	0.002	0.006	-	-	Negligible	0.01	0.05	0.03	-	Negligible
53	0.001	0.006	-	-	Negligible	0.001	0.006	-	-	Negligible	0.01	0.05	0.02	-	Negligible
54	0.001	0.006	-	-	Negligible	0.001	0.006	-	-	Negligible	0.01	0.05	0.03	-	Negligible
55	0.001	0.007	-	-	Negligible	0.001	0.007	-	-	Negligible	0.01	0.05	0.02	-	Negligible

56	0.001	0.007	-	-	Negligible	0.001	0.007	-	-	Negligible	0.01	0.05	0.03	-	Negligible
57	0.002	0.006	-	-	Negligible	0.002	0.006	-	-	Negligible	0.01	0.06	0.03	-	Negligible
58	0.002	0.008	-	-	Negligible	0.002	0.008	-	-	Negligible	0.01	0.07	0.03	-	Negligible
59	0.003	0.012	-	-	Negligible	0.003	0.012	-	-	Negligible	0.02	0.09	0.05	-	Negligible
60	0.001	0.005	-	-	Negligible	0.001	0.005	-	-	Negligible	0.01	0.04	0.02	-	Negligible
61	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.04	0.02	-	Negligible
62	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.04	0.02	-	Negligible
63	0.000	0.002	-	-	Negligible	0.000	0.002	-	-	Negligible	0.00	0.03	0.01	-	Negligible
64	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.01	0.04	0.02	-	Negligible
65	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.05	0.02	-	Negligible
66	0.001	0.005	-	-	Negligible	0.001	0.005	-	-	Negligible	0.01	0.06	0.03	-	Negligible
67	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.03	0.02	-	Negligible
68	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.06	0.03	-	Negligible
69	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.01	0.04	0.02	-	Negligible
70	0.001	0.006	-	-	Negligible	0.001	0.006	-	-	Negligible	0.01	0.09	0.04	-	Negligible
71	0.000	0.002	-	-	Negligible	0.000	0.002	-	-	Negligible	0.01	0.03	0.01	-	Negligible
72	0.000	0.002	-	-	Negligible	0.000	0.002	-	-	Negligible	0.00	0.03	0.01	-	Negligible
73	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.04	0.02	-	Negligible
74	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.01	0.05	0.02	-	Negligible
75	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.06	0.03	-	Negligible
76	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.04	0.02	-	Negligible
77	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.01	0.03	0.02	-	Negligible
78	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.05	0.03	-	Negligible
79	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.05	0.03	-	Negligible
80	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.00	0.04	0.01	-	Negligible
81	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.01	0.04	0.02	-	Negligible
82	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.06	0.02	-	Negligible
83	0.001	0.002	-	-	Negligible	0.001	0.002	-	-	Negligible	0.01	0.04	0.03	-	Negligible
84	0.001	0.006	-	-	Negligible	0.001	0.006	-	-	Negligible	0.01	0.09	0.04	-	Negligible
85	0.001	0.005	-	-	Negligible	0.001	0.005	-	-	Negligible	0.01	0.06	0.03	-	Negligible
86	0.001	0.006	-	-	Negligible	0.001	0.006	-	-	Negligible	0.01	0.08	0.03	-	Negligible
87	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.00	0.04	0.01	-	Negligible
88	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.04	0.02	-	Negligible

89	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.06	0.02	-	Negligible
90	0.013	0.036	-	-	Negligible	0.013	0.036	-	-	Negligible	0.05	0.18	0.10	-	Negligible
91	0.002	0.012	-	-	Negligible	0.002	0.012	-	-	Negligible	0.02	0.08	0.03	-	Negligible
92	0.002	0.011	-	-	Negligible	0.002	0.011	-	-	Negligible	0.02	0.08	0.04	-	Negligible
93	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.04	0.02	-	Negligible
94	0.003	0.011	-	-	Negligible	0.003	0.011	-	-	Negligible	0.02	0.08	0.04	-	Negligible
95	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.01	0.05	0.02	-	Negligible
96	0.002	0.014	-	-	Negligible	0.002	0.014	-	-	Negligible	0.02	0.11	0.05	-	Negligible
97	0.000	0.002	-	-	Negligible	0.000	0.002	-	-	Negligible	0.00	0.03	0.01	-	Negligible
98	0.000	0.003	-	-	Negligible	0.000	0.003	-	-	Negligible	0.01	0.04	0.02	-	Negligible
99	0.001	0.003	-	-	Negligible	0.001	0.003	-	-	Negligible	0.01	0.06	0.03	-	Negligible
100	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.04	0.02	-	Negligible
101	0.014	0.034	-	-	Negligible	0.014	0.034	-	-	Negligible	0.05	0.18	0.10	-	Negligible
102	0.004	0.006	-	-	Negligible	0.004	0.006	-	-	Negligible	0.03	0.05	0.05	-	Negligible
103	0.003	0.012	-	-	Negligible	0.003	0.012	-	-	Negligible	0.02	0.09	0.05	-	Negligible
104	0.003	0.017	-	-	Negligible	0.003	0.017	-	-	Negligible	0.02	0.13	0.06	-	Negligible
105	0.001	0.005	-	-	Negligible	0.001	0.005	-	-	Negligible	0.01	0.03	0.01	-	Negligible
106	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.05	0.02	-	Negligible
107	0.001	0.004	-	-	Negligible	0.001	0.004	-	-	Negligible	0.01	0.04	0.02	-	Negligible
108	0.000	0.000	-	-	Negligible	0.000	0.000	-	-	Negligible	0.00	0.00	0.00	-	Negligible
109	0.000	0.001	-	-	Negligible	0.000	0.001	-	-	Negligible	0.00	0.01	0.00	-	Negligible
110	0.000	0.002	-	-	Negligible	0.000	0.002	-	-	Negligible	0.00	0.03	0.01	-	Negligible
111	0.001	0.008	-	-	Negligible	0.001	0.008	-	-	Negligible	0.01	0.08	0.03	-	Negligible
112	0.019	0.067	-	-	Negligible	0.019	0.067	-	-	Negligible	0.069	0.226	0.124	-	Negligible
113	0.019	0.063	-	-	Negligible	0.019	0.063	-	-	Negligible	0.066	0.212	0.113	-	Negligible

D2.6 Hydrogen fluoride (HF) and hydrogen chloride (HCl)

Table D6: Process contributions of HF at the human receptors

Human receptor ID	HF monthly mean concentration (µg/m³)					HF 100th percentile 1 hour average concentration (µg/m³)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW boilers	Michelin	Significance
	EAL: 16 µg/m³					EAL: 160 µg/m³				
1	0.00002	0.00130	-	-	Negligible	0.001	0.108	-	-	Negligible
2	0.00001	0.00080	-	-	Negligible	0.002	0.100	-	-	Negligible
3	0.00001	0.00070	-	-	Negligible	0.001	0.092	-	-	Negligible
4	0.00001	0.00060	-	-	Negligible	0.001	0.126	-	-	Negligible
5	0.00002	0.00050	-	-	Negligible	0.002	0.122	-	-	Negligible
6	0.00003	0.00060	-	-	Negligible	0.001	0.110	-	-	Negligible
7	0.00004	0.00120	-	-	Negligible	0.001	0.098	-	-	Negligible
8	0.00001	0.00070	-	-	Negligible	0.001	0.097	-	-	Negligible
9	0.00013	0.00320	-	-	Negligible	0.001	0.082	-	-	Negligible
10	0.00011	0.00390	-	-	Negligible	0.001	0.074	-	-	Negligible
11	0.00010	0.00380	-	-	Negligible	0.001	0.070	-	-	Negligible
12	0.00009	0.00380	-	-	Negligible	0.001	0.065	-	-	Negligible
13	0.00005	0.00210	-	-	Negligible	0.001	0.071	-	-	Negligible
14	0.00001	0.00070	-	-	Negligible	0.001	0.077	-	-	Negligible
15	0.00000	0.00040	-	-	Negligible	0.001	0.082	-	-	Negligible
16	0.00000	0.00020	-	-	Negligible	0.001	0.068	-	-	Negligible
17	0.00001	0.00020	-	-	Negligible	0.001	0.072	-	-	Negligible
18	0.00001	0.00030	-	-	Negligible	0.001	0.068	-	-	Negligible
19	0.00000	0.00010	-	-	Negligible	0.001	0.075	-	-	Negligible
20	0.00000	0.00030	-	-	Negligible	0.001	0.057	-	-	Negligible
21	0.00001	0.00060	-	-	Negligible	0.001	0.051	-	-	Negligible
22	0.00001	0.00050	-	-	Negligible	0.001	0.060	-	-	Negligible
23	0.00001	0.00040	-	-	Negligible	0.000	0.045	-	-	Negligible
24	0.00001	0.00060	-	-	Negligible	0.001	0.038	-	-	Negligible
25	0.00002	0.00140	-	-	Negligible	0.001	0.078	-	-	Negligible
26	0.00001	0.00110	-	-	Negligible	0.001	0.058	-	-	Negligible

27	0.00001	0.00080	-	-	Negligible	0.000	0.047	-	-	Negligible
28	0.00001	0.00070	-	-	Negligible	0.001	0.055	-	-	Negligible
29	0.00002	0.00130	-	-	Negligible	0.001	0.064	-	-	Negligible
30	0.00001	0.00080	-	-	Negligible	0.000	0.044	-	-	Negligible
31	0.00000	0.00020	-	-	Negligible	0.001	0.055	-	-	Negligible
32	0.00000	0.00030	-	-	Negligible	0.001	0.064	-	-	Negligible
33	0.00003	0.00180	-	-	Negligible	0.002	0.150	-	-	Negligible
34	0.00000	0.00010	-	-	Negligible	0.001	0.086	-	-	Negligible
35	0.00001	0.00120	-	-	Negligible	0.001	0.077	-	-	Negligible
36	0.00006	0.00070	-	-	Negligible	0.002	0.091	-	-	Negligible
37	0.00002	0.00070	-	-	Negligible	0.001	0.108	-	-	Negligible
38	0.00002	0.00080	-	-	Negligible	0.001	0.105	-	-	Negligible
39	0.00002	0.00110	-	-	Negligible	0.001	0.084	-	-	Negligible
40	0.00002	0.00150	-	-	Negligible	0.002	0.089	-	-	Negligible
41	0.00002	0.00150	-	-	Negligible	0.001	0.114	-	-	Negligible
42	0.00001	0.00090	-	-	Negligible	0.001	0.076	-	-	Negligible
43	0.00003	0.00120	-	-	Negligible	0.001	0.095	-	-	Negligible
44	0.00007	0.00230	-	-	Negligible	0.001	0.087	-	-	Negligible
45	0.00004	0.00160	-	-	Negligible	0.001	0.092	-	-	Negligible
46	0.00003	0.00110	-	-	Negligible	0.001	0.104	-	-	Negligible
47	0.00002	0.00060	-	-	Negligible	0.001	0.127	-	-	Negligible
48	0.00002	0.00070	-	-	Negligible	0.001	0.135	-	-	Negligible
49	0.00002	0.00070	-	-	Negligible	0.002	0.132	-	-	Negligible
50	0.00001	0.00070	-	-	Negligible	0.001	0.109	-	-	Negligible
51	0.00001	0.00080	-	-	Negligible	0.001	0.092	-	-	Negligible
52	0.00001	0.00060	-	-	Negligible	0.001	0.090	-	-	Negligible
53	0.00001	0.00060	-	-	Negligible	0.001	0.095	-	-	Negligible
54	0.00001	0.00060	-	-	Negligible	0.001	0.102	-	-	Negligible
55	0.00001	0.00070	-	-	Negligible	0.001	0.091	-	-	Negligible
56	0.00001	0.00070	-	-	Negligible	0.001	0.086	-	-	Negligible
57	0.00001	0.00060	-	-	Negligible	0.001	0.116	-	-	Negligible
58	0.00001	0.00080	-	-	Negligible	0.001	0.071	-	-	Negligible
59	0.00002	0.00120	-	-	Negligible	0.001	0.097	-	-	Negligible

60	0.00000	0.00050	-	-	Negligible	0.001	0.070	-	-	Negligible
61	0.00000	0.00040	-	-	Negligible	0.001	0.079	-	-	Negligible
62	0.00000	0.00030	-	-	Negligible	0.001	0.067	-	-	Negligible
63	0.00000	0.00020	-	-	Negligible	0.001	0.076	-	-	Negligible
64	0.00000	0.00030	-	-	Negligible	0.000	0.036	-	-	Negligible
65	0.00000	0.00040	-	-	Negligible	0.000	0.048	-	-	Negligible
66	0.00000	0.00050	-	-	Negligible	0.001	0.058	-	-	Negligible
67	0.00000	0.00030	-	-	Negligible	0.001	0.055	-	-	Negligible
68	0.00001	0.00030	-	-	Negligible	0.001	0.059	-	-	Negligible
69	0.00000	0.00030	-	-	Negligible	0.001	0.043	-	-	Negligible
70	0.00001	0.00060	-	-	Negligible	0.001	0.046	-	-	Negligible
71	0.00000	0.00020	-	-	Negligible	0.001	0.060	-	-	Negligible
72	0.00000	0.00020	-	-	Negligible	0.001	0.069	-	-	Negligible
73	0.00000	0.00030	-	-	Negligible	0.001	0.061	-	-	Negligible
74	0.00000	0.00030	-	-	Negligible	0.001	0.047	-	-	Negligible
75	0.00000	0.00030	-	-	Negligible	0.001	0.060	-	-	Negligible
76	0.00000	0.00040	-	-	Negligible	0.001	0.077	-	-	Negligible
77	0.00000	0.00030	-	-	Negligible	0.001	0.064	-	-	Negligible
78	0.00000	0.00030	-	-	Negligible	0.001	0.063	-	-	Negligible
79	0.00001	0.00030	-	-	Negligible	0.001	0.065	-	-	Negligible
80	0.00000	0.00030	-	-	Negligible	0.000	0.041	-	-	Negligible
81	0.00000	0.00030	-	-	Negligible	0.001	0.056	-	-	Negligible
82	0.00000	0.00040	-	-	Negligible	0.001	0.042	-	-	Negligible
83	0.00001	0.00020	-	-	Negligible	0.001	0.072	-	-	Negligible
84	0.00001	0.00060	-	-	Negligible	0.001	0.051	-	-	Negligible
85	0.00001	0.00050	-	-	Negligible	0.001	0.060	-	-	Negligible
86	0.00001	0.00060	-	-	Negligible	0.001	0.039	-	-	Negligible
87	0.00000	0.00030	-	-	Negligible	0.000	0.043	-	-	Negligible
88	0.00000	0.00030	-	-	Negligible	0.001	0.056	-	-	Negligible
89	0.00000	0.00040	-	-	Negligible	0.001	0.042	-	-	Negligible
90	0.00010	0.00360	-	-	Negligible	0.001	0.070	-	-	Negligible
91	0.00002	0.00120	-	-	Negligible	0.001	0.069	-	-	Negligible
92	0.00002	0.00110	-	-	Negligible	0.001	0.061	-	-	Negligible

93	0.00000	0.00040	-	-	Negligible	0.001	0.074	-	-	Negligible
94	0.00002	0.00110	-	-	Negligible	0.001	0.085	-	-	Negligible
95	0.00000	0.00030	-	-	Negligible	0.001	0.047	-	-	Negligible
96	0.00002	0.00140	-	-	Negligible	0.001	0.078	-	-	Negligible
97	0.00000	0.00020	-	-	Negligible	0.001	0.077	-	-	Negligible
98	0.00000	0.00030	-	-	Negligible	0.001	0.043	-	-	Negligible
99	0.00000	0.00030	-	-	Negligible	0.001	0.061	-	-	Negligible
100	0.00000	0.00040	-	-	Negligible	0.001	0.078	-	-	Negligible
101	0.00010	0.00340	-	-	Negligible	0.001	0.075	-	-	Negligible
102	0.00003	0.00060	-	-	Negligible	0.001	0.113	-	-	Negligible
103	0.00002	0.00120	-	-	Negligible	0.001	0.114	-	-	Negligible
104	0.00002	0.00170	-	-	Negligible	0.001	0.115	-	-	Negligible
105	0.00001	0.00050	-	-	Negligible	0.000	0.039	-	-	Negligible
106	0.00000	0.00040	-	-	Negligible	0.001	0.063	-	-	Negligible
107	0.00000	0.00040	-	-	Negligible	0.001	0.075	-	-	Negligible
108	0.00000	0.00000	-	-	Negligible	0.001	0.018	-	-	Negligible
109	0.00000	0.00010	-	-	Negligible	0.000	0.016	-	-	Negligible
110	0.00000	0.00020	-	-	Negligible	0.001	0.056	-	-	Negligible
111	0.00001	0.00080	-	-	Negligible	0.001	0.072	-	-	Negligible
112	0.00010	0.00670	-	-	Negligible	0.002	0.169	-	-	Negligible
113	0.00014	0.00630	-	-	Negligible	0.002	0.164	-	-	Negligible

D2.6.1 Hydrogen chloride (HCl)

Table D7: Process contributions of HCl at the human receptors

Human receptor ID	HCl 100th percentile 1 hour average concentration (µg/m³)				Significance
	DERL	EfW CHP	EfW boilers	Michelin	
	EAL: 750 µg/m³				
1	1.87	1.08	-	-	Negligible
2	2.52	1.00	-	-	Negligible
3	1.85	0.92	-	-	Negligible
4	1.98	1.26	-	-	Negligible
5	2.41	1.22	-	-	Negligible
6	2.30	1.10	-	-	Negligible
7	2.26	0.98	-	-	Negligible
8	1.76	0.97	-	-	Negligible
9	1.67	0.82	-	-	Negligible
10	1.43	0.74	-	-	Negligible
11	1.36	0.70	-	-	Negligible
12	1.24	0.65	-	-	Negligible
13	1.32	0.71	-	-	Negligible
14	1.45	0.77	-	-	Negligible
15	1.23	0.82	-	-	Negligible
16	1.09	0.68	-	-	Negligible
17	1.28	0.72	-	-	Negligible
18	1.28	0.68	-	-	Negligible
19	1.43	0.75	-	-	Negligible
20	1.09	0.57	-	-	Negligible
21	1.10	0.51	-	-	Negligible
22	1.03	0.60	-	-	Negligible
23	0.75	0.45	-	-	Negligible
24	0.90	0.38	-	-	Negligible
25	1.07	0.78	-	-	Negligible
26	0.91	0.58	-	-	Negligible

27	0.64	0.47	-	-	Negligible
28	1.17	0.55	-	-	Negligible
29	2.16	0.64	-	-	Negligible
30	0.66	0.44	-	-	Negligible
31	1.09	0.55	-	-	Negligible
32	0.99	0.64	-	-	Negligible
33	2.79	1.50	-	-	Negligible
34	1.71	0.86	-	-	Negligible
35	1.27	0.77	-	-	Negligible
36	2.49	0.91	-	-	Negligible
37	1.90	1.08	-	-	Negligible
38	1.80	1.05	-	-	Negligible
39	1.34	0.84	-	-	Negligible
40	2.59	0.89	-	-	Negligible
41	1.43	1.14	-	-	Negligible
42	1.87	0.76	-	-	Negligible
43	1.51	0.95	-	-	Negligible
44	1.84	0.87	-	-	Negligible
45	1.64	0.92	-	-	Negligible
46	1.80	1.04	-	-	Negligible
47	2.26	1.27	-	-	Negligible
48	2.14	1.35	-	-	Negligible
49	2.46	1.32	-	-	Negligible
50	2.04	1.09	-	-	Negligible
51	1.67	0.92	-	-	Negligible
52	1.78	0.90	-	-	Negligible
53	1.62	0.95	-	-	Negligible
54	2.03	1.02	-	-	Negligible
55	1.71	0.91	-	-	Negligible
56	1.49	0.86	-	-	Negligible
57	2.06	1.16	-	-	Negligible
58	1.65	0.71	-	-	Negligible
59	1.78	0.97	-	-	Negligible

60	1.22	0.70	-	-	Negligible
61	1.33	0.79	-	-	Negligible
62	1.13	0.67	-	-	Negligible
63	1.30	0.76	-	-	Negligible
64	0.79	0.36	-	-	Negligible
65	0.76	0.48	-	-	Negligible
66	0.95	0.58	-	-	Negligible
67	1.06	0.55	-	-	Negligible
68	1.10	0.59	-	-	Negligible
69	1.08	0.43	-	-	Negligible
70	1.10	0.46	-	-	Negligible
71	1.32	0.60	-	-	Negligible
72	1.18	0.69	-	-	Negligible
73	1.25	0.61	-	-	Negligible
74	0.91	0.47	-	-	Negligible
75	0.98	0.60	-	-	Negligible
76	1.22	0.77	-	-	Negligible
77	1.13	0.64	-	-	Negligible
78	1.02	0.63	-	-	Negligible
79	1.24	0.65	-	-	Negligible
80	0.68	0.41	-	-	Negligible
81	1.04	0.56	-	-	Negligible
82	0.82	0.42	-	-	Negligible
83	1.28	0.72	-	-	Negligible
84	1.12	0.51	-	-	Negligible
85	1.03	0.60	-	-	Negligible
86	0.91	0.39	-	-	Negligible
87	0.68	0.43	-	-	Negligible
88	1.04	0.56	-	-	Negligible
89	0.83	0.42	-	-	Negligible
90	1.36	0.70	-	-	Negligible
91	1.53	0.69	-	-	Negligible
92	1.41	0.61	-	-	Negligible

93	1.22	0.74	-	-	Negligible
94	1.35	0.85	-	-	Negligible
95	0.93	0.47	-	-	Negligible
96	1.07	0.78	-	-	Negligible
97	1.31	0.77	-	-	Negligible
98	1.10	0.43	-	-	Negligible
99	0.99	0.61	-	-	Negligible
100	1.23	0.78	-	-	Negligible
101	1.46	0.75	-	-	Negligible
102	2.32	1.13	-	-	Negligible
103	2.14	1.14	-	-	Negligible
104	1.34	1.15	-	-	Negligible
105	0.66	0.39	-	-	Negligible
106	1.13	0.63	-	-	Negligible
107	1.22	0.75	-	-	Negligible
108	1.87	0.18	-	-	Negligible
109	0.28	0.16	-	-	Negligible
110	0.95	0.56	-	-	Negligible
111	1.48	0.72	-	-	Negligible
112	3.94	1.69	-	-	Negligible
113	3.51	1.64	-	-	Negligible

D2.7 Ammonia (NH_3)

Table D8: Process contributions of NH_3 at the human receptors

Human receptor ID	NH_3 annual mean concentration (µg/m^3)					N100th percentile 1 hour concentration (µg/m^3)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW boilers	Michelin	Significance
	EAL: 180 µg/m^3					EAL: 2,500 µg/m^3				
1	0.002	0.007	-	-	Negligible	0.08	0.54	-	-	Negligible
2	0.001	0.004	-	-	Negligible	0.11	0.50	-	-	Negligible
3	0.001	0.003	-	-	Negligible	0.08	0.46	-	-	Negligible
4	0.001	0.003	-	-	Negligible	0.09	0.63	-	-	Negligible
5	0.001	0.003	-	-	Negligible	0.11	0.61	-	-	Negligible
6	0.002	0.003	-	-	Negligible	0.10	0.55	-	-	Negligible
7	0.003	0.006	-	-	Negligible	0.10	0.49	-	-	Negligible
8	0.001	0.003	-	-	Negligible	0.08	0.48	-	-	Negligible
9	0.009	0.016	-	-	Negligible	0.07	0.41	-	-	Negligible
10	0.008	0.019	-	-	Negligible	0.06	0.37	-	-	Negligible
11	0.007	0.019	-	-	Negligible	0.06	0.35	-	-	Negligible
12	0.007	0.019	-	-	Negligible	0.05	0.32	-	-	Negligible
13	0.003	0.011	-	-	Negligible	0.06	0.36	-	-	Negligible
14	0.000	0.003	-	-	Negligible	0.06	0.39	-	-	Negligible
15	0.000	0.002	-	-	Negligible	0.05	0.41	-	-	Negligible
16	0.000	0.001	-	-	Negligible	0.05	0.34	-	-	Negligible
17	0.000	0.001	-	-	Negligible	0.06	0.36	-	-	Negligible
18	0.000	0.001	-	-	Negligible	0.06	0.34	-	-	Negligible
19	0.000	0.001	-	-	Negligible	0.06	0.38	-	-	Negligible
20	0.000	0.001	-	-	Negligible	0.05	0.29	-	-	Negligible
21	0.001	0.003	-	-	Negligible	0.05	0.25	-	-	Negligible
22	0.000	0.002	-	-	Negligible	0.05	0.30	-	-	Negligible
23	0.000	0.002	-	-	Negligible	0.03	0.22	-	-	Negligible
24	0.000	0.003	-	-	Negligible	0.04	0.19	-	-	Negligible
25	0.001	0.007	-	-	Negligible	0.05	0.39	-	-	Negligible

26	0.001	0.005	-	-	Negligible	0.04	0.29	-	-	Negligible
27	0.001	0.004	-	-	Negligible	0.03	0.23	-	-	Negligible
28	0.001	0.003	-	-	Negligible	0.05	0.27	-	-	Negligible
29	0.001	0.007	-	-	Negligible	0.10	0.32	-	-	Negligible
30	0.001	0.004	-	-	Negligible	0.03	0.22	-	-	Negligible
31	0.000	0.001	-	-	Negligible	0.05	0.27	-	-	Negligible
32	0.000	0.002	-	-	Negligible	0.04	0.32	-	-	Negligible
33	0.002	0.009	-	-	Negligible	0.12	0.75	-	-	Negligible
34	0.000	0.001	-	-	Negligible	0.08	0.43	-	-	Negligible
35	0.001	0.006	-	-	Negligible	0.06	0.38	-	-	Negligible
36	0.004	0.004	-	-	Negligible	0.11	0.45	-	-	Negligible
37	0.002	0.004	-	-	Negligible	0.08	0.54	-	-	Negligible
38	0.001	0.004	-	-	Negligible	0.08	0.52	-	-	Negligible
39	0.001	0.006	-	-	Negligible	0.06	0.42	-	-	Negligible
40	0.002	0.008	-	-	Negligible	0.11	0.45	-	-	Negligible
41	0.001	0.008	-	-	Negligible	0.06	0.57	-	-	Negligible
42	0.001	0.004	-	-	Negligible	0.08	0.38	-	-	Negligible
43	0.002	0.006	-	-	Negligible	0.07	0.48	-	-	Negligible
44	0.005	0.012	-	-	Negligible	0.08	0.43	-	-	Negligible
45	0.003	0.008	-	-	Negligible	0.07	0.46	-	-	Negligible
46	0.002	0.006	-	-	Negligible	0.08	0.52	-	-	Negligible
47	0.002	0.003	-	-	Negligible	0.10	0.64	-	-	Negligible
48	0.001	0.003	-	-	Negligible	0.09	0.68	-	-	Negligible
49	0.001	0.003	-	-	Negligible	0.11	0.66	-	-	Negligible
50	0.001	0.003	-	-	Negligible	0.09	0.55	-	-	Negligible
51	0.001	0.004	-	-	Negligible	0.07	0.46	-	-	Negligible
52	0.001	0.003	-	-	Negligible	0.08	0.45	-	-	Negligible
53	0.001	0.003	-	-	Negligible	0.07	0.48	-	-	Negligible
54	0.001	0.003	-	-	Negligible	0.09	0.51	-	-	Negligible
55	0.001	0.003	-	-	Negligible	0.08	0.45	-	-	Negligible
56	0.001	0.003	-	-	Negligible	0.07	0.43	-	-	Negligible
57	0.001	0.003	-	-	Negligible	0.09	0.58	-	-	Negligible
58	0.001	0.004	-	-	Negligible	0.07	0.35	-	-	Negligible

59	0.001	0.006	-	-	Negligible	0.08	0.48	-	-	Negligible
60	0.000	0.002	-	-	Negligible	0.05	0.35	-	-	Negligible
61	0.000	0.002	-	-	Negligible	0.06	0.40	-	-	Negligible
62	0.000	0.002	-	-	Negligible	0.05	0.34	-	-	Negligible
63	0.000	0.001	-	-	Negligible	0.06	0.38	-	-	Negligible
64	0.000	0.001	-	-	Negligible	0.03	0.18	-	-	Negligible
65	0.000	0.002	-	-	Negligible	0.03	0.24	-	-	Negligible
66	0.000	0.002	-	-	Negligible	0.04	0.29	-	-	Negligible
67	0.000	0.001	-	-	Negligible	0.05	0.28	-	-	Negligible
68	0.000	0.002	-	-	Negligible	0.05	0.29	-	-	Negligible
69	0.000	0.001	-	-	Negligible	0.05	0.22	-	-	Negligible
70	0.001	0.003	-	-	Negligible	0.05	0.23	-	-	Negligible
71	0.000	0.001	-	-	Negligible	0.06	0.30	-	-	Negligible
72	0.000	0.001	-	-	Negligible	0.05	0.35	-	-	Negligible
73	0.000	0.002	-	-	Negligible	0.06	0.31	-	-	Negligible
74	0.000	0.002	-	-	Negligible	0.04	0.23	-	-	Negligible
75	0.000	0.002	-	-	Negligible	0.04	0.30	-	-	Negligible
76	0.000	0.002	-	-	Negligible	0.05	0.38	-	-	Negligible
77	0.000	0.001	-	-	Negligible	0.05	0.32	-	-	Negligible
78	0.000	0.001	-	-	Negligible	0.04	0.31	-	-	Negligible
79	0.000	0.002	-	-	Negligible	0.05	0.33	-	-	Negligible
80	0.000	0.001	-	-	Negligible	0.03	0.21	-	-	Negligible
81	0.000	0.002	-	-	Negligible	0.05	0.28	-	-	Negligible
82	0.000	0.002	-	-	Negligible	0.04	0.21	-	-	Negligible
83	0.000	0.001	-	-	Negligible	0.06	0.36	-	-	Negligible
84	0.001	0.003	-	-	Negligible	0.05	0.25	-	-	Negligible
85	0.000	0.002	-	-	Negligible	0.05	0.30	-	-	Negligible
86	0.000	0.003	-	-	Negligible	0.04	0.19	-	-	Negligible
87	0.000	0.001	-	-	Negligible	0.03	0.21	-	-	Negligible
88	0.000	0.002	-	-	Negligible	0.05	0.28	-	-	Negligible
89	0.000	0.002	-	-	Negligible	0.04	0.21	-	-	Negligible
90	0.007	0.018	-	-	Negligible	0.06	0.35	-	-	Negligible
91	0.001	0.006	-	-	Negligible	0.07	0.34	-	-	Negligible

92	0.001	0.005	-	-	Negligible	0.06	0.30	-	-	Negligible
93	0.000	0.002	-	-	Negligible	0.05	0.37	-	-	Negligible
94	0.001	0.006	-	-	Negligible	0.06	0.43	-	-	Negligible
95	0.000	0.002	-	-	Negligible	0.04	0.23	-	-	Negligible
96	0.001	0.007	-	-	Negligible	0.05	0.39	-	-	Negligible
97	0.000	0.001	-	-	Negligible	0.06	0.39	-	-	Negligible
98	0.000	0.001	-	-	Negligible	0.05	0.22	-	-	Negligible
99	0.000	0.002	-	-	Negligible	0.04	0.30	-	-	Negligible
100	0.000	0.002	-	-	Negligible	0.05	0.39	-	-	Negligible
101	0.007	0.017	-	-	Negligible	0.06	0.38	-	-	Negligible
102	0.002	0.003	-	-	Negligible	0.10	0.57	-	-	Negligible
103	0.002	0.006	-	-	Negligible	0.09	0.57	-	-	Negligible
104	0.001	0.008	-	-	Negligible	0.06	0.58	-	-	Negligible
105	0.000	0.002	-	-	Negligible	0.03	0.20	-	-	Negligible
106	0.000	0.002	-	-	Negligible	0.05	0.32	-	-	Negligible
107	0.000	0.002	-	-	Negligible	0.05	0.37	-	-	Negligible
108	0.000	0.000	-	-	Negligible	0.08	0.09	-	-	Negligible
109	0.000	0.001	-	-	Negligible	0.01	0.08	-	-	Negligible
110	0.000	0.001	-	-	Negligible	0.04	0.28	-	-	Negligible
111	0.001	0.004	-	-	Negligible	0.07	0.36	-	-	Negligible
112	0.010	0.034	-	-	Negligible	0.17	0.85	-	-	Negligible
113	0.009	0.031	-	-	Negligible	0.15	0.82	-	-	Negligible

D2.8 Dioxins and furans

Table D9: Process contributions of dioxins and furans at the human receptors

Human receptor ID	Dioxins and furans LT PC (fg/m^3)			
	DERL	EfW CHP	EfW boilers	Michelin
	No EAL or air quality standard available			
1	0.13	0.13	-	-
2	0.06	0.08	-	-
3	0.05	0.07	-	-
4	0.07	0.06	-	-
5	0.09	0.05	-	-
6	0.14	0.06	-	-
7	0.23	0.12	-	-
8	0.06	0.07	-	-
9	0.70	0.32	-	-
10	0.61	0.39	-	-
11	0.54	0.38	-	-
12	0.49	0.38	-	-
13	0.26	0.21	-	-
14	0.03	0.07	-	-
15	0.02	0.04	-	-
16	0.02	0.02	-	-
17	0.03	0.02	-	-
18	0.03	0.03	-	-
19	0.02	0.01	-	-
20	0.02	0.03	-	-
21	0.04	0.06	-	-
22	0.03	0.05	-	-
23	0.03	0.04	-	-
24	0.03	0.06	-	-
25	0.08	0.14	-	-
26	0.06	0.11	-	-

27	0.04	0.08	-	-
28	0.05	0.07	-	-
29	0.10	0.13	-	-
30	0.05	0.08	-	-
31	0.01	0.02	-	-
32	0.02	0.03	-	-
33	0.14	0.18	-	-
34	0.01	0.01	-	-
35	0.08	0.12	-	-
36	0.33	0.07	-	-
37	0.11	0.07	-	-
38	0.10	0.08	-	-
39	0.10	0.11	-	-
40	0.12	0.15	-	-
41	0.10	0.15	-	-
42	0.07	0.09	-	-
43	0.13	0.12	-	-
44	0.39	0.23	-	-
45	0.21	0.16	-	-
46	0.15	0.11	-	-
47	0.12	0.06	-	-
48	0.10	0.07	-	-
49	0.08	0.07	-	-
50	0.06	0.07	-	-
51	0.08	0.08	-	-
52	0.07	0.06	-	-
53	0.05	0.06	-	-
54	0.05	0.06	-	-
55	0.05	0.07	-	-
56	0.05	0.07	-	-
57	0.06	0.06	-	-
58	0.07	0.08	-	-
59	0.11	0.12	-	-

60	0.02	0.05	-	-
61	0.02	0.04	-	-
62	0.02	0.03	-	-
63	0.02	0.02	-	-
64	0.02	0.03	-	-
65	0.02	0.04	-	-
66	0.03	0.05	-	-
67	0.02	0.03	-	-
68	0.03	0.03	-	-
69	0.02	0.03	-	-
70	0.04	0.06	-	-
71	0.01	0.02	-	-
72	0.01	0.02	-	-
73	0.02	0.03	-	-
74	0.02	0.03	-	-
75	0.02	0.03	-	-
76	0.02	0.04	-	-
77	0.02	0.03	-	-
78	0.02	0.03	-	-
79	0.03	0.03	-	-
80	0.01	0.03	-	-
81	0.02	0.03	-	-
82	0.03	0.04	-	-
83	0.03	0.02	-	-
84	0.04	0.06	-	-
85	0.03	0.05	-	-
86	0.03	0.06	-	-
87	0.02	0.03	-	-
88	0.02	0.03	-	-
89	0.03	0.04	-	-
90	0.51	0.36	-	-
91	0.09	0.12	-	-
92	0.09	0.11	-	-

93	0.02	0.04	-	-
94	0.10	0.11	-	-
95	0.02	0.03	-	-
96	0.08	0.14	-	-
97	0.02	0.02	-	-
98	0.02	0.03	-	-
99	0.02	0.03	-	-
100	0.02	0.04	-	-
101	0.53	0.34	-	-
102	0.14	0.06	-	-
103	0.12	0.12	-	-
104	0.10	0.17	-	-
105	0.04	0.05	-	-
106	0.02	0.04	-	-
107	0.02	0.04	-	-
108	0.01	0.00	-	-
109	0.01	0.01	-	-
110	0.02	0.02	-	-
111	0.04	0.08	-	-
112	0.74	0.67	-	-
113	0.71	0.63	-	-

D2.9 Dioxin-like polychlorinated biphenyls (PCBs)

Table D10: Process contributions of PCBs at the human receptors concentration

Human receptor ID	PCBs annual mean (µg/m³)					PCBs 100th percentile 1 hour concentration (µg/m³)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW Boilers	Michelin	Significance
	EAL: 0.2 µg/m³					EAL: 6 µg/m³				
1	1.80×10^{-9}	1.10×10^{-9}	-	-	Negligible	9.00×10^{-8}	9.00×10^{-8}	-	-	Negligible
2	9.00×10^{-10}	7.00×10^{-10}	-	-	Negligible	1.20×10^{-7}	9.00×10^{-8}	-	-	Negligible
3	8.00×10^{-10}	6.00×10^{-10}	-	-	Negligible	9.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
4	1.00×10^{-9}	5.00×10^{-10}	-	-	Negligible	9.00×10^{-8}	1.10×10^{-7}	-	-	Negligible
5	1.30×10^{-9}	5.00×10^{-10}	-	-	Negligible	1.10×10^{-7}	1.10×10^{-7}	-	-	Negligible
6	2.00×10^{-9}	5.00×10^{-10}	-	-	Negligible	1.10×10^{-7}	1.00×10^{-7}	-	-	Negligible
7	3.30×10^{-9}	1.10×10^{-9}	-	-	Negligible	1.10×10^{-7}	9.00×10^{-8}	-	-	Negligible
8	8.00×10^{-10}	6.00×10^{-10}	-	-	Negligible	8.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
9	1.00×10^{-8}	2.80×10^{-9}	-	-	Negligible	8.00×10^{-8}	7.00×10^{-8}	-	-	Negligible
10	8.60×10^{-9}	3.40×10^{-9}	-	-	Negligible	7.00×10^{-8}	6.00×10^{-8}	-	-	Negligible
11	7.70×10^{-9}	3.30×10^{-9}	-	-	Negligible	6.00×10^{-8}	6.00×10^{-8}	-	-	Negligible
12	7.00×10^{-9}	3.30×10^{-9}	-	-	Negligible	6.00×10^{-8}	6.00×10^{-8}	-	-	Negligible
13	3.70×10^{-9}	1.80×10^{-9}	-	-	Negligible	6.00×10^{-8}	6.00×10^{-8}	-	-	Negligible
14	5.00×10^{-10}	6.00×10^{-10}	-	-	Negligible	7.00×10^{-8}	7.00×10^{-8}	-	-	Negligible
15	3.00×10^{-10}	4.00×10^{-10}	-	-	Negligible	6.00×10^{-8}	7.00×10^{-8}	-	-	Negligible
16	3.00×10^{-10}	2.00×10^{-10}	-	-	Negligible	5.00×10^{-8}	6.00×10^{-8}	-	-	Negligible
17	4.00×10^{-10}	2.00×10^{-10}	-	-	Negligible	6.00×10^{-8}	6.00×10^{-8}	-	-	Negligible
18	5.00×10^{-10}	2.00×10^{-10}	-	-	Negligible	6.00×10^{-8}	6.00×10^{-8}	-	-	Negligible
19	3.00×10^{-10}	1.00×10^{-10}	-	-	Negligible	7.00×10^{-8}	7.00×10^{-8}	-	-	Negligible
20	3.00×10^{-10}	2.00×10^{-10}	-	-	Negligible	5.00×10^{-8}	5.00×10^{-8}	-	-	Negligible
21	6.00×10^{-10}	5.00×10^{-10}	-	-	Negligible	5.00×10^{-8}	4.00×10^{-8}	-	-	Negligible
22	4.00×10^{-10}	4.00×10^{-10}	-	-	Negligible	5.00×10^{-8}	5.00×10^{-8}	-	-	Negligible
23	4.00×10^{-10}	4.00×10^{-10}	-	-	Negligible	4.00×10^{-8}	4.00×10^{-8}	-	-	Negligible
24	5.00×10^{-10}	5.00×10^{-10}	-	-	Negligible	4.00×10^{-8}	3.00×10^{-8}	-	-	Negligible
25	1.20×10^{-9}	1.20×10^{-9}	-	-	Negligible	5.00×10^{-8}	7.00×10^{-8}	-	-	Negligible

26	9.00×10^{-10}	9.00×10^{-10}	-	-	Negligible	4.00×10^{-8}	5.00×10^{-8}	-	-	Negligible
27	6.00×10^{-10}	7.00×10^{-10}	-	-	Negligible	3.00×10^{-8}	4.00×10^{-8}	-	-	Negligible
28	7.00×10^{-10}	6.00×10^{-10}	-	-	Negligible	5.00×10^{-8}	5.00×10^{-8}	-	-	Negligible
29	1.50×10^{-9}	1.20×10^{-9}	-	-	Negligible	1.00×10^{-7}	6.00×10^{-8}	-	-	Negligible
30	7.00×10^{-10}	7.00×10^{-10}	-	-	Negligible	3.00×10^{-8}	4.00×10^{-8}	-	-	Negligible
31	2.00×10^{-10}	2.00×10^{-10}	-	-	Negligible	5.00×10^{-8}	5.00×10^{-8}	-	-	Negligible
32	3.00×10^{-10}	3.00×10^{-10}	-	-	Negligible	5.00×10^{-8}	6.00×10^{-8}	-	-	Negligible
33	2.00×10^{-9}	1.60×10^{-9}	-	-	Negligible	1.30×10^{-7}	1.30×10^{-7}	-	-	Negligible
34	2.00×10^{-10}	1.00×10^{-10}	-	-	Negligible	8.00×10^{-8}	7.00×10^{-8}	-	-	Negligible
35	1.10×10^{-9}	1.10×10^{-9}	-	-	Negligible	6.00×10^{-8}	7.00×10^{-8}	-	-	Negligible
36	4.70×10^{-9}	6.00×10^{-10}	-	-	Negligible	1.20×10^{-7}	8.00×10^{-8}	-	-	Negligible
37	1.60×10^{-9}	6.00×10^{-10}	-	-	Negligible	9.00×10^{-8}	9.00×10^{-8}	-	-	Negligible
38	1.40×10^{-9}	7.00×10^{-10}	-	-	Negligible	8.00×10^{-8}	9.00×10^{-8}	-	-	Negligible
39	1.40×10^{-9}	1.00×10^{-9}	-	-	Negligible	6.00×10^{-8}	7.00×10^{-8}	-	-	Negligible
40	1.70×10^{-9}	1.30×10^{-9}	-	-	Negligible	1.20×10^{-7}	8.00×10^{-8}	-	-	Negligible
41	1.40×10^{-9}	1.30×10^{-9}	-	-	Negligible	7.00×10^{-8}	1.00×10^{-7}	-	-	Negligible
42	1.00×10^{-9}	8.00×10^{-10}	-	-	Negligible	9.00×10^{-8}	7.00×10^{-8}	-	-	Negligible
43	1.90×10^{-9}	1.10×10^{-9}	-	-	Negligible	7.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
44	5.50×10^{-9}	2.00×10^{-9}	-	-	Negligible	9.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
45	3.00×10^{-9}	1.40×10^{-9}	-	-	Negligible	8.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
46	2.10×10^{-9}	1.00×10^{-9}	-	-	Negligible	8.00×10^{-8}	9.00×10^{-8}	-	-	Negligible
47	1.70×10^{-9}	5.00×10^{-10}	-	-	Negligible	1.10×10^{-7}	1.10×10^{-7}	-	-	Negligible
48	1.40×10^{-9}	6.00×10^{-10}	-	-	Negligible	1.00×10^{-7}	1.20×10^{-7}	-	-	Negligible
49	1.10×10^{-9}	6.00×10^{-10}	-	-	Negligible	1.20×10^{-7}	1.20×10^{-7}	-	-	Negligible
50	9.00×10^{-10}	6.00×10^{-10}	-	-	Negligible	1.00×10^{-7}	1.00×10^{-7}	-	-	Negligible
51	1.10×10^{-9}	7.00×10^{-10}	-	-	Negligible	8.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
52	9.00×10^{-10}	5.00×10^{-10}	-	-	Negligible	8.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
53	8.00×10^{-10}	5.00×10^{-10}	-	-	Negligible	8.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
54	7.00×10^{-10}	5.00×10^{-10}	-	-	Negligible	1.00×10^{-7}	9.00×10^{-8}	-	-	Negligible
55	7.00×10^{-10}	6.00×10^{-10}	-	-	Negligible	8.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
56	8.00×10^{-10}	6.00×10^{-10}	-	-	Negligible	7.00×10^{-8}	8.00×10^{-8}	-	-	Negligible
57	8.00×10^{-10}	5.00×10^{-10}	-	-	Negligible	1.00×10^{-7}	1.00×10^{-7}	-	-	Negligible
58	1.00×10^{-9}	7.00×10^{-10}	-	-	Negligible	8.00×10^{-8}	6.00×10^{-8}	-	-	Negligible

59	1.50 x10^{-9}	1.00 x10^{-9}	-	-	Negligible	8.00 x10^{-8}	8.00 x10^{-8}	-	-	Negligible
60	3.00 x10^{-10}	4.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	6.00 x10^{-8}	-	-	Negligible
61	3.00 x10^{-10}	4.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	7.00 x10^{-8}	-	-	Negligible
62	3.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	6.00 x10^{-8}	-	-	Negligible
63	2.00 x10^{-10}	2.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	7.00 x10^{-8}	-	-	Negligible
64	2.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	4.00 x10^{-8}	3.00 x10^{-8}	-	-	Negligible
65	3.00 x10^{-10}	4.00 x10^{-10}	-	-	Negligible	4.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
66	4.00 x10^{-10}	4.00 x10^{-10}	-	-	Negligible	4.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
67	3.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
68	4.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
69	3.00 x10^{-10}	2.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
70	5.00 x10^{-10}	5.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
71	2.00 x10^{-10}	2.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
72	2.00 x10^{-10}	2.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	6.00 x10^{-8}	-	-	Negligible
73	3.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
74	3.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	4.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
75	4.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
76	3.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	7.00 x10^{-8}	-	-	Negligible
77	3.00 x10^{-10}	2.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	6.00 x10^{-8}	-	-	Negligible
78	4.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
79	4.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	6.00 x10^{-8}	-	-	Negligible
80	2.00 x10^{-10}	2.00 x10^{-10}	-	-	Negligible	3.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
81	3.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
82	4.00 x10^{-10}	4.00 x10^{-10}	-	-	Negligible	4.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
83	4.00 x10^{-10}	2.00 x10^{-10}	-	-	Negligible	6.00 x10^{-8}	6.00 x10^{-8}	-	-	Negligible
84	6.00 x10^{-10}	5.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
85	4.00 x10^{-10}	4.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
86	5.00 x10^{-10}	5.00 x10^{-10}	-	-	Negligible	4.00 x10^{-8}	3.00 x10^{-8}	-	-	Negligible
87	2.00 x10^{-10}	2.00 x10^{-10}	-	-	Negligible	3.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
88	3.00 x10^{-10}	3.00 x10^{-10}	-	-	Negligible	5.00 x10^{-8}	5.00 x10^{-8}	-	-	Negligible
89	4.00 x10^{-10}	4.00 x10^{-10}	-	-	Negligible	4.00 x10^{-8}	4.00 x10^{-8}	-	-	Negligible
90	7.20 x10^{-9}	3.10 x10^{-9}	-	-	Negligible	6.00 x10^{-8}	6.00 x10^{-8}	-	-	Negligible
91	1.20 x10^{-9}	1.00 x10^{-9}	-	-	Negligible	7.00 x10^{-8}	6.00 x10^{-8}	-	-	Negligible

92	$1.30 x10^{-9}$	$1.00 x10^{-9}$	-	-	Negligible	$7.00 x10^{-8}$	$5.00 x10^{-8}$	-	-	Negligible
93	$3.00 x10^{-10}$	$3.00 x10^{-10}$	-	-	Negligible	$6.00 x10^{-8}$	$6.00 x10^{-8}$	-	-	Negligible
94	$1.40 x10^{-9}$	$1.00 x10^{-9}$	-	-	Negligible	$6.00 x10^{-8}$	$7.00 x10^{-8}$	-	-	Negligible
95	$3.00 x10^{-10}$	$3.00 x10^{-10}$	-	-	Negligible	$4.00 x10^{-8}$	$4.00 x10^{-8}$	-	-	Negligible
96	$1.20 x10^{-9}$	$1.20 x10^{-9}$	-	-	Negligible	$5.00 x10^{-8}$	$7.00 x10^{-8}$	-	-	Negligible
97	$2.00 x10^{-10}$	$2.00 x10^{-10}$	-	-	Negligible	$6.00 x10^{-8}$	$7.00 x10^{-8}$	-	-	Negligible
98	$3.00 x10^{-10}$	$3.00 x10^{-10}$	-	-	Negligible	$5.00 x10^{-8}$	$4.00 x10^{-8}$	-	-	Negligible
99	$4.00 x10^{-10}$	$3.00 x10^{-10}$	-	-	Negligible	$5.00 x10^{-8}$	$5.00 x10^{-8}$	-	-	Negligible
100	$3.00 x10^{-10}$	$3.00 x10^{-10}$	-	-	Negligible	$6.00 x10^{-8}$	$7.00 x10^{-8}$	-	-	Negligible
101	$7.50 x10^{-9}$	$3.00 x10^{-9}$	-	-	Negligible	$7.00 x10^{-8}$	$7.00 x10^{-8}$	-	-	Negligible
102	$2.00 x10^{-9}$	$5.00 x10^{-10}$	-	-	Negligible	$1.10 x10^{-7}$	$1.00 x10^{-7}$	-	-	Negligible
103	$1.60 x10^{-9}$	$1.10 x10^{-9}$	-	-	Negligible	$1.00 x10^{-7}$	$1.00 x10^{-7}$	-	-	Negligible
104	$1.50 x10^{-9}$	$1.40 x10^{-9}$	-	-	Negligible	$6.00 x10^{-8}$	$1.00 x10^{-7}$	-	-	Negligible
105	$5.00 x10^{-10}$	$4.00 x10^{-10}$	-	-	Negligible	$3.00 x10^{-8}$	$3.00 x10^{-8}$	-	-	Negligible
106	$3.00 x10^{-10}$	$3.00 x10^{-10}$	-	-	Negligible	$5.00 x10^{-8}$	$5.00 x10^{-8}$	-	-	Negligible
107	$3.00 x10^{-10}$	$3.00 x10^{-10}$	-	-	Negligible	$6.00 x10^{-8}$	$7.00 x10^{-8}$	-	-	Negligible
108	$1.00 x10^{-10}$	$<1.00 x10^{-10}$	-	-	Negligible	$9.00 x10^{-8}$	$2.00 x10^{-8}$	-	-	Negligible
109	$1.00 x10^{-10}$	$1.00 x10^{-10}$	-	-	Negligible	$1.00 x10^{-8}$	$1.00 x10^{-8}$	-	-	Negligible
110	$2.00 x10^{-10}$	$2.00 x10^{-10}$	-	-	Negligible	$4.00 x10^{-8}$	$5.00 x10^{-8}$	-	-	Negligible
111	$6.00 x10^{-10}$	$7.00 x10^{-10}$	-	-	Negligible	$7.00 x10^{-8}$	$6.00 x10^{-8}$	-	-	Negligible
112	$1.00 x10^{-8}$	$1.00 x10^{-8}$	-	-	Negligible	$2.00 x10^{-7}$	$1.00 x10^{-7}$	-	-	Negligible
113	$1.00 x10^{-8}$	$1.00 x10^{-8}$	-	-	Negligible	$2.00 x10^{-7}$	$1.00 x10^{-7}$	-	-	Negligible

D2.10 Polycyclic aromatic hydrocarbons (PAHs) as benzo(a)pyrene

Table D11: Process contributions of PAH at the human receptors

Human receptor ID	PAHs annual mean concentration (µg/m^3)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance
	Air quality standard: 0.25ng/m^3 (0.00025µg/m^3)				
1	0.00003	0.00002	-	-	Negligible
2	0.00001	0.00001	-	-	Negligible
3	0.00001	0.00001	-	-	Negligible
4	0.00002	0.00001	-	-	Negligible
5	0.00002	0.00001	-	-	Negligible
6	0.00003	0.00001	-	-	Slight beneficial
7	0.00005	0.00002	-	-	Moderate beneficial
8	0.00001	0.00001	-	-	Negligible
9	0.00016	0.00004	-	-	Moderate beneficial
10	0.00014	0.00005	-	-	Moderate beneficial
11	0.00012	0.00005	-	-	Moderate beneficial
12	0.00011	0.00005	-	-	Moderate beneficial
13	0.00006	0.00003	-	-	Moderate beneficial
14	0.00001	0.00001	-	-	Negligible
15	0.00001	0.00001	-	-	Negligible
16	0.00000	0.00000	-	-	Negligible
17	0.00001	0.00000	-	-	Negligible
18	0.00001	0.00000	-	-	Negligible
19	0.00001	0.00000	-	-	Negligible
20	0.00000	0.00000	-	-	Negligible
21	0.00001	0.00001	-	-	Negligible
22	0.00001	0.00001	-	-	Negligible
23	0.00001	0.00001	-	-	Negligible
24	0.00001	0.00001	-	-	Negligible
25	0.00002	0.00002	-	-	Negligible

26	0.00001	0.00001	-	-	Negligible
27	0.00001	0.00001	-	-	Negligible
28	0.00001	0.00001	-	-	Negligible
29	0.00002	0.00002	-	-	Negligible
30	0.00001	0.00001	-	-	Negligible
31	0.00000	0.00000	-	-	Negligible
32	0.00001	0.00000	-	-	Negligible
33	0.00003	0.00003	-	-	Negligible
34	0.00000	0.00000	-	-	Negligible
35	0.00002	0.00002	-	-	Negligible
36	0.00008	0.00001	-	-	Moderate beneficial
37	0.00003	0.00001	-	-	Slight beneficial
38	0.00002	0.00001	-	-	Negligible
39	0.00002	0.00002	-	-	Negligible
40	0.00003	0.00002	-	-	Negligible
41	0.00002	0.00002	-	-	Negligible
42	0.00002	0.00001	-	-	Negligible
43	0.00003	0.00002	-	-	Negligible
44	0.00009	0.00003	-	-	Moderate beneficial
45	0.00005	0.00002	-	-	Moderate beneficial
46	0.00003	0.00002	-	-	Slight beneficial
47	0.00003	0.00001	-	-	Slight beneficial
48	0.00002	0.00001	-	-	Negligible
49	0.00002	0.00001	-	-	Negligible
50	0.00001	0.00001	-	-	Negligible
51	0.00002	0.00001	-	-	Negligible
52	0.00001	0.00001	-	-	Negligible
53	0.00001	0.00001	-	-	Negligible
54	0.00001	0.00001	-	-	Negligible
55	0.00001	0.00001	-	-	Negligible
56	0.00001	0.00001	-	-	Negligible
57	0.00001	0.00001	-	-	Negligible
58	0.00002	0.00001	-	-	Negligible

59	0.00002	0.00002	-	-	Negligible
60	0.00001	0.00001	-	-	Negligible
61	0.00001	0.00001	-	-	Negligible
62	0.00000	0.00000	-	-	Negligible
63	0.00000	0.00000	-	-	Negligible
64	0.00000	0.00000	-	-	Negligible
65	0.00001	0.00001	-	-	Negligible
66	0.00001	0.00001	-	-	Negligible
67	0.00000	0.00000	-	-	Negligible
68	0.00001	0.00000	-	-	Negligible
69	0.00000	0.00000	-	-	Negligible
70	0.00001	0.00001	-	-	Negligible
71	0.00000	0.00000	-	-	Negligible
72	0.00000	0.00000	-	-	Negligible
73	0.00001	0.00000	-	-	Negligible
74	0.00000	0.00000	-	-	Negligible
75	0.00001	0.00000	-	-	Negligible
76	0.00000	0.00001	-	-	Negligible
77	0.00000	0.00000	-	-	Negligible
78	0.00001	0.00000	-	-	Negligible
79	0.00001	0.00000	-	-	Negligible
80	0.00000	0.00000	-	-	Negligible
81	0.00000	0.00000	-	-	Negligible
82	0.00001	0.00001	-	-	Negligible
83	0.00001	0.00000	-	-	Negligible
84	0.00001	0.00001	-	-	Negligible
85	0.00001	0.00001	-	-	Negligible
86	0.00001	0.00001	-	-	Negligible
87	0.00000	0.00000	-	-	Negligible
88	0.00000	0.00000	-	-	Negligible
89	0.00001	0.00001	-	-	Negligible
90	0.00011	0.00005	-	-	Moderate beneficial
91	0.00002	0.00002	-	-	Negligible

92	0.00002	0.00002	-	-	Negligible
93	0.00000	0.00001	-	-	Negligible
94	0.00002	0.00002	-	-	Negligible
95	0.00000	0.00000	-	-	Negligible
96	0.00002	0.00002	-	-	Negligible
97	0.00000	0.00000	-	-	Negligible
98	0.00000	0.00000	-	-	Negligible
99	0.00001	0.00000	-	-	Negligible
100	0.00000	0.00001	-	-	Negligible
101	0.00012	0.00005	-	-	Moderate beneficial
102	0.00003	0.00001	-	-	Slight beneficial
103	0.00003	0.00002	-	-	Negligible
104	0.00002	0.00002	-	-	Negligible
105	0.00001	0.00001	-	-	Negligible
106	0.00001	0.00000	-	-	Negligible
107	0.00000	0.00001	-	-	Negligible
108	0.00000	0.00000	-	-	Negligible
109	0.00000	0.00000	-	-	Negligible
110	0.00000	0.00000	-	-	Negligible
111	0.00001	0.00001	-	-	Negligible
112	0.00017	0.00009	-	-	Moderate beneficial
113	0.00016	0.00009	-	-	Moderate beneficial

D2.11 Trace Metals

D2.11.1 Group I metals: Cadmium (Cd) and Thallium (Tl)

Cd and Tl were modelled assuming that the total emitted would be either all Cd or all Tl to provide a worst case.

Table D12: Process contributions of Cd and Tl at the human receptors

Human receptor ID	Cd or Tl annual mean concentration (µg/m³)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance
	Air quality standard for Cd: 5ng/m³ (0.005µg/m³) EAL standard for Tl: 100µg/m³				
1	0.00003	0.00007			Negligible
2	0.00002	0.00004	-	-	Negligible
3	0.00001	0.00003	-	-	Negligible
4	0.00002	0.00003	-	-	Negligible
5	0.00002	0.00003	-	-	Negligible
6	0.00004	0.00003	-	-	Negligible
7	0.00006	0.00006	-	-	Negligible
8	0.00001	0.00003	-	-	Negligible
9	0.00018	0.00016	-	-	Negligible
10	0.00015	0.00019	-	-	Negligible
11	0.00014	0.00019	-	-	Negligible
12	0.00012	0.00019	-	-	Negligible
13	0.00007	0.00011	-	-	Negligible
14	0.00001	0.00003	-	-	Negligible
15	0.00001	0.00002	-	-	Negligible
16	0.00001	0.00001	-	-	Negligible
17	0.00001	0.00001	-	-	Negligible
18	0.00001	0.00001	-	-	Negligible
19	0.00001	0.00001	-	-	Negligible

20	0.00000	0.00001	-	-	Negligible
21	0.00001	0.00003	-	-	Negligible
22	0.00001	0.00002	-	-	Negligible
23	0.00001	0.00002	-	-	Negligible
24	0.00001	0.00003	-	-	Negligible
25	0.00002	0.00007	-	-	Negligible
26	0.00002	0.00005	-	-	Negligible
27	0.00001	0.00004	-	-	Negligible
28	0.00001	0.00003	-	-	Negligible
29	0.00003	0.00007	-	-	Negligible
30	0.00001	0.00004	-	-	Negligible
31	0.00000	0.00001	-	-	Negligible
32	0.00001	0.00002	-	-	Negligible
33	0.00004	0.00009	-	-	Negligible
34	0.00000	0.00001	-	-	Negligible
35	0.00002	0.00006	-	-	Negligible
36	0.00008	0.00004	-	-	Negligible
37	0.00003	0.00004	-	-	Negligible
38	0.00003	0.00004	-	-	Negligible
39	0.00003	0.00006	-	-	Negligible
40	0.00003	0.00008	-	-	Negligible
41	0.00003	0.00008	-	-	Negligible
42	0.00002	0.00004	-	-	Negligible
43	0.00003	0.00006	-	-	Negligible
44	0.00010	0.00012	-	-	Negligible
45	0.00005	0.00008	-	-	Negligible
46	0.00004	0.00006	-	-	Negligible
47	0.00003	0.00003	-	-	Negligible
48	0.00003	0.00003	-	-	Negligible
49	0.00002	0.00003	-	-	Negligible
50	0.00002	0.00003	-	-	Negligible
51	0.00002	0.00004	-	-	Negligible
52	0.00002	0.00003	-	-	Negligible

53	0.00001	0.00003	-	-	Negligible
54	0.00001	0.00003	-	-	Negligible
55	0.00001	0.00003	-	-	Negligible
56	0.00001	0.00003	-	-	Negligible
57	0.00002	0.00003	-	-	Negligible
58	0.00002	0.00004	-	-	Negligible
59	0.00003	0.00006	-	-	Negligible
60	0.00001	0.00002	-	-	Negligible
61	0.00001	0.00002	-	-	Negligible
62	0.00001	0.00002	-	-	Negligible
63	0.00000	0.00001	-	-	Negligible
64	0.00000	0.00001	-	-	Negligible
65	0.00001	0.00002	-	-	Negligible
66	0.00001	0.00002	-	-	Negligible
67	0.00000	0.00001	-	-	Negligible
68	0.00001	0.00002	-	-	Negligible
69	0.00000	0.00001	-	-	Negligible
70	0.00001	0.00003	-	-	Negligible
71	0.00000	0.00001	-	-	Negligible
72	0.00000	0.00001	-	-	Negligible
73	0.00001	0.00002	-	-	Negligible
74	0.00000	0.00002	-	-	Negligible
75	0.00001	0.00002	-	-	Negligible
76	0.00001	0.00002	-	-	Negligible
77	0.00000	0.00001	-	-	Negligible
78	0.00001	0.00001	-	-	Negligible
79	0.00001	0.00002	-	-	Negligible
80	0.00000	0.00001	-	-	Negligible
81	0.00000	0.00002	-	-	Negligible
82	0.00001	0.00002	-	-	Negligible
83	0.00001	0.00001	-	-	Negligible
84	0.00001	0.00003	-	-	Negligible
85	0.00001	0.00002	-	-	Negligible

86	0.00001	0.00003	-	-	Negligible
87	0.00000	0.00001	-	-	Negligible
88	0.00000	0.00002	-	-	Negligible
89	0.00001	0.00002	-	-	Negligible
90	0.00013	0.00018	-	-	Negligible
91	0.00002	0.00006	-	-	Negligible
92	0.00002	0.00005	-	-	Negligible
93	0.00000	0.00002	-	-	Negligible
94	0.00003	0.00006	-	-	Negligible
95	0.00000	0.00002	-	-	Negligible
96	0.00002	0.00007	-	-	Negligible
97	0.00000	0.00001	-	-	Negligible
98	0.00000	0.00001	-	-	Negligible
99	0.00001	0.00002	-	-	Negligible
100	0.00001	0.00002	-	-	Negligible
101	0.00013	0.00017	-	-	Negligible
102	0.00004	0.00003	-	-	Negligible
103	0.00003	0.00006	-	-	Negligible
104	0.00003	0.00008	-	-	Negligible
105	0.00001	0.00002	-	-	Negligible
106	0.00001	0.00002	-	-	Negligible
107	0.00000	0.00002	-	-	Negligible
108	0.00000	0.00000	-	-	Negligible
109	0.00000	0.00001	-	-	Negligible
110	0.00000	0.00001	-	-	Negligible
111	0.00001	0.00004	-	-	Negligible
112	0.00037	0.00067	-	-	Negligible
113	0.00036	0.00063	-	-	Negligible

D2.11.2 Group II metals: Mercury (Hg)

Table D13: Process contributions of Hg at the human receptors

Human receptor ID	Hg annual mean concentration (µg/m^3)					Hg 100th percentile 1 hour mean concentration (µg/m^3)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW boilers	Michelin	Significance
	EAL: 0.25µg/m^3					EAL: 7.5µg/m^3				
1	0.000010	0.000066	-	-	Negligible	0.0005	0.0054	-	-	Negligible
2	0.000005	0.000041	-	-	Negligible	0.0007	0.0050	-	-	Negligible
3	0.000004	0.000034	-	-	Negligible	0.0005	0.0046	-	-	Negligible
4	0.000006	0.000030	-	-	Negligible	0.0005	0.0063	-	-	Negligible
5	0.000007	0.000026	-	-	Negligible	0.0007	0.0061	-	-	Negligible
6	0.000012	0.000030	-	-	Negligible	0.0006	0.0055	-	-	Negligible
7	0.000019	0.000061	-	-	Negligible	0.0006	0.0049	-	-	Negligible
8	0.000005	0.000033	-	-	Negligible	0.0005	0.0048	-	-	Negligible
9	0.000058	0.000162	-	-	Negligible	0.0005	0.0041	-	-	Negligible
10	0.000050	0.000194	-	-	Negligible	0.0004	0.0037	-	-	Negligible
11	0.000045	0.000191	-	-	Negligible	0.0004	0.0035	-	-	Negligible
12	0.000041	0.000191	-	-	Negligible	0.0003	0.0032	-	-	Negligible
13	0.000022	0.000106	-	-	Negligible	0.0004	0.0036	-	-	Negligible
14	0.000003	0.000034	-	-	Negligible	0.0004	0.0039	-	-	Negligible
15	0.000002	0.000021	-	-	Negligible	0.0003	0.0041	-	-	Negligible
16	0.000002	0.000012	-	-	Negligible	0.0003	0.0034	-	-	Negligible
17	0.000003	0.000011	-	-	Negligible	0.0004	0.0036	-	-	Negligible
18	0.000003	0.000013	-	-	Negligible	0.0004	0.0034	-	-	Negligible
19	0.000002	0.000007	-	-	Negligible	0.0004	0.0038	-	-	Negligible
20	0.000002	0.000013	-	-	Negligible	0.0003	0.0029	-	-	Negligible
21	0.000003	0.000031	-	-	Negligible	0.0003	0.0025	-	-	Negligible
22	0.000002	0.000023	-	-	Negligible	0.0003	0.0030	-	-	Negligible
23	0.000002	0.000022	-	-	Negligible	0.0002	0.0022	-	-	Negligible
24	0.000003	0.000028	-	-	Negligible	0.0002	0.0019	-	-	Negligible
25	0.000007	0.000071	-	-	Negligible	0.0003	0.0039	-	-	Negligible

26	0.000005	0.000053	-	-	Negligible	0.0003	0.0029	-	-	Negligible
27	0.000004	0.000040	-	-	Negligible	0.0002	0.0023	-	-	Negligible
28	0.000004	0.000033	-	-	Negligible	0.0003	0.0027	-	-	Negligible
29	0.000009	0.000066	-	-	Negligible	0.0006	0.0032	-	-	Negligible
30	0.000004	0.000040	-	-	Negligible	0.0002	0.0022	-	-	Negligible
31	0.000001	0.000009	-	-	Negligible	0.0003	0.0027	-	-	Negligible
32	0.000002	0.000016	-	-	Negligible	0.0003	0.0032	-	-	Negligible
33	0.000012	0.000092	-	-	Negligible	0.0008	0.0075	-	-	Negligible
34	0.000001	0.000007	-	-	Negligible	0.0005	0.0043	-	-	Negligible
35	0.000006	0.000062	-	-	Negligible	0.0003	0.0038	-	-	Negligible
36	0.000028	0.000037	-	-	Negligible	0.0007	0.0045	-	-	Negligible
37	0.000009	0.000037	-	-	Negligible	0.0005	0.0054	-	-	Negligible
38	0.000008	0.000040	-	-	Negligible	0.0005	0.0052	-	-	Negligible
39	0.000008	0.000057	-	-	Negligible	0.0004	0.0042	-	-	Negligible
40	0.000010	0.000075	-	-	Negligible	0.0007	0.0045	-	-	Negligible
41	0.000008	0.000077	-	-	Negligible	0.0004	0.0057	-	-	Negligible
42	0.000006	0.000043	-	-	Negligible	0.0005	0.0038	-	-	Negligible
43	0.000011	0.000062	-	-	Negligible	0.0004	0.0048	-	-	Negligible
44	0.000032	0.000117	-	-	Negligible	0.0005	0.0043	-	-	Negligible
45	0.000018	0.000079	-	-	Negligible	0.0005	0.0046	-	-	Negligible
46	0.000012	0.000055	-	-	Negligible	0.0005	0.0052	-	-	Negligible
47	0.000010	0.000031	-	-	Negligible	0.0006	0.0064	-	-	Negligible
48	0.000008	0.000033	-	-	Negligible	0.0006	0.0068	-	-	Negligible
49	0.000007	0.000034	-	-	Negligible	0.0007	0.0066	-	-	Negligible
50	0.000005	0.000035	-	-	Negligible	0.0006	0.0055	-	-	Negligible
51	0.000006	0.000038	-	-	Negligible	0.0005	0.0046	-	-	Negligible
52	0.000005	0.000031	-	-	Negligible	0.0005	0.0045	-	-	Negligible
53	0.000004	0.000028	-	-	Negligible	0.0004	0.0048	-	-	Negligible
54	0.000004	0.000028	-	-	Negligible	0.0006	0.0051	-	-	Negligible
55	0.000004	0.000033	-	-	Negligible	0.0005	0.0045	-	-	Negligible
56	0.000004	0.000033	-	-	Negligible	0.0004	0.0043	-	-	Negligible
57	0.000005	0.000030	-	-	Negligible	0.0006	0.0058	-	-	Negligible
58	0.000006	0.000042	-	-	Negligible	0.0005	0.0035	-	-	Negligible

59	0.000009	0.000058	-	-	Negligible	0.0005	0.0048	-	-	Negligible
60	0.000002	0.000023	-	-	Negligible	0.0003	0.0035	-	-	Negligible
61	0.000002	0.000022	-	-	Negligible	0.0004	0.0040	-	-	Negligible
62	0.000002	0.000015	-	-	Negligible	0.0003	0.0034	-	-	Negligible
63	0.000001	0.000012	-	-	Negligible	0.0004	0.0038	-	-	Negligible
64	0.000001	0.000015	-	-	Negligible	0.0002	0.0018	-	-	Negligible
65	0.000002	0.000021	-	-	Negligible	0.0002	0.0024	-	-	Negligible
66	0.000002	0.000023	-	-	Negligible	0.0003	0.0029	-	-	Negligible
67	0.000002	0.000015	-	-	Negligible	0.0003	0.0028	-	-	Negligible
68	0.000003	0.000017	-	-	Negligible	0.0003	0.0029	-	-	Negligible
69	0.000001	0.000014	-	-	Negligible	0.0003	0.0022	-	-	Negligible
70	0.000003	0.000032	-	-	Negligible	0.0003	0.0023	-	-	Negligible
71	0.000001	0.000011	-	-	Negligible	0.0004	0.0030	-	-	Negligible
72	0.000001	0.000010	-	-	Negligible	0.0003	0.0035	-	-	Negligible
73	0.000002	0.000017	-	-	Negligible	0.0003	0.0031	-	-	Negligible
74	0.000002	0.000017	-	-	Negligible	0.0003	0.0023	-	-	Negligible
75	0.000002	0.000017	-	-	Negligible	0.0003	0.0030	-	-	Negligible
76	0.000002	0.000018	-	-	Negligible	0.0003	0.0038	-	-	Negligible
77	0.000002	0.000014	-	-	Negligible	0.0003	0.0032	-	-	Negligible
78	0.000002	0.000014	-	-	Negligible	0.0003	0.0031	-	-	Negligible
79	0.000003	0.000015	-	-	Negligible	0.0003	0.0033	-	-	Negligible
80	0.000001	0.000014	-	-	Negligible	0.0002	0.0021	-	-	Negligible
81	0.000002	0.000015	-	-	Negligible	0.0003	0.0028	-	-	Negligible
82	0.000002	0.000022	-	-	Negligible	0.0002	0.0021	-	-	Negligible
83	0.000003	0.000012	-	-	Negligible	0.0004	0.0036	-	-	Negligible
84	0.000003	0.000032	-	-	Negligible	0.0003	0.0025	-	-	Negligible
85	0.000002	0.000023	-	-	Negligible	0.0003	0.0030	-	-	Negligible
86	0.000003	0.000028	-	-	Negligible	0.0003	0.0019	-	-	Negligible
87	0.000001	0.000014	-	-	Negligible	0.0002	0.0021	-	-	Negligible
88	0.000002	0.000016	-	-	Negligible	0.0003	0.0028	-	-	Negligible
89	0.000002	0.000022	-	-	Negligible	0.0002	0.0021	-	-	Negligible
90	0.000042	0.000180	-	-	Negligible	0.0004	0.0035	-	-	Negligible
91	0.000007	0.000058	-	-	Negligible	0.0004	0.0034	-	-	Negligible

92	0.000007	0.000055	-	-	Negligible	0.0004	0.0030	-	-	Negligible
93	0.000002	0.000019	-	-	Negligible	0.0003	0.0037	-	-	Negligible
94	0.000008	0.000057	-	-	Negligible	0.0004	0.0043	-	-	Negligible
95	0.000002	0.000017	-	-	Negligible	0.0003	0.0023	-	-	Negligible
96	0.000007	0.000071	-	-	Negligible	0.0003	0.0039	-	-	Negligible
97	0.000001	0.000012	-	-	Negligible	0.0004	0.0039	-	-	Negligible
98	0.000001	0.000014	-	-	Negligible	0.0003	0.0022	-	-	Negligible
99	0.000002	0.000017	-	-	Negligible	0.0003	0.0030	-	-	Negligible
100	0.000002	0.000018	-	-	Negligible	0.0003	0.0039	-	-	Negligible
101	0.000044	0.000170	-	-	Negligible	0.0004	0.0038	-	-	Negligible
102	0.000012	0.000029	-	-	Negligible	0.0006	0.0057	-	-	Negligible
103	0.000010	0.000060	-	-	Negligible	0.0006	0.0057	-	-	Negligible
104	0.000009	0.000083	-	-	Negligible	0.0004	0.0058	-	-	Negligible
105	0.000003	0.000024	-	-	Negligible	0.0002	0.0020	-	-	Negligible
106	0.000002	0.000018	-	-	Negligible	0.0003	0.0032	-	-	Negligible
107	0.000002	0.000019	-	-	Negligible	0.0003	0.0037	-	-	Negligible
108	0.000001	0.000001	-	-	Negligible	0.0005	0.0009	-	-	Negligible
109	0.000001	0.000006	-	-	Negligible	0.0001	0.0008	-	-	Negligible
110	0.000001	0.000012	-	-	Negligible	0.0003	0.0028	-	-	Negligible
111	0.000003	0.000042	-	-	Negligible	0.0004	0.0036	-	-	Negligible
112	0.00006	0.00034	-	-	Negligible	0.00109	0.00847	-	-	Negligible
113	0.00006	0.00031	-	-	Negligible	0.00097	0.00818	-	-	Negligible

D2.11.3 Group III metals

Group III metals are: lead (Pb), arsenic (As), nickel (Ni), antimony (Sb), chromium (Cr and CrVI), cobalt (Co), copper (Cu), manganese (Mn) and vanadium (V).

Table D14: Process contributions of Group III metals at the human receptors

Human receptor ID	Group III metals, annual mean concentration (μg/m^3)					Group III metals, 100th percentile 1 hour average concentration (μg/m^3)				
	DERL	EfW CHP	EfW boilers	Michelin	Significance	DERL	EfW CHP	EfW boilers	Michelin	Significance
	Different for each metal. See Tables 1 and 2 of the main report					Different for each metal. See Table 2 of the main report				
1	0.0003	0.0007	-	-	Negligible	0.013	0.054	-	-	Negligible
2	0.0001	0.0004	-	-	Negligible	0.017	0.050	-	-	Negligible
3	0.0001	0.0003	-	-	Negligible	0.013	0.046	-	-	Negligible
4	0.0001	0.0003	-	-	Negligible	0.014	0.063	-	-	Negligible
5	0.0002	0.0003	-	-	Negligible	0.017	0.061	-	-	Negligible
6	0.0003	0.0003	-	-	Negligible	0.016	0.055	-	-	Negligible
7	0.0005	0.0006	-	-	Negligible	0.016	0.049	-	-	Negligible
8	0.0001	0.0003	-	-	Negligible	0.012	0.048	-	-	Negligible
9	0.0015	0.0016	-	-	Negligible	0.012	0.041	-	-	Negligible
10	0.0013	0.0019	-	-	Negligible	0.010	0.037	-	-	Negligible
11	0.0011	0.0019	-	-	Negligible	0.009	0.035	-	-	Negligible
12	0.0010	0.0019	-	-	Negligible	0.009	0.032	-	-	Negligible
13	0.0005	0.0011	-	-	Negligible	0.009	0.036	-	-	Negligible
14	0.0001	0.0003	-	-	Negligible	0.010	0.039	-	-	Negligible
15	0.0000	0.0002	-	-	Negligible	0.008	0.041	-	-	Negligible
16	0.0000	0.0001	-	-	Negligible	0.008	0.034	-	-	Negligible
17	0.0001	0.0001	-	-	Negligible	0.009	0.036	-	-	Negligible
18	0.0001	0.0001	-	-	Negligible	0.009	0.034	-	-	Negligible
19	0.0000	0.0001	-	-	Negligible	0.010	0.038	-	-	Negligible
20	0.0000	0.0001	-	-	Negligible	0.008	0.029	-	-	Negligible

21	0.0001	0.0003	-	-	Negligible	0.008	0.025	-	-	Negligible
22	0.0001	0.0002	-	-	Negligible	0.007	0.030	-	-	Negligible
23	0.0001	0.0002	-	-	Negligible	0.005	0.022	-	-	Negligible
24	0.0001	0.0003	-	-	Negligible	0.006	0.019	-	-	Negligible
25	0.0002	0.0007	-	-	Negligible	0.007	0.039	-	-	Negligible
26	0.0001	0.0005	-	-	Negligible	0.006	0.029	-	-	Negligible
27	0.0001	0.0004	-	-	Negligible	0.004	0.023	-	-	Negligible
28	0.0001	0.0003	-	-	Negligible	0.008	0.027	-	-	Negligible
29	0.0002	0.0007	-	-	Negligible	0.015	0.032	-	-	Negligible
30	0.0001	0.0004	-	-	Negligible	0.005	0.022	-	-	Negligible
31	0.0000	0.0001	-	-	Negligible	0.008	0.027	-	-	Negligible
32	0.0000	0.0002	-	-	Negligible	0.007	0.032	-	-	Negligible
33	0.0003	0.0009	-	-	Negligible	0.019	0.075	-	-	Negligible
34	0.0000	0.0001	-	-	Negligible	0.012	0.043	-	-	Negligible
35	0.0002	0.0006	-	-	Negligible	0.009	0.038	-	-	Negligible
36	0.0007	0.0004	-	-	Negligible	0.017	0.045	-	-	Negligible
37	0.0002	0.0004	-	-	Negligible	0.013	0.054	-	-	Negligible
38	0.0002	0.0004	-	-	Negligible	0.012	0.052	-	-	Negligible
39	0.0002	0.0006	-	-	Negligible	0.009	0.042	-	-	Negligible
40	0.0003	0.0008	-	-	Negligible	0.018	0.045	-	-	Negligible
41	0.0002	0.0008	-	-	Negligible	0.010	0.057	-	-	Negligible
42	0.0001	0.0004	-	-	Negligible	0.013	0.038	-	-	Negligible
43	0.0003	0.0006	-	-	Negligible	0.010	0.048	-	-	Negligible
44	0.0008	0.0012	-	-	Negligible	0.013	0.043	-	-	Negligible
45	0.0004	0.0008	-	-	Negligible	0.011	0.046	-	-	Negligible
46	0.0003	0.0006	-	-	Negligible	0.012	0.052	-	-	Negligible
47	0.0002	0.0003	-	-	Negligible	0.016	0.064	-	-	Negligible
48	0.0002	0.0003	-	-	Negligible	0.015	0.068	-	-	Negligible
49	0.0002	0.0003	-	-	Negligible	0.017	0.066	-	-	Negligible
50	0.0001	0.0003	-	-	Negligible	0.014	0.055	-	-	Negligible
51	0.0002	0.0004	-	-	Negligible	0.012	0.046	-	-	Negligible
52	0.0001	0.0003	-	-	Negligible	0.012	0.045	-	-	Negligible
53	0.0001	0.0003	-	-	Negligible	0.011	0.048	-	-	Negligible

54	0.0001	0.0003	-	-	Negligible	0.014	0.051	-	-	Negligible
55	0.0001	0.0003	-	-	Negligible	0.012	0.045	-	-	Negligible
56	0.0001	0.0003	-	-	Negligible	0.010	0.043	-	-	Negligible
57	0.0001	0.0003	-	-	Negligible	0.014	0.058	-	-	Negligible
58	0.0001	0.0004	-	-	Negligible	0.011	0.035	-	-	Negligible
59	0.0002	0.0006	-	-	Negligible	0.012	0.048	-	-	Negligible
60	0.0000	0.0002	-	-	Negligible	0.008	0.035	-	-	Negligible
61	0.0000	0.0002	-	-	Negligible	0.009	0.040	-	-	Negligible
62	0.0000	0.0002	-	-	Negligible	0.008	0.034	-	-	Negligible
63	0.0000	0.0001	-	-	Negligible	0.009	0.038	-	-	Negligible
64	0.0000	0.0001	-	-	Negligible	0.005	0.018	-	-	Negligible
65	0.0000	0.0002	-	-	Negligible	0.005	0.024	-	-	Negligible
66	0.0001	0.0002	-	-	Negligible	0.007	0.029	-	-	Negligible
67	0.0000	0.0001	-	-	Negligible	0.007	0.028	-	-	Negligible
68	0.0001	0.0002	-	-	Negligible	0.008	0.029	-	-	Negligible
69	0.0000	0.0001	-	-	Negligible	0.007	0.022	-	-	Negligible
70	0.0001	0.0003	-	-	Negligible	0.008	0.023	-	-	Negligible
71	0.0000	0.0001	-	-	Negligible	0.009	0.030	-	-	Negligible
72	0.0000	0.0001	-	-	Negligible	0.008	0.035	-	-	Negligible
73	0.0000	0.0002	-	-	Negligible	0.009	0.031	-	-	Negligible
74	0.0000	0.0002	-	-	Negligible	0.006	0.023	-	-	Negligible
75	0.0001	0.0002	-	-	Negligible	0.007	0.030	-	-	Negligible
76	0.0000	0.0002	-	-	Negligible	0.008	0.038	-	-	Negligible
77	0.0000	0.0001	-	-	Negligible	0.008	0.032	-	-	Negligible
78	0.0001	0.0001	-	-	Negligible	0.007	0.031	-	-	Negligible
79	0.0001	0.0002	-	-	Negligible	0.009	0.033	-	-	Negligible
80	0.0000	0.0001	-	-	Negligible	0.005	0.021	-	-	Negligible
81	0.0000	0.0002	-	-	Negligible	0.007	0.028	-	-	Negligible
82	0.0001	0.0002	-	-	Negligible	0.006	0.021	-	-	Negligible
83	0.0001	0.0001	-	-	Negligible	0.009	0.036	-	-	Negligible
84	0.0001	0.0003	-	-	Negligible	0.008	0.025	-	-	Negligible
85	0.0001	0.0002	-	-	Negligible	0.007	0.030	-	-	Negligible
86	0.0001	0.0003	-	-	Negligible	0.006	0.019	-	-	Negligible

87	0.0000	0.0001	-	-	Negligible	0.005	0.021	-	-	Negligible
88	0.0000	0.0002	-	-	Negligible	0.007	0.028	-	-	Negligible
89	0.0001	0.0002	-	-	Negligible	0.006	0.021	-	-	Negligible
90	0.0011	0.0018	-	-	Negligible	0.009	0.035	-	-	Negligible
91	0.0002	0.0006	-	-	Negligible	0.011	0.034	-	-	Negligible
92	0.0002	0.0005	-	-	Negligible	0.010	0.030	-	-	Negligible
93	0.0000	0.0002	-	-	Negligible	0.008	0.037	-	-	Negligible
94	0.0002	0.0006	-	-	Negligible	0.009	0.043	-	-	Negligible
95	0.0000	0.0002	-	-	Negligible	0.006	0.023	-	-	Negligible
96	0.0002	0.0007	-	-	Negligible	0.007	0.039	-	-	Negligible
97	0.0000	0.0001	-	-	Negligible	0.009	0.039	-	-	Negligible
98	0.0000	0.0001	-	-	Negligible	0.008	0.022	-	-	Negligible
99	0.0001	0.0002	-	-	Negligible	0.007	0.030	-	-	Negligible
100	0.0000	0.0002	-	-	Negligible	0.009	0.039	-	-	Negligible
101	0.0011	0.0017	-	-	Negligible	0.010	0.038	-	-	Negligible
102	0.0003	0.0003	-	-	Negligible	0.016	0.057	-	-	Negligible
103	0.0002	0.0006	-	-	Negligible	0.015	0.057	-	-	Negligible
104	0.0002	0.0008	-	-	Negligible	0.009	0.058	-	-	Negligible
105	0.0001	0.0002	-	-	Negligible	0.005	0.020	-	-	Negligible
106	0.0000	0.0002	-	-	Negligible	0.008	0.032	-	-	Negligible
107	0.0000	0.0002	-	-	Negligible	0.008	0.037	-	-	Negligible
108	0.0000	0.0000	-	-	Negligible	0.013	0.009	-	-	Negligible
109	0.0000	0.0001	-	-	Negligible	0.002	0.008	-	-	Negligible
110	0.0000	0.0001	-	-	Negligible	0.007	0.028	-	-	Negligible
111	0.0001	0.0004	-	-	Negligible	0.010	0.036	-	-	Negligible
112	0.001535	0.003351	-	-	Negligible	0.027	0.085	-	-	Negligible
113	0.001489	0.003150	-	-	Negligible	0.024	0.082	-	-	Negligible

Appendix E

Model Results at Ecological Receptors

Contents

E1.1 Annual mean NO_x concentrations

Table E1: Predicted annual mean NO_x concentrations at sensitive ecological sites, and comparison with the critical level

Ecological receptor ID	Receptor location	Existing DERL Facility				Proposed EfW Facility			
		Mod NO_X (PC) (µg/m^3)	1% test	Tot NO_X (PEC) (µg/m^3)	70% test	Mod NO_X (PC) (µg/m^3)	1% test	Tot NO_X (PEC) (µg/m^3)	70% test
1	Firth of Tay and Eden Estuary	0.003	0.01%	15.703	52.34%	0.007	0.02%	15.707	52.36%
2	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
3	Inner Tay Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
4	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.008	0.03%	15.708	52.36%
5	Firth of Tay and Eden Estuary	0.002	0.01%	15.702	52.34%	0.005	0.02%	15.705	52.35%
6	Firth of Tay and Eden Estuary	0.005	0.02%	15.705	52.35%	0.010	0.03%	15.710	52.37%
7	Inner Tay Estuary	0.005	0.02%	15.705	52.35%	0.010	0.03%	15.710	52.37%
8	Firth of Tay and Eden Estuary	0.003	0.01%	15.703	52.34%	0.007	0.02%	15.707	52.36%
9	Firth of Tay and Eden Estuary	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
10	Firth of Tay and Eden Estuary	0.003	0.01%	15.703	52.34%	0.005	0.02%	15.705	52.35%
11	Firth of Tay and Eden Estuary	0.006	0.02%	15.706	52.35%	0.013	0.04%	15.713	52.38%
12	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.009	0.03%	15.709	52.36%
13	Firth of Tay and Eden Estuary	0.003	0.01%	15.703	52.34%	0.006	0.02%	15.706	52.35%
14	Gallowhill/Cawmill Woods	0.012	0.04%	15.712	52.37%	0.024	0.08%	15.724	52.41%
15	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.014	0.05%	15.714	52.38%
16	Firth of Tay and Eden Estuary	0.003	0.01%	15.703	52.34%	0.007	0.02%	15.707	52.36%
17	Ancient Woodland	0.010	0.03%	15.710	52.37%	0.019	0.06%	15.719	52.40%
18	Baldrogon Wood	0.017	0.06%	15.717	52.39%	0.034	0.11%	15.734	52.45%

19	Wynton Wood	0.015	0.05%	15.715	52.38%	0.030	0.10%	15.730	52.43%
20	Heathland	0.006	0.02%	15.706	52.35%	0.013	0.04%	15.713	52.38%
21	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.015	0.05%	15.715	52.38%
22	Firth of Tay and Eden Estuary	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
23	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
24	Ancient Woodland	0.023	0.08%	15.723	52.41%	0.045	0.15%	15.745	52.48%
25	Ancient Woodland	0.029	0.10%	15.729	52.43%	0.056	0.19%	15.756	52.52%
26	Balmerino - Wormit Shore	0.004	0.01%	15.704	52.35%	0.008	0.03%	15.708	52.36%
27	Trottick Mill Ponds	0.032	0.11%	15.732	52.44%	0.063	0.21%	15.763	52.54%
28	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.014	0.05%	15.714	52.38%
29	East/West Links Wood	0.005	0.02%	15.705	52.35%	0.010	0.03%	15.710	52.37%
30	North Hill	0.005	0.02%	15.705	52.35%	0.009	0.03%	15.709	52.36%
31	River Tay	0.003	0.01%	15.703	52.34%	0.005	0.02%	15.705	52.35%
32	Woodland	0.033	0.11%	15.733	52.44%	0.064	0.21%	15.764	52.55%
33	Heathland	0.007	0.02%	15.707	52.36%	0.014	0.05%	15.714	52.38%
34	Waterbody	0.021	0.07%	15.721	52.40%	0.041	0.14%	15.741	52.47%
35	Balmuir Wood	0.015	0.05%	15.715	52.38%	0.030	0.10%	15.730	52.43%
36	River Tay	0.003	0.01%	15.703	52.34%	0.005	0.02%	15.705	52.35%
37	Dighty Water	0.045	0.15%	15.745	52.48%	0.089	0.30%	15.789	52.63%
38	Knockhill Wood	0.005	0.02%	15.705	52.35%	0.010	0.03%	15.710	52.37%
39	Ancient Woodland	0.029	0.10%	15.729	52.43%	0.057	0.19%	15.757	52.52%
40	Dighty Water	0.055	0.18%	15.755	52.52%	0.107	0.36%	15.807	52.69%
41	Waterbody	0.035	0.12%	15.735	52.45%	0.069	0.23%	15.769	52.56%
42	Whitehouse Den	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%

43	Firth of Tay and Eden Estuary	0.009	0.03%	15.709	52.36%	0.017	0.06%	15.717	52.39%
44	River Tay	0.003	0.01%	15.703	52.34%	0.006	0.02%	15.706	52.35%
45	Dighty Water	0.052	0.17%	15.752	52.51%	0.102	0.34%	15.802	52.67%
46	Waterbody	0.052	0.17%	15.752	52.51%	0.102	0.34%	15.802	52.67%
47	Morendy Wood	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
48	Corbie Den	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
49	Sheihill Wood	0.015	0.05%	15.715	52.38%	0.029	0.10%	15.729	52.43%
50	Laverock Law	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%
51	Woodland	0.024	0.08%	15.724	52.41%	0.047	0.16%	15.747	52.49%
52	Dighty Water	0.053	0.18%	15.753	52.51%	0.104	0.35%	15.804	52.68%
53	Ancient Woodland	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
54	Roseberry Wood	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%
55	Heathland	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%
56	Craig Law	0.008	0.03%	15.708	52.36%	0.015	0.05%	15.715	52.38%
57	Fithie Burn	0.031	0.10%	15.731	52.44%	0.060	0.20%	15.760	52.53%
58	Woodland	0.029	0.10%	15.729	52.43%	0.057	0.19%	15.757	52.52%
59	River Tay	0.003	0.01%	15.703	52.34%	0.007	0.02%	15.707	52.36%
60	Dighty Water	0.087	0.29%	15.787	52.62%	0.170	0.57%	15.870	52.90%
61	Woodland	0.063	0.21%	15.763	52.54%	0.123	0.41%	15.823	52.74%
62	Woodland	0.030	0.10%	15.730	52.43%	0.058	0.19%	15.758	52.53%
63	Fithie Burn	0.029	0.10%	15.729	52.43%	0.056	0.19%	15.756	52.52%
64	Woodland	0.026	0.09%	15.726	52.42%	0.052	0.17%	15.752	52.51%
65	Corbie Den	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
66	Woodland	0.039	0.13%	15.739	52.46%	0.075	0.25%	15.775	52.58%

67	Corbie Den	0.005	0.02%	15.705	52.35%	0.010	0.03%	15.710	52.37%
68	Pickletillem Marsh	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%
69	Woodland	0.028	0.09%	15.728	52.43%	0.055	0.18%	15.755	52.52%
70	Dighty Water	0.018	0.06%	15.718	52.39%	0.036	0.12%	15.736	52.45%
71	Fithie Burn	0.028	0.09%	15.728	52.43%	0.055	0.18%	15.755	52.52%
72	Firth of Tay and Eden Estuary	0.015	0.05%	15.715	52.38%	0.029	0.10%	15.729	52.43%
73	Woodland	0.024	0.08%	15.724	52.41%	0.047	0.16%	15.747	52.49%
74	East Muirhouse Strip	0.017	0.06%	15.717	52.39%	0.033	0.11%	15.733	52.44%
75	Brighty Wood	0.011	0.04%	15.711	52.37%	0.021	0.07%	15.721	52.40%
76	Woodland	0.045	0.15%	15.745	52.48%	0.089	0.30%	15.789	52.63%
77	Firth of Tay and Eden Estuary	0.009	0.03%	15.709	52.36%	0.017	0.06%	15.717	52.39%
78	Gallowfauld Burn	0.005	0.02%	15.705	52.35%	0.009	0.03%	15.709	52.36%
79	Woodland	0.032	0.11%	15.732	52.44%	0.063	0.21%	15.763	52.54%
80	Waterbody	0.040	0.13%	15.740	52.47%	0.077	0.26%	15.777	52.59%
81	Fithie Burn	0.031	0.10%	15.731	52.44%	0.062	0.21%	15.762	52.54%
82	Duntrune/Glack Hills	0.025	0.08%	15.725	52.42%	0.048	0.16%	15.748	52.49%
83	Dighty Water	0.013	0.04%	15.713	52.38%	0.026	0.09%	15.726	52.42%
84	River Tay	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
85	Woodland	0.008	0.03%	15.708	52.36%	0.016	0.05%	15.716	52.39%
86	Ancient Woodland	0.005	0.02%	15.705	52.35%	0.009	0.03%	15.709	52.36%
87	St Michael's Wood Marshes	0.006	0.02%	15.706	52.35%	0.012	0.04%	15.712	52.37%
88	St Michael's Wood	0.006	0.02%	15.706	52.35%	0.012	0.04%	15.712	52.37%
89	Fithie Burn	0.093	0.31%	15.793	52.64%	0.183	0.61%	15.883	52.94%
90	Gagie Marsh	0.013	0.04%	15.713	52.38%	0.025	0.08%	15.725	52.42%

91	Waterbody	0.049	0.16%	15.749	52.50%	0.097	0.32%	15.797	52.66%
92	Fithie Burn	0.341	1.14%	16.041	53.47%	0.668	2.23%	16.368	54.56%
93	Heathland	0.007	0.02%	15.707	52.36%	0.014	0.05%	15.714	52.38%
94	Woodland	0.039	0.13%	15.739	52.46%	0.076	0.25%	15.776	52.59%
95	Woodland	0.039	0.13%	15.739	52.46%	0.076	0.25%	15.776	52.59%
96	Fithie Burn	0.057	0.19%	15.757	52.52%	0.112	0.37%	15.812	52.71%
97	Fithie Burn	0.038	0.13%	15.738	52.46%	0.074	0.25%	15.774	52.58%
98	Kirkton Wood	0.007	0.02%	15.707	52.36%	0.014	0.05%	15.714	52.38%
99	Big Latch	0.009	0.03%	15.709	52.36%	0.018	0.06%	15.718	52.39%
100	Fithie Burn	0.000	0.00%	15.700	52.33%	0.000	0.00%	15.700	52.33%
101	Woodland	0.124	0.41%	15.824	52.75%	0.242	0.81%	15.942	53.14%
102	Eden Estuary	0.004	0.01%	15.704	52.35%	0.009	0.03%	15.709	52.36%
103	Firth of Tay and Eden Estuary	0.008	0.03%	15.708	52.36%	0.017	0.06%	15.717	52.39%
104	Tayport - Tentsmuir Coast	0.008	0.03%	15.708	52.36%	0.017	0.06%	15.717	52.39%
105	Woodland	0.063	0.21%	15.763	52.54%	0.122	0.41%	15.822	52.74%
106	Dighty Water	0.104	0.35%	15.804	52.68%	0.203	0.68%	15.903	53.01%
107	Woodland	0.148	0.49%	15.848	52.83%	0.289	0.96%	15.989	53.30%
108	Murroes Burn	0.176	0.59%	15.876	52.92%	0.345	1.15%	16.045	53.48%
109	Waterbody	0.204	0.68%	15.904	53.01%	0.399	1.33%	16.099	53.66%
110	Murroes Burn	0.100	0.33%	15.800	52.67%	0.196	0.65%	15.896	52.99%
111	Woodland	0.419	1.40%	16.119	53.73%	0.820	2.73%	16.520	55.07%
112	Murroes Burn	0.423	1.41%	16.123	53.74%	0.827	2.76%	16.527	55.09%
113	Woodland	0.502	1.67%	16.202	54.01%	0.983	3.28%	16.683	55.61%
114	Murroes Burn	0.450	1.50%	16.150	53.83%	0.881	2.94%	16.581	55.27%

115	Kellas Wood	0.016	0.05%	15.716	52.39%	0.031	0.10%	15.731	52.44%
116	Dighty Water	0.187	0.62%	15.887	52.96%	0.366	1.22%	16.066	53.55%
117	Little Latch	0.009	0.03%	15.709	52.36%	0.017	0.06%	15.717	52.39%
118	Waterbody	0.134	0.45%	15.834	52.78%	0.263	0.88%	15.963	53.21%
119	Murroes Burn	0.125	0.42%	15.825	52.75%	0.244	0.81%	15.944	53.15%
120	River Tay	0.004	0.01%	15.704	52.35%	0.008	0.03%	15.708	52.36%
121	Woodland	0.088	0.29%	15.788	52.63%	0.172	0.57%	15.872	52.91%
122	Murroes Burn	0.090	0.30%	15.790	52.63%	0.177	0.59%	15.877	52.92%
123	Murroes Burn	0.052	0.17%	15.752	52.51%	0.101	0.34%	15.801	52.67%
124	Tentsmuir	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%
125	Dighty Water	0.192	0.64%	15.892	52.97%	0.375	1.25%	16.075	53.58%
126	Morton Lochs	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%
127	Woodland	0.152	0.51%	15.852	52.84%	0.297	0.99%	15.997	53.32%
128	Rhynd Wood	0.006	0.02%	15.706	52.35%	0.012	0.04%	15.712	52.37%
129	West Wood	0.009	0.03%	15.709	52.36%	0.017	0.06%	15.717	52.39%
130	Tentsmuir	0.006	0.02%	15.706	52.35%	0.012	0.04%	15.712	52.37%
131	Morton Lochs	0.006	0.02%	15.706	52.35%	0.012	0.04%	15.712	52.37%
132	West Wood	0.009	0.03%	15.709	52.36%	0.017	0.06%	15.717	52.39%
133	Buckler Heads Wood	0.019	0.06%	15.719	52.40%	0.037	0.12%	15.737	52.46%
134	Firth of Tay and Eden Estuary	0.010	0.03%	15.710	52.37%	0.019	0.06%	15.719	52.40%
135	Monifeth Bay	0.010	0.03%	15.710	52.37%	0.019	0.06%	15.719	52.40%
136	Dighty Water	0.187	0.62%	15.887	52.96%	0.367	1.22%	16.067	53.56%
137	Woodside Wood	0.026	0.09%	15.726	52.42%	0.051	0.17%	15.751	52.50%
138	Morton Links	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%

139	Carrot Hill Meadow	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
140	Firth of Tay and Eden Estuary	0.006	0.02%	15.706	52.35%	0.012	0.04%	15.712	52.37%
141	Firth of Tay and Eden Estuary	0.016	0.05%	15.716	52.39%	0.032	0.11%	15.732	52.44%
142	Woodland	0.026	0.09%	15.726	52.42%	0.050	0.17%	15.750	52.50%
143	Tentsmuir	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
144	FID:59 x	0.051	0.17%	15.751	52.50%	0.100	0.33%	15.800	52.67%
145	Broughty Ferry	0.020	0.07%	15.720	52.40%	0.040	0.13%	15.740	52.47%
146	Eden Estuary	0.004	0.01%	15.704	52.35%	0.008	0.03%	15.708	52.36%
147	Woodland	0.168	0.56%	15.868	52.89%	0.328	1.09%	16.028	53.43%
148	Ancient Woodland	0.082	0.27%	15.782	52.61%	0.161	0.54%	15.861	52.87%
149	Broughty Ferry	0.025	0.08%	15.725	52.42%	0.049	0.16%	15.749	52.50%
150	Tentsmuir	0.005	0.02%	15.705	52.35%	0.010	0.03%	15.710	52.37%
151	Firth of Tay and Eden Estuary	0.021	0.07%	15.721	52.40%	0.040	0.13%	15.740	52.47%
152	Monifeth Bay	0.021	0.07%	15.721	52.40%	0.040	0.13%	15.740	52.47%
153	Tentsmuir	0.005	0.02%	15.705	52.35%	0.010	0.03%	15.710	52.37%
154	Tentsmuir	0.006	0.02%	15.706	52.35%	0.012	0.04%	15.712	52.37%
155	Gallow Hill	0.126	0.42%	15.826	52.75%	0.246	0.82%	15.946	53.15%
156	Tentsmuir	0.005	0.02%	15.705	52.35%	0.009	0.03%	15.709	52.36%
157	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.014	0.05%	15.714	52.38%
158	Firth of Tay and Eden Estuary	0.013	0.04%	15.713	52.38%	0.025	0.08%	15.725	52.42%
159	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
160	Firth of Tay and Eden Estuary	0.034	0.11%	15.734	52.45%	0.067	0.22%	15.767	52.56%
161	Monifeth Bay	0.034	0.11%	15.734	52.45%	0.067	0.22%	15.767	52.56%
162	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%

163	Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
164	Firth of Tay and Eden Estuary	0.046	0.15%	15.746	52.49%	0.089	0.30%	15.789	52.63%
165	Laws Hill	0.107	0.36%	15.807	52.69%	0.209	0.70%	15.909	53.03%
166	Tentsmuir	0.008	0.03%	15.708	52.36%	0.017	0.06%	15.717	52.39%
167	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
168	Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
169	Denfind Plantation	0.016	0.05%	15.716	52.39%	0.032	0.11%	15.732	52.44%
170	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
171	Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
172	Firth of Tay and Eden Estuary	0.010	0.03%	15.710	52.37%	0.019	0.06%	15.719	52.40%
173	Firth of Tay and Eden Estuary	0.046	0.15%	15.746	52.49%	0.090	0.30%	15.790	52.63%
174	Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
175	Tentsmuir	0.005	0.02%	15.705	52.35%	0.010	0.03%	15.710	52.37%
176	Firth of Tay and Eden Estuary	0.043	0.14%	15.743	52.48%	0.083	0.28%	15.783	52.61%
177	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.007	0.02%	15.707	52.36%
178	Firth of Tay and Eden Estuary	0.011	0.04%	15.711	52.37%	0.021	0.07%	15.721	52.40%
179	Barry Links	0.047	0.16%	15.747	52.49%	0.091	0.30%	15.791	52.64%
180	Firth of Tay and Eden Estuary	0.003	0.01%	15.703	52.34%	0.006	0.02%	15.706	52.35%
181	Firth of Tay and Eden Estuary	0.004	0.01%	15.704	52.35%	0.008	0.03%	15.708	52.36%
182	Firth of Tay and Eden Estuary	0.006	0.02%	15.706	52.35%	0.011	0.04%	15.711	52.37%
183	Firth of Tay and Eden Estuary	0.029	0.10%	15.729	52.43%	0.057	0.19%	15.757	52.52%
184	Firth of Tay and Eden Estuary	0.008	0.03%	15.708	52.36%	0.016	0.05%	15.716	52.39%
185	Ancient Woodland	0.073	0.24%	15.773	52.58%	0.143	0.48%	15.843	52.81%
186	Firth of Tay and Eden Estuary	0.036	0.12%	15.736	52.45%	0.071	0.24%	15.771	52.57%

187	Firth of Tay and Eden Estuary	0.036	0.12%	15.736	52.45%	0.070	0.23%	15.770	52.57%
188	Weet's/Camustane/+ Woods	0.025	0.08%	15.725	52.42%	0.050	0.17%	15.750	52.50%
189	Firth of Tay and Eden Estuary	0.009	0.03%	15.709	52.36%	0.018	0.06%	15.718	52.39%
190	Firth of Tay and Eden Estuary	0.022	0.07%	15.722	52.41%	0.043	0.14%	15.743	52.48%
191	Firth of Tay and Eden Estuary	0.025	0.08%	15.725	52.42%	0.049	0.16%	15.749	52.50%
192	Firth of Tay and Eden Estuary	0.025	0.08%	15.725	52.42%	0.049	0.16%	15.749	52.50%
193	Tentsmuir	0.011	0.04%	15.711	52.37%	0.022	0.07%	15.722	52.41%
194	Firth of Tay and Eden Estuary	0.008	0.03%	15.708	52.36%	0.015	0.05%	15.715	52.38%
195	Firth of Tay and Eden Estuary	0.020	0.07%	15.720	52.40%	0.038	0.13%	15.738	52.46%
196	Firth of Tay and Eden Estuary	0.019	0.06%	15.719	52.40%	0.038	0.13%	15.738	52.46%
197	Firth of Tay and Eden Estuary	0.018	0.06%	15.718	52.39%	0.035	0.12%	15.735	52.45%
198	Firth of Tay and Eden Estuary	0.017	0.06%	15.717	52.39%	0.034	0.11%	15.734	52.45%
199	Firth of Tay and Eden Estuary	0.023	0.08%	15.723	52.41%	0.045	0.15%	15.745	52.48%
200	Firth of Tay and Eden Estuary	0.031	0.10%	15.731	52.44%	0.061	0.20%	15.761	52.54%
201	Firth of Tay and Eden Estuary	0.015	0.05%	15.715	52.38%	0.030	0.10%	15.730	52.43%
202	Tentsmuir	0.010	0.03%	15.710	52.37%	0.020	0.07%	15.720	52.40%
203	Firth of Tay and Eden Estuary	0.021	0.07%	15.721	52.40%	0.042	0.14%	15.742	52.47%
204	Firth of Tay and Eden Estuary	0.031	0.10%	15.731	52.44%	0.061	0.20%	15.761	52.54%
205	Firth of Tay and Eden Estuary	0.042	0.14%	15.742	52.47%	0.081	0.27%	15.781	52.60%
206	Firth of Tay and Eden Estuary	0.027	0.09%	15.727	52.42%	0.052	0.17%	15.752	52.51%
207	Firth of Tay and Eden Estuary	0.012	0.04%	15.712	52.37%	0.024	0.08%	15.724	52.41%
208	Firth of Tay and Eden Estuary	0.017	0.06%	15.717	52.39%	0.033	0.11%	15.733	52.44%
209	Firth of Tay and Eden Estuary	0.008	0.03%	15.708	52.36%	0.015	0.05%	15.715	52.38%
210	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.014	0.05%	15.714	52.38%

211	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%
212	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.013	0.04%	15.713	52.38%
213	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.015	0.05%	15.715	52.38%
214	Firth of Tay and Eden Estuary	0.007	0.02%	15.707	52.36%	0.014	0.05%	15.714	52.38%
215	Firth of Tay and Eden Estuary	0.006	0.02%	15.706	52.35%	0.012	0.04%	15.712	52.37%
216	Firth of Tay and Eden Estuary	0.006	0.02%	15.706	52.35%	0.013	0.04%	15.713	52.38%

E1.2 Daily mean NO_x concentrations

Table E2: Predicted daily mean NO_x concentrations at sensitive ecological sites, and comparison with the critical level

Ecological Receptor ID	Receptor Location	Existing DERL Facility				Proposed EfW Facility			
		Mod NO_X (PC) (µg/m³)	1% test	Tot NO_X (PEC) (µg/m³)	70% test	Mod NO_X (PC) (µg/m³)	1% test	Tot NO_X (PEC) (µg/m³)	70% test
1	Firth of Tay and Eden Estuary	0.15	0.19%	31.50	42.00%	0.14	0.19%	31.54	42.05%
2	Firth of Tay and Eden Estuary	0.16	0.21%	31.51	42.02%	0.15	0.20%	31.55	42.07%
3	Inner Tay Estuary	0.16	0.21%	31.51	42.02%	0.15	0.20%	31.55	42.07%
4	Firth of Tay and Eden Estuary	0.17	0.23%	31.52	42.03%	0.16	0.21%	31.56	42.08%
5	Firth of Tay and Eden Estuary	0.11	0.14%	31.47	41.97%	0.10	0.13%	31.50	42.00%
6	Firth of Tay and Eden Estuary	0.18	0.23%	31.52	42.03%	0.16	0.22%	31.56	42.08%
7	Inner Tay Estuary	0.18	0.23%	31.52	42.03%	0.16	0.22%	31.56	42.08%
8	Firth of Tay and Eden Estuary	0.16	0.21%	31.51	42.02%	0.14	0.19%	31.54	42.06%
9	Firth of Tay and Eden Estuary	0.23	0.30%	31.56	42.08%	0.21	0.28%	31.61	42.15%
10	Firth of Tay and Eden Estuary	0.14	0.18%	31.50	41.99%	0.13	0.18%	31.53	42.04%
11	Firth of Tay and Eden Estuary	0.25	0.33%	31.57	42.10%	0.24	0.32%	31.64	42.18%
12	Firth of Tay and Eden Estuary	0.22	0.30%	31.56	42.08%	0.20	0.27%	31.60	42.14%
13	Firth of Tay and Eden Estuary	0.18	0.24%	31.52	42.03%	0.17	0.23%	31.57	42.09%
14	Gallowhill/Cawmill Woods	0.42	0.56%	31.69	42.26%	0.42	0.56%	31.82	42.43%
15	Firth of Tay and Eden Estuary	0.28	0.38%	31.60	42.13%	0.26	0.35%	31.66	42.22%
16	Firth of Tay and Eden Estuary	0.18	0.24%	31.53	42.04%	0.17	0.23%	31.57	42.10%
17	Ancient Woodland	0.63	0.84%	31.84	42.45%	0.55	0.73%	31.95	42.60%
18	Baldrogon Wood	0.44	0.59%	31.71	42.28%	0.40	0.53%	31.80	42.40%
19	Wynton Wood	0.32	0.43%	31.63	42.17%	0.31	0.42%	31.71	42.28%

20	Heathland	0.20	0.27%	31.54	42.05%	0.24	0.31%	31.64	42.18%
21	Firth of Tay and Eden Estuary	0.35	0.47%	31.65	42.20%	0.34	0.46%	31.74	42.32%
22	Firth of Tay and Eden Estuary	0.31	0.41%	31.61	42.15%	0.27	0.37%	31.67	42.23%
23	Firth of Tay and Eden Estuary	0.19	0.25%	31.53	42.04%	0.18	0.24%	31.58	42.11%
24	Ancient Woodland	0.49	0.66%	31.75	42.33%	0.42	0.56%	31.82	42.43%
25	Ancient Woodland	0.70	0.93%	31.89	42.52%	0.68	0.90%	32.08	42.77%
26	Balmerino - Wormit Shore	0.16	0.21%	31.51	42.01%	0.14	0.18%	31.54	42.05%
27	Trottick Mill Ponds	0.90	1.20%	32.03	42.70%	0.74	0.98%	32.14	42.85%
28	Firth of Tay and Eden Estuary	0.46	0.61%	31.72	42.30%	0.41	0.55%	31.81	42.42%
29	East/West Links Wood	0.23	0.30%	31.56	42.08%	0.20	0.27%	31.60	42.13%
30	North Hill	0.24	0.31%	31.56	42.09%	0.20	0.27%	31.60	42.13%
31	River Tay	0.10	0.13%	31.47	41.96%	0.07	0.09%	31.47	41.96%
32	Woodland	1.00	1.33%	32.10	42.80%	0.94	1.25%	32.34	43.12%
33	Heathland	0.34	0.46%	31.64	42.19%	0.30	0.40%	31.70	42.26%
34	Waterbody	0.76	1.02%	31.94	42.58%	0.65	0.86%	32.05	42.73%
35	Balmuir Wood	0.56	0.75%	31.79	42.39%	0.48	0.64%	31.88	42.51%
36	River Tay	0.11	0.14%	31.48	41.97%	0.07	0.10%	31.47	41.96%
37	Dighty Water	1.31	1.75%	32.32	43.09%	1.22	1.63%	32.62	43.50%
38	Knockhill Wood	0.28	0.38%	31.60	42.13%	0.25	0.33%	31.65	42.20%
39	Ancient Woodland	1.06	1.41%	32.14	42.86%	0.82	1.10%	32.22	42.96%
40	Dighty Water	1.54	2.06%	32.48	43.31%	1.39	1.85%	32.79	43.72%
41	Waterbody	1.25	1.67%	32.28	43.03%	0.98	1.31%	32.38	43.17%
42	Whitehouse Den	0.24	0.31%	31.57	42.09%	0.18	0.24%	31.58	42.11%
43	Firth of Tay and Eden Estuary	0.50	0.66%	31.75	42.33%	0.53	0.71%	31.93	42.57%

44	River Tay	0.10	0.14%	31.47	41.96%	0.07	0.10%	31.47	41.97%
45	Dighty Water	1.52	2.03%	32.47	43.29%	1.57	2.09%	32.97	43.95%
46	Waterbody	1.28	1.71%	32.30	43.06%	1.00	1.34%	32.40	43.20%
47	Morendy Wood	0.30	0.40%	31.61	42.15%	0.27	0.36%	31.67	42.23%
48	Corbie Den	0.20	0.27%	31.54	42.06%	0.13	0.17%	31.53	42.04%
49	Sheihill Wood	0.55	0.73%	31.78	42.38%	0.47	0.62%	31.87	42.49%
50	Laverock Law	0.31	0.41%	31.62	42.15%	0.29	0.38%	31.69	42.25%
51	Woodland	0.96	1.28%	32.07	42.77%	0.83	1.10%	32.23	42.97%
52	Dighty Water	1.90	2.53%	32.73	43.64%	1.64	2.19%	33.04	44.05%
53	Ancient Woodland	0.20	0.26%	31.54	42.05%	0.13	0.17%	31.53	42.04%
54	Roseberry Wood	0.38	0.51%	31.67	42.22%	0.34	0.46%	31.74	42.33%
55	Heathland	0.22	0.29%	31.55	42.07%	0.16	0.21%	31.56	42.08%
56	Craig Law	0.38	0.50%	31.66	42.22%	0.36	0.48%	31.76	42.34%
57	Fithie Burn	1.47	1.96%	32.43	43.24%	1.22	1.63%	32.62	43.49%
58	Woodland	1.36	1.81%	32.35	43.14%	1.13	1.50%	32.53	43.37%
59	River Tay	0.12	0.15%	31.48	41.97%	0.11	0.14%	31.51	42.01%
60	Dighty Water	3.13	4.18%	33.59	44.79%	2.65	3.53%	34.05	45.40%
61	Woodland	2.33	3.10%	33.03	44.04%	1.90	2.54%	33.30	44.41%
62	Woodland	1.37	1.82%	32.36	43.14%	1.09	1.45%	32.49	43.32%
63	Fithie Burn	1.23	1.64%	32.26	43.01%	0.97	1.30%	32.37	43.17%
64	Woodland	1.02	1.36%	32.12	42.82%	0.81	1.08%	32.21	42.95%
65	Corbie Den	0.20	0.26%	31.54	42.05%	0.18	0.24%	31.58	42.11%
66	Woodland	1.97	2.62%	32.78	43.70%	1.51	2.01%	32.91	43.88%
67	Corbie Den	0.17	0.23%	31.52	42.03%	0.16	0.22%	31.56	42.08%

68	Pickletillem Marsh	0.27	0.36%	31.59	42.12%	0.22	0.30%	31.62	42.16%
69	Woodland	0.96	1.29%	32.08	42.77%	0.74	0.99%	32.14	42.86%
70	Dighty Water	1.68	2.24%	32.58	43.44%	1.53	2.04%	32.93	43.91%
71	Fithie Burn	0.76	1.02%	31.93	42.58%	0.61	0.81%	32.01	42.68%
72	Firth of Tay and Eden Estuary	1.04	1.38%	32.13	42.83%	0.99	1.32%	32.39	43.19%
73	Woodland	0.67	0.90%	31.87	42.49%	0.56	0.74%	31.96	42.61%
74	East Muirhouse Strip	0.62	0.83%	31.84	42.45%	0.52	0.69%	31.92	42.56%
75	Brighty Wood	0.44	0.59%	31.71	42.28%	0.37	0.50%	31.77	42.37%
76	Woodland	1.60	2.14%	32.52	43.36%	1.15	1.53%	32.55	43.40%
77	Firth of Tay and Eden Estuary	0.47	0.63%	31.73	42.31%	0.43	0.58%	31.83	42.45%
78	Gallowfauld Burn	0.16	0.21%	31.51	42.02%	0.15	0.20%	31.55	42.07%
79	Woodland	0.97	1.30%	32.08	42.78%	0.80	1.07%	32.20	42.94%
80	Waterbody	1.25	1.67%	32.28	43.03%	1.00	1.34%	32.40	43.20%
81	Fithie Burn	0.88	1.17%	32.01	42.68%	0.73	0.97%	32.13	42.84%
82	Duntrune/Glack Hills	0.75	1.00%	31.92	42.57%	0.61	0.82%	32.01	42.68%
83	Dighty Water	2.08	2.77%	32.85	43.80%	2.01	2.67%	33.41	44.54%
84	River Tay	0.13	0.17%	31.49	41.99%	0.12	0.16%	31.52	42.03%
85	Woodland	0.40	0.53%	31.68	42.24%	0.35	0.46%	31.75	42.33%
86	Ancient Woodland	0.16	0.21%	31.51	42.01%	0.15	0.19%	31.55	42.06%
87	St Michael's Wood Marshes	0.29	0.39%	31.60	42.14%	0.25	0.33%	31.65	42.20%
88	St Michael's Wood	0.29	0.39%	31.60	42.14%	0.25	0.33%	31.65	42.20%
89	Fithie Burn	3.77	5.02%	34.04	45.38%	2.23	2.97%	33.63	44.84%
90	Gagie Marsh	0.43	0.57%	31.70	42.27%	0.36	0.48%	31.76	42.34%
91	Waterbody	1.89	2.52%	32.72	43.63%	1.30	1.74%	32.70	43.60%

92	Fithie Burn	10.64	14.19%	38.85	51.80%	4.41	5.88%	35.81	47.75%
93	Heathland	0.22	0.30%	31.56	42.07%	0.20	0.27%	31.60	42.14%
94	Woodland	1.36	1.81%	32.35	43.14%	0.93	1.24%	32.33	43.11%
95	Woodland	1.36	1.81%	32.35	43.14%	0.93	1.24%	32.33	43.11%
96	Fithie Burn	2.09	2.78%	32.86	43.81%	1.54	2.06%	32.94	43.92%
97	Fithie Burn	1.29	1.72%	32.30	43.07%	0.90	1.20%	32.30	43.07%
98	Kirkton Wood	0.30	0.40%	31.61	42.15%	0.24	0.32%	31.64	42.19%
99	Big Latch	0.29	0.39%	31.60	42.14%	0.25	0.34%	31.65	42.20%
100	Fithie Burn	0.00	0.00%	31.40	41.87%	0.00	0.00%	31.40	41.87%
101	Woodland	4.05	5.40%	34.24	45.65%	2.19	2.92%	33.59	44.79%
102	Eden Estuary	0.19	0.26%	31.53	42.05%	0.17	0.22%	31.57	42.09%
103	Firth of Tay and Eden Estuary	0.51	0.67%	31.75	42.34%	0.39	0.52%	31.79	42.39%
104	Tayport - Tentsmuir Coast	0.51	0.67%	31.75	42.34%	0.39	0.52%	31.79	42.39%
105	Woodland	1.76	2.35%	32.63	43.51%	1.41	1.89%	32.81	43.75%
106	Dighty Water	2.65	3.53%	33.25	44.34%	2.89	3.85%	34.29	45.72%
107	Woodland	3.73	4.98%	34.01	45.35%	2.59	3.45%	33.99	45.32%
108	Murroes Burn	3.75	5.00%	34.02	45.37%	2.79	3.73%	34.19	45.59%
109	Waterbody	4.14	5.52%	34.30	45.73%	2.89	3.85%	34.29	45.72%
110	Murroes Burn	2.59	3.45%	33.21	44.28%	1.90	2.53%	33.30	44.40%
111	Woodland	5.64	7.52%	35.35	47.13%	4.16	5.55%	35.56	47.42%
112	Murroes Burn	5.46	7.27%	35.22	46.96%	4.03	5.38%	35.43	47.24%
113	Woodland	4.20	5.60%	34.34	45.79%	3.86	5.14%	35.26	47.01%
114	Murroes Burn	3.65	4.87%	33.95	45.27%	3.77	5.03%	35.17	46.90%
115	Kellas Wood	0.35	0.47%	31.65	42.20%	0.30	0.40%	31.70	42.27%

116	Dighty Water	2.61	3.48%	33.23	44.30%	2.47	3.30%	33.87	45.16%
117	Little Latch	0.23	0.31%	31.56	42.08%	0.19	0.26%	31.59	42.12%
118	Waterbody	2.08	2.78%	32.86	43.81%	1.90	2.54%	33.30	44.40%
119	Murroes Burn	1.95	2.60%	32.77	43.69%	1.84	2.45%	33.24	44.32%
120	River Tay	0.11	0.14%	31.47	41.97%	0.10	0.13%	31.50	42.00%
121	Woodland	1.55	2.06%	32.48	43.31%	1.51	2.01%	32.91	43.88%
122	Murroes Burn	1.42	1.89%	32.39	43.19%	1.41	1.88%	32.81	43.75%
123	Murroes Burn	1.15	1.54%	32.21	42.94%	1.02	1.36%	32.42	43.23%
124	Tentsmuir	0.26	0.35%	31.58	42.11%	0.22	0.29%	31.62	42.16%
125	Dighty Water	2.07	2.76%	32.85	43.80%	1.69	2.25%	33.09	44.12%
126	Morton Lochs	0.25	0.33%	31.58	42.10%	0.21	0.28%	31.61	42.15%
127	Woodland	1.82	2.43%	32.67	43.57%	1.75	2.33%	33.15	44.20%
128	Rhynd Wood	0.20	0.27%	31.54	42.06%	0.18	0.24%	31.58	42.10%
129	West Wood	0.24	0.32%	31.57	42.09%	0.20	0.26%	31.60	42.13%
130	Tentsmuir	0.23	0.31%	31.56	42.09%	0.20	0.27%	31.60	42.13%
131	Morton Lochs	0.23	0.30%	31.56	42.08%	0.19	0.26%	31.59	42.13%
132	West Wood	0.23	0.30%	31.56	42.08%	0.19	0.25%	31.59	42.12%
133	Buckler Heads Wood	0.37	0.50%	31.66	42.21%	0.34	0.45%	31.74	42.32%
134	Firth of Tay and Eden Estuary	0.36	0.48%	31.65	42.20%	0.39	0.52%	31.79	42.39%
135	Monifeth Bay	0.36	0.48%	31.65	42.20%	0.39	0.52%	31.79	42.39%
136	Dighty Water	1.40	1.87%	32.38	43.18%	1.47	1.97%	32.87	43.83%
137	Woodside Wood	0.57	0.76%	31.80	42.40%	0.49	0.65%	31.89	42.52%
138	Morton Links	0.22	0.29%	31.55	42.07%	0.18	0.25%	31.58	42.11%
139	Carrot Hill Meadow	0.18	0.24%	31.52	42.03%	0.16	0.21%	31.56	42.08%

140	Firth of Tay and Eden Estuary	0.20	0.27%	31.54	42.06%	0.20	0.26%	31.60	42.13%
141	Firth of Tay and Eden Estuary	0.60	0.81%	31.82	42.43%	0.61	0.81%	32.01	42.68%
142	Woodland	0.59	0.79%	31.82	42.42%	0.60	0.79%	32.00	42.66%
143	Tentsmuir	0.18	0.24%	31.53	42.03%	0.16	0.21%	31.56	42.08%
144	FID:59 x	0.67	0.89%	31.87	42.49%	0.61	0.81%	32.01	42.67%
145	Broughty Ferry	0.62	0.83%	31.84	42.45%	0.59	0.79%	31.99	42.66%
146	Eden Estuary	0.15	0.20%	31.50	42.00%	0.13	0.17%	31.53	42.04%
147	Woodland	1.19	1.59%	32.23	42.98%	1.09	1.45%	32.49	43.32%
148	Ancient Woodland	0.84	1.12%	31.99	42.65%	0.79	1.06%	32.19	42.93%
149	Broughty Ferry	0.54	0.72%	31.78	42.37%	0.55	0.73%	31.95	42.60%
150	Tentsmuir	0.17	0.22%	31.52	42.02%	0.14	0.19%	31.54	42.06%
151	Firth of Tay and Eden Estuary	0.52	0.70%	31.77	42.36%	0.48	0.64%	31.88	42.51%
152	Monifeth Bay	0.52	0.70%	31.77	42.36%	0.48	0.64%	31.88	42.51%
153	Tentsmuir	0.16	0.22%	31.51	42.02%	0.16	0.21%	31.56	42.08%
154	Tentsmuir	0.20	0.27%	31.54	42.06%	0.21	0.28%	31.61	42.14%
155	Gallow Hill	1.17	1.55%	32.22	42.95%	0.91	1.21%	32.31	43.08%
156	Tentsmuir	0.16	0.21%	31.51	42.02%	0.13	0.18%	31.53	42.05%
157	Firth of Tay and Eden Estuary	0.28	0.37%	31.60	42.13%	0.28	0.38%	31.68	42.24%
158	Firth of Tay and Eden Estuary	0.44	0.59%	31.71	42.28%	0.43	0.57%	31.83	42.44%
159	Firth of Tay and Eden Estuary	0.14	0.18%	31.50	41.99%	0.12	0.16%	31.52	42.03%
160	Firth of Tay and Eden Estuary	0.80	1.06%	31.96	42.61%	0.76	1.01%	32.16	42.88%
161	Monifeth Bay	0.80	1.06%	31.96	42.61%	0.76	1.01%	32.16	42.88%
162	Firth of Tay and Eden Estuary	0.14	0.18%	31.50	41.99%	0.12	0.16%	31.52	42.03%
163	Eden Estuary	0.14	0.18%	31.50	41.99%	0.12	0.16%	31.52	42.03%

164	Firth of Tay and Eden Estuary	0.74	0.99%	31.92	42.56%	0.66	0.89%	32.06	42.75%
165	Laws Hill	0.96	1.29%	32.08	42.77%	0.79	1.05%	32.19	42.92%
166	Tentsmuir	0.32	0.43%	31.62	42.17%	0.32	0.42%	31.72	42.29%
167	Firth of Tay and Eden Estuary	0.14	0.19%	31.50	42.00%	0.13	0.17%	31.53	42.03%
168	Eden Estuary	0.14	0.19%	31.50	42.00%	0.13	0.17%	31.53	42.03%
169	Denfind Plantation	0.41	0.55%	31.69	42.25%	0.33	0.44%	31.73	42.31%
170	Firth of Tay and Eden Estuary	0.13	0.17%	31.49	41.99%	0.11	0.15%	31.51	42.01%
171	Eden Estuary	0.13	0.17%	31.49	41.99%	0.11	0.15%	31.51	42.01%
172	Firth of Tay and Eden Estuary	0.33	0.44%	31.63	42.17%	0.32	0.43%	31.72	42.30%
173	Firth of Tay and Eden Estuary	0.61	0.81%	31.83	42.43%	0.58	0.77%	31.98	42.64%
174	Eden Estuary	0.12	0.16%	31.49	41.98%	0.12	0.16%	31.52	42.02%
175	Tentsmuir	0.19	0.26%	31.53	42.05%	0.19	0.26%	31.59	42.12%
176	Firth of Tay and Eden Estuary	0.58	0.77%	31.80	42.41%	0.54	0.72%	31.94	42.59%
177	Firth of Tay and Eden Estuary	0.12	0.16%	31.48	41.98%	0.12	0.16%	31.52	42.02%
178	Firth of Tay and Eden Estuary	0.33	0.44%	31.63	42.18%	0.32	0.43%	31.72	42.29%
179	Barry Links	0.62	0.83%	31.83	42.44%	0.58	0.77%	31.98	42.64%
180	Firth of Tay and Eden Estuary	0.13	0.17%	31.49	41.99%	0.11	0.15%	31.51	42.02%
181	Firth of Tay and Eden Estuary	0.13	0.18%	31.49	41.99%	0.13	0.18%	31.53	42.05%
182	Firth of Tay and Eden Estuary	0.22	0.30%	31.56	42.08%	0.22	0.30%	31.62	42.17%
183	Firth of Tay and Eden Estuary	0.61	0.81%	31.83	42.44%	0.56	0.74%	31.96	42.61%
184	Firth of Tay and Eden Estuary	0.29	0.38%	31.60	42.13%	0.28	0.37%	31.68	42.24%
185	Ancient Woodland	0.54	0.72%	31.78	42.37%	0.51	0.67%	31.91	42.54%
186	Firth of Tay and Eden Estuary	0.50	0.67%	31.75	42.33%	0.45	0.60%	31.85	42.47%
187	Firth of Tay and Eden Estuary	0.50	0.66%	31.75	42.33%	0.45	0.59%	31.85	42.46%

188	Weet's/Camustane/+ Woods	0.39	0.53%	31.68	42.23%	0.35	0.46%	31.75	42.33%
189	Firth of Tay and Eden Estuary	0.27	0.36%	31.59	42.12%	0.26	0.35%	31.66	42.21%
190	Firth of Tay and Eden Estuary	0.50	0.66%	31.75	42.33%	0.45	0.61%	31.85	42.47%
191	Firth of Tay and Eden Estuary	0.43	0.57%	31.70	42.26%	0.38	0.51%	31.78	42.37%
192	Firth of Tay and Eden Estuary	0.42	0.56%	31.70	42.26%	0.38	0.50%	31.78	42.37%
193	Tentsmuir	0.25	0.33%	31.57	42.10%	0.24	0.31%	31.64	42.18%
194	Firth of Tay and Eden Estuary	0.23	0.31%	31.56	42.08%	0.23	0.30%	31.63	42.17%
195	Firth of Tay and Eden Estuary	0.42	0.55%	31.69	42.25%	0.38	0.50%	31.78	42.37%
196	Firth of Tay and Eden Estuary	0.42	0.55%	31.69	42.25%	0.38	0.51%	31.78	42.37%
197	Firth of Tay and Eden Estuary	0.40	0.54%	31.68	42.24%	0.37	0.49%	31.77	42.36%
198	Firth of Tay and Eden Estuary	0.37	0.50%	31.66	42.21%	0.34	0.46%	31.74	42.32%
199	Firth of Tay and Eden Estuary	0.35	0.47%	31.65	42.19%	0.31	0.42%	31.71	42.28%
200	Firth of Tay and Eden Estuary	0.34	0.46%	31.64	42.19%	0.30	0.40%	31.70	42.27%
201	Firth of Tay and Eden Estuary	0.34	0.46%	31.64	42.19%	0.32	0.42%	31.72	42.29%
202	Tentsmuir	0.25	0.33%	31.57	42.10%	0.23	0.31%	31.63	42.18%
203	Firth of Tay and Eden Estuary	0.57	0.75%	31.80	42.39%	0.52	0.70%	31.92	42.56%
204	Firth of Tay and Eden Estuary	0.74	0.99%	31.92	42.56%	0.75	1.00%	32.15	42.86%
205	Firth of Tay and Eden Estuary	0.83	1.10%	31.98	42.64%	0.76	1.01%	32.16	42.88%
206	Firth of Tay and Eden Estuary	0.64	0.85%	31.85	42.46%	0.65	0.86%	32.05	42.73%
207	Firth of Tay and Eden Estuary	0.49	0.66%	31.75	42.33%	0.52	0.69%	31.92	42.56%
208	Firth of Tay and Eden Estuary	0.60	0.80%	31.82	42.42%	0.58	0.78%	31.98	42.65%
209	Firth of Tay and Eden Estuary	0.41	0.55%	31.69	42.25%	0.39	0.52%	31.79	42.38%
210	Firth of Tay and Eden Estuary	0.29	0.39%	31.60	42.14%	0.27	0.36%	31.67	42.23%
211	Firth of Tay and Eden Estuary	0.22	0.29%	31.55	42.07%	0.21	0.28%	31.61	42.15%

212	Firth of Tay and Eden Estuary	0.21	0.28%	31.55	42.07%	0.20	0.27%	31.60	42.14%
213	Firth of Tay and Eden Estuary	0.28	0.37%	31.59	42.13%	0.29	0.38%	31.69	42.25%
214	Firth of Tay and Eden Estuary	0.30	0.40%	31.61	42.15%	0.28	0.37%	31.68	42.24%
215	Firth of Tay and Eden Estuary	0.20	0.26%	31.54	42.05%	0.19	0.25%	31.59	42.12%
216	Firth of Tay and Eden Estuary	0.23	0.31%	31.56	42.08%	0.21	0.28%	31.61	42.15%

E1.3 Annual mean SO_2 Concentrations

Table E3: Predicted annual mean SO_2 concentrations at sensitive ecological sites, and comparison with the critical level

Ecological receptor ID	Receptor location	Existing DERL Facility				Proposed EfW Facility			
		Mod SO_2 (PC) (µg/m^3)	1% test	Tot SO_2 (PEC) (µg/m^3)	70% test	Mod SO_2 (PC) (µg/m^3)	1% test	Tot SO_2 (PEC) (µg/m^3)	70% test
1	Firth of Tay and Eden Estuary	0.0004	0.004%	1.5004	15.00%	0.0017	0.017%	1.5017	15.02%
2	Firth of Tay and Eden Estuary	0.0005	0.005%	1.5005	15.00%	0.0019	0.019%	1.5019	15.02%
3	Inner Tay Estuary	0.0005	0.005%	1.5005	15.00%	0.0019	0.019%	1.5019	15.02%
4	Firth of Tay and Eden Estuary	0.0005	0.005%	1.5005	15.01%	0.0021	0.021%	1.5021	15.02%
5	Firth of Tay and Eden Estuary	0.0003	0.003%	1.5003	15.00%	0.0011	0.011%	1.5011	15.01%
6	Firth of Tay and Eden Estuary	0.0006	0.006%	1.5006	15.01%	0.0024	0.024%	1.5024	15.02%
7	Inner Tay Estuary	0.0006	0.006%	1.5006	15.01%	0.0024	0.024%	1.5024	15.02%
8	Firth of Tay and Eden Estuary	0.0004	0.004%	1.5004	15.00%	0.0016	0.016%	1.5016	15.02%
9	Firth of Tay and Eden Estuary	0.0007	0.007%	1.5007	15.01%	0.0028	0.028%	1.5028	15.03%
10	Firth of Tay and Eden Estuary	0.0003	0.003%	1.5003	15.00%	0.0013	0.013%	1.5013	15.01%
11	Firth of Tay and Eden Estuary	0.0008	0.008%	1.5008	15.01%	0.0031	0.031%	1.5031	15.03%
12	Firth of Tay and Eden Estuary	0.0005	0.005%	1.5005	15.01%	0.0021	0.021%	1.5021	15.02%
13	Firth of Tay and Eden Estuary	0.0004	0.004%	1.5004	15.00%	0.0016	0.016%	1.5016	15.02%
14	Gallowhill/Cawmill Woods	0.0015	0.015%	1.5015	15.02%	0.0061	0.061%	1.5061	15.06%
15	Firth of Tay and Eden Estuary	0.0009	0.009%	1.5009	15.01%	0.0035	0.035%	1.5035	15.03%
16	Firth of Tay and Eden Estuary	0.0004	0.004%	1.5004	15.00%	0.0016	0.016%	1.5016	15.02%
17	Ancient Woodland	0.0012	0.012%	1.5012	15.01%	0.0047	0.047%	1.5047	15.05%
18	Baldrogon Wood	0.0021	0.021%	1.5021	15.02%	0.0085	0.085%	1.5085	15.09%

19	Wynton Wood	0.0019	0.019%	1.5019	15.02%	0.0075	0.075%	1.5075	15.07%
20	Heathland	0.0008	0.008%	1.5008	15.01%	0.0031	0.031%	1.5031	15.03%
21	Firth of Tay and Eden Estuary	0.0009	0.009%	1.5009	15.01%	0.0036	0.036%	1.5036	15.04%
22	Firth of Tay and Eden Estuary	0.0007	0.007%	1.5007	15.01%	0.0028	0.028%	1.5028	15.03%
23	Firth of Tay and Eden Estuary	0.0005	0.005%	1.5005	15.00%	0.0019	0.019%	1.5019	15.02%
24	Ancient Woodland	0.0028	0.028%	1.5028	15.03%	0.0113	0.113%	1.5113	15.11%
25	Ancient Woodland	0.0035	0.035%	1.5035	15.04%	0.0140	0.140%	1.5140	15.14%
26	Balmerino - Wormit Shore	0.0005	0.005%	1.5005	15.00%	0.0020	0.020%	1.5020	15.02%
27	Trottick Mill Ponds	0.0039	0.039%	1.5039	15.04%	0.0157	0.157%	1.5157	15.16%
28	Firth of Tay and Eden Estuary	0.0009	0.009%	1.5009	15.01%	0.0035	0.035%	1.5035	15.04%
29	East/West Links Wood	0.0006	0.006%	1.5006	15.01%	0.0024	0.024%	1.5024	15.02%
30	North Hill	0.0006	0.006%	1.5006	15.01%	0.0022	0.022%	1.5022	15.02%
31	River Tay	0.0003	0.003%	1.5003	15.00%	0.0013	0.013%	1.5013	15.01%
32	Woodland	0.0040	0.040%	1.5040	15.04%	0.0160	0.160%	1.5160	15.16%
33	Heathland	0.0009	0.009%	1.5009	15.01%	0.0036	0.036%	1.5036	15.04%
34	Waterbody	0.0025	0.025%	1.5025	15.03%	0.0102	0.102%	1.5102	15.10%
35	Balmuir Wood	0.0019	0.019%	1.5019	15.02%	0.0075	0.075%	1.5075	15.08%
36	River Tay	0.0003	0.003%	1.5003	15.00%	0.0013	0.013%	1.5013	15.01%
37	Dighty Water	0.0055	0.055%	1.5055	15.06%	0.0222	0.222%	1.5222	15.22%
38	Knockhill Wood	0.0007	0.007%	1.5007	15.01%	0.0026	0.026%	1.5026	15.03%
39	Ancient Woodland	0.0036	0.036%	1.5036	15.04%	0.0142	0.142%	1.5142	15.14%
40	Dighty Water	0.0067	0.067%	1.5067	15.07%	0.0268	0.268%	1.5268	15.27%
41	Waterbody	0.0043	0.043%	1.5043	15.04%	0.0174	0.174%	1.5174	15.17%
42	Whitehouse Den	0.0008	0.008%	1.5008	15.01%	0.0033	0.033%	1.5033	15.03%

43	Firth of Tay and Eden Estuary	0.0011	0.011%	1.5011	15.01%	0.0043	0.043%	1.5043	15.04%
44	River Tay	0.0004	0.004%	1.5004	15.00%	0.0015	0.015%	1.5015	15.01%
45	Dighty Water	0.0063	0.063%	1.5063	15.06%	0.0254	0.254%	1.5254	15.25%
46	Waterbody	0.0064	0.064%	1.5064	15.06%	0.0254	0.254%	1.5254	15.25%
47	Morendy Wood	0.0007	0.007%	1.5007	15.01%	0.0028	0.028%	1.5028	15.03%
48	Corbie Den	0.0007	0.007%	1.5007	15.01%	0.0028	0.028%	1.5028	15.03%
49	Sheihill Wood	0.0018	0.018%	1.5018	15.02%	0.0072	0.072%	1.5072	15.07%
50	Laverock Law	0.0008	0.008%	1.5008	15.01%	0.0032	0.032%	1.5032	15.03%
51	Woodland	0.0029	0.029%	1.5029	15.03%	0.0116	0.116%	1.5116	15.12%
52	Dighty Water	0.0065	0.065%	1.5065	15.07%	0.0261	0.261%	1.5261	15.26%
53	Ancient Woodland	0.0007	0.007%	1.5007	15.01%	0.0028	0.028%	1.5028	15.03%
54	Roseberry Wood	0.0008	0.008%	1.5008	15.01%	0.0033	0.033%	1.5033	15.03%
55	Heathland	0.0008	0.008%	1.5008	15.01%	0.0033	0.033%	1.5033	15.03%
56	Craig Law	0.0009	0.009%	1.5009	15.01%	0.0037	0.037%	1.5037	15.04%
57	Fithie Burn	0.0038	0.038%	1.5038	15.04%	0.0151	0.151%	1.5151	15.15%
58	Woodland	0.0035	0.035%	1.5035	15.04%	0.0142	0.142%	1.5142	15.14%
59	River Tay	0.0004	0.004%	1.5004	15.00%	0.0016	0.016%	1.5016	15.02%
60	Dighty Water	0.0106	0.106%	1.5106	15.11%	0.0426	0.426%	1.5426	15.43%
61	Woodland	0.0077	0.077%	1.5077	15.08%	0.0307	0.307%	1.5307	15.31%
62	Woodland	0.0036	0.036%	1.5036	15.04%	0.0146	0.146%	1.5146	15.15%
63	Fithie Burn	0.0035	0.035%	1.5035	15.03%	0.0140	0.140%	1.5140	15.14%
64	Woodland	0.0032	0.032%	1.5032	15.03%	0.0129	0.129%	1.5129	15.13%
65	Corbie Den	0.0007	0.007%	1.5007	15.01%	0.0028	0.028%	1.5028	15.03%
66	Woodland	0.0047	0.047%	1.5047	15.05%	0.0188	0.188%	1.5188	15.19%

67	Corbie Den	0.0006	0.006%	1.5006	15.01%	0.0024	0.024%	1.5024	15.02%
68	Pickletillem Marsh	0.0008	0.008%	1.5008	15.01%	0.0033	0.033%	1.5033	15.03%
69	Woodland	0.0034	0.034%	1.5034	15.03%	0.0137	0.137%	1.5137	15.14%
70	Dighty Water	0.0022	0.022%	1.5022	15.02%	0.0090	0.090%	1.5090	15.09%
71	Fithie Burn	0.0034	0.034%	1.5034	15.03%	0.0137	0.137%	1.5137	15.14%
72	Firth of Tay and Eden Estuary	0.0018	0.018%	1.5018	15.02%	0.0074	0.074%	1.5074	15.07%
73	Woodland	0.0029	0.029%	1.5029	15.03%	0.0118	0.118%	1.5118	15.12%
74	East Muirhouse Strip	0.0020	0.020%	1.5020	15.02%	0.0082	0.082%	1.5082	15.08%
75	Brighty Wood	0.0013	0.013%	1.5013	15.01%	0.0053	0.053%	1.5053	15.05%
76	Woodland	0.0055	0.055%	1.5055	15.06%	0.0222	0.222%	1.5222	15.22%
77	Firth of Tay and Eden Estuary	0.0011	0.011%	1.5011	15.01%	0.0043	0.043%	1.5043	15.04%
78	Gallowfauld Burn	0.0006	0.006%	1.5006	15.01%	0.0023	0.023%	1.5023	15.02%
79	Woodland	0.0039	0.039%	1.5039	15.04%	0.0157	0.157%	1.5157	15.16%
80	Waterbody	0.0048	0.048%	1.5048	15.05%	0.0193	0.193%	1.5193	15.19%
81	Fithie Burn	0.0038	0.038%	1.5038	15.04%	0.0154	0.154%	1.5154	15.15%
82	Duntrune/Glack Hills	0.0030	0.030%	1.5030	15.03%	0.0121	0.121%	1.5121	15.12%
83	Dighty Water	0.0016	0.016%	1.5016	15.02%	0.0065	0.065%	1.5065	15.06%
84	River Tay	0.0005	0.005%	1.5005	15.00%	0.0019	0.019%	1.5019	15.02%
85	Woodland	0.0010	0.010%	1.5010	15.01%	0.0039	0.039%	1.5039	15.04%
86	Ancient Woodland	0.0006	0.006%	1.5006	15.01%	0.0023	0.023%	1.5023	15.02%
87	St Michael's Wood Marshes	0.0008	0.008%	1.5008	15.01%	0.0031	0.031%	1.5031	15.03%
88	St Michael's Wood	0.0008	0.008%	1.5008	15.01%	0.0031	0.031%	1.5031	15.03%
89	Fithie Burn	0.0114	0.114%	1.5114	15.11%	0.0457	0.457%	1.5457	15.46%
90	Gagie Marsh	0.0015	0.015%	1.5015	15.02%	0.0062	0.062%	1.5062	15.06%

91	Waterbody	0.0060	0.060%	1.5060	15.06%	0.0241	0.241%	1.5241	15.24%
92	Fithie Burn	0.0417	0.417%	1.5417	15.42%	0.1671	1.671%	1.6671	16.67%
93	Heathland	0.0009	0.009%	1.5009	15.01%	0.0034	0.034%	1.5034	15.03%
94	Woodland	0.0047	0.047%	1.5047	15.05%	0.0190	0.190%	1.5190	15.19%
95	Woodland	0.0047	0.047%	1.5047	15.05%	0.0190	0.190%	1.5190	15.19%
96	Fithie Burn	0.0070	0.070%	1.5070	15.07%	0.0281	0.281%	1.5281	15.28%
97	Fithie Burn	0.0046	0.046%	1.5046	15.05%	0.0186	0.186%	1.5186	15.19%
98	Kirkton Wood	0.0009	0.009%	1.5009	15.01%	0.0036	0.036%	1.5036	15.04%
99	Big Latch	0.0011	0.011%	1.5011	15.01%	0.0045	0.045%	1.5045	15.04%
100	Fithie Burn	0.0000	0.000%	1.5000	15.00%	0.0000	0.000%	1.5000	15.00%
101	Woodland	0.0151	0.151%	1.5151	15.15%	0.0605	0.605%	1.5605	15.61%
102	Eden Estuary	0.0005	0.005%	1.5005	15.01%	0.0022	0.022%	1.5022	15.02%
103	Firth of Tay and Eden Estuary	0.0010	0.010%	1.5010	15.01%	0.0042	0.042%	1.5042	15.04%
104	Tayport - Tentsmuir Coast	0.0010	0.010%	1.5010	15.01%	0.0042	0.042%	1.5042	15.04%
105	Woodland	0.0076	0.076%	1.5076	15.08%	0.0306	0.306%	1.5306	15.31%
106	Dighty Water	0.0127	0.127%	1.5127	15.13%	0.0507	0.507%	1.5507	15.51%
107	Woodland	0.0180	0.180%	1.5180	15.18%	0.0722	0.722%	1.5722	15.72%
108	Murroes Burn	0.0215	0.215%	1.5215	15.22%	0.0861	0.861%	1.5861	15.86%
109	Waterbody	0.0249	0.249%	1.5249	15.25%	0.0997	0.997%	1.5997	16.00%
110	Murroes Burn	0.0122	0.122%	1.5122	15.12%	0.0490	0.490%	1.5490	15.49%
111	Woodland	0.0512	0.512%	1.5512	15.51%	0.2051	2.051%	1.7051	17.05%
112	Murroes Burn	0.0516	0.516%	1.5516	15.52%	0.2068	2.068%	1.7068	17.07%
113	Woodland	0.0614	0.614%	1.5614	15.61%	0.2458	2.458%	1.7458	17.46%
114	Murroes Burn	0.0550	0.550%	1.5550	15.55%	0.2202	2.202%	1.7202	17.20%

115	Kellas Wood	0.0019	0.019%	1.5019	15.02%	0.0078	0.078%	1.5078	15.08%
116	Dighty Water	0.0228	0.228%	1.5228	15.23%	0.0914	0.914%	1.5914	15.91%
117	Little Latch	0.0011	0.011%	1.5011	15.01%	0.0044	0.044%	1.5044	15.04%
118	Waterbody	0.0164	0.164%	1.5164	15.16%	0.0657	0.657%	1.5657	15.66%
119	Murroes Burn	0.0152	0.152%	1.5152	15.15%	0.0611	0.611%	1.5611	15.61%
120	River Tay	0.0005	0.005%	1.5005	15.01%	0.0021	0.021%	1.5021	15.02%
121	Woodland	0.0107	0.107%	1.5107	15.11%	0.0430	0.430%	1.5430	15.43%
122	Murroes Burn	0.0110	0.110%	1.5110	15.11%	0.0442	0.442%	1.5442	15.44%
123	Murroes Burn	0.0063	0.063%	1.5063	15.06%	0.0252	0.252%	1.5252	15.25%
124	Tentsmuir	0.0008	0.008%	1.5008	15.01%	0.0033	0.033%	1.5033	15.03%
125	Dighty Water	0.0234	0.234%	1.5234	15.23%	0.0938	0.938%	1.5938	15.94%
126	Morton Lochs	0.0008	0.008%	1.5008	15.01%	0.0032	0.032%	1.5032	15.03%
127	Woodland	0.0185	0.185%	1.5185	15.19%	0.0743	0.743%	1.5743	15.74%
128	Rhynd Wood	0.0007	0.007%	1.5007	15.01%	0.0029	0.029%	1.5029	15.03%
129	West Wood	0.0010	0.010%	1.5010	15.01%	0.0042	0.042%	1.5042	15.04%
130	Tentsmuir	0.0008	0.008%	1.5008	15.01%	0.0031	0.031%	1.5031	15.03%
131	Morton Lochs	0.0008	0.008%	1.5008	15.01%	0.0031	0.031%	1.5031	15.03%
132	West Wood	0.0011	0.011%	1.5011	15.01%	0.0044	0.044%	1.5044	15.04%
133	Buckler Heads Wood	0.0023	0.023%	1.5023	15.02%	0.0093	0.093%	1.5093	15.09%
134	Firth of Tay and Eden Estuary	0.0012	0.012%	1.5012	15.01%	0.0048	0.048%	1.5048	15.05%
135	Monifeth Bay	0.0012	0.012%	1.5012	15.01%	0.0048	0.048%	1.5048	15.05%
136	Dighty Water	0.0229	0.229%	1.5229	15.23%	0.0917	0.917%	1.5917	15.92%
137	Woodside Wood	0.0032	0.032%	1.5032	15.03%	0.0127	0.127%	1.5127	15.13%
138	Morton Links	0.0007	0.007%	1.5007	15.01%	0.0028	0.028%	1.5028	15.03%

139	Carrot Hill Meadow	0.0007	0.007%	1.5007	15.01%	0.0027	0.027%	1.5027	15.03%
140	Firth of Tay and Eden Estuary	0.0008	0.008%	1.5008	15.01%	0.0031	0.031%	1.5031	15.03%
141	Firth of Tay and Eden Estuary	0.0020	0.020%	1.5020	15.02%	0.0079	0.079%	1.5079	15.08%
142	Woodland	0.0031	0.031%	1.5031	15.03%	0.0125	0.125%	1.5125	15.12%
143	Tentsmuir	0.0007	0.007%	1.5007	15.01%	0.0028	0.028%	1.5028	15.03%
144	FID:59 x	0.0062	0.062%	1.5062	15.06%	0.0250	0.250%	1.5250	15.25%
145	Broughty Ferry	0.0025	0.025%	1.5025	15.02%	0.0099	0.099%	1.5099	15.10%
146	Eden Estuary	0.0005	0.005%	1.5005	15.01%	0.0021	0.021%	1.5021	15.02%
147	Woodland	0.0205	0.205%	1.5205	15.20%	0.0819	0.819%	1.5819	15.82%
148	Ancient Woodland	0.0100	0.100%	1.5100	15.10%	0.0402	0.402%	1.5402	15.40%
149	Broughty Ferry	0.0031	0.031%	1.5031	15.03%	0.0122	0.122%	1.5122	15.12%
150	Tentsmuir	0.0006	0.006%	1.5006	15.01%	0.0025	0.025%	1.5025	15.02%
151	Firth of Tay and Eden Estuary	0.0025	0.025%	1.5025	15.03%	0.0101	0.101%	1.5101	15.10%
152	Monifeth Bay	0.0025	0.025%	1.5025	15.03%	0.0101	0.101%	1.5101	15.10%
153	Tentsmuir	0.0006	0.006%	1.5006	15.01%	0.0025	0.025%	1.5025	15.02%
154	Tentsmuir	0.0007	0.007%	1.5007	15.01%	0.0029	0.029%	1.5029	15.03%
155	Gallow Hill	0.0154	0.154%	1.5154	15.15%	0.0615	0.615%	1.5615	15.62%
156	Tentsmuir	0.0006	0.006%	1.5006	15.01%	0.0022	0.022%	1.5022	15.02%
157	Firth of Tay and Eden Estuary	0.0009	0.009%	1.5009	15.01%	0.0035	0.035%	1.5035	15.04%
158	Firth of Tay and Eden Estuary	0.0016	0.016%	1.5016	15.02%	0.0063	0.063%	1.5063	15.06%
159	Firth of Tay and Eden Estuary	0.0004	0.004%	1.5004	15.00%	0.0018	0.018%	1.5018	15.02%
160	Firth of Tay and Eden Estuary	0.0042	0.042%	1.5042	15.04%	0.0169	0.169%	1.5169	15.17%
161	Monifeth Bay	0.0042	0.042%	1.5042	15.04%	0.0169	0.169%	1.5169	15.17%
162	Firth of Tay and Eden Estuary	0.0005	0.005%	1.5005	15.00%	0.0019	0.019%	1.5019	15.02%

163	Eden Estuary	0.0005	0.005%	1.5005	15.00%	0.0019	0.019%	1.5019	15.02%
164	Firth of Tay and Eden Estuary	0.0056	0.056%	1.5056	15.06%	0.0223	0.223%	1.5223	15.22%
165	Laws Hill	0.0130	0.130%	1.5130	15.13%	0.0522	0.522%	1.5522	15.52%
166	Tentsmuir	0.0010	0.010%	1.5010	15.01%	0.0041	0.041%	1.5041	15.04%
167	Firth of Tay and Eden Estuary	0.0005	0.005%	1.5005	15.00%	0.0018	0.018%	1.5018	15.02%
168	Eden Estuary	0.0005	0.005%	1.5005	15.00%	0.0018	0.018%	1.5018	15.02%
169	Denfind Plantation	0.0020	0.020%	1.5020	15.02%	0.0080	0.080%	1.5080	15.08%
170	Firth of Tay and Eden Estuary	0.0004	0.004%	1.5004	15.00%	0.0018	0.018%	1.5018	15.02%
171	Eden Estuary	0.0004	0.004%	1.5004	15.00%	0.0018	0.018%	1.5018	15.02%
172	Firth of Tay and Eden Estuary	0.0012	0.012%	1.5012	15.01%	0.0048	0.048%	1.5048	15.05%
173	Firth of Tay and Eden Estuary	0.0056	0.056%	1.5056	15.06%	0.0225	0.225%	1.5225	15.23%
174	Eden Estuary	0.0005	0.005%	1.5005	15.00%	0.0019	0.019%	1.5019	15.02%
175	Tentsmuir	0.0006	0.006%	1.5006	15.01%	0.0026	0.026%	1.5026	15.03%
176	Firth of Tay and Eden Estuary	0.0052	0.052%	1.5052	15.05%	0.0208	0.208%	1.5208	15.21%
177	Firth of Tay and Eden Estuary	0.0005	0.005%	1.5005	15.00%	0.0019	0.019%	1.5019	15.02%
178	Firth of Tay and Eden Estuary	0.0013	0.013%	1.5013	15.01%	0.0052	0.052%	1.5052	15.05%
179	Barry Links	0.0057	0.057%	1.5057	15.06%	0.0228	0.228%	1.5228	15.23%
180	Firth of Tay and Eden Estuary	0.0004	0.004%	1.5004	15.00%	0.0016	0.016%	1.5016	15.02%
181	Firth of Tay and Eden Estuary	0.0005	0.005%	1.5005	15.01%	0.0021	0.021%	1.5021	15.02%
182	Firth of Tay and Eden Estuary	0.0007	0.007%	1.5007	15.01%	0.0029	0.029%	1.5029	15.03%
183	Firth of Tay and Eden Estuary	0.0036	0.036%	1.5036	15.04%	0.0143	0.143%	1.5143	15.14%
184	Firth of Tay and Eden Estuary	0.0010	0.010%	1.5010	15.01%	0.0041	0.041%	1.5041	15.04%
185	Ancient Woodland	0.0090	0.090%	1.5090	15.09%	0.0359	0.359%	1.5359	15.36%
186	Firth of Tay and Eden Estuary	0.0044	0.044%	1.5044	15.04%	0.0177	0.177%	1.5177	15.18%

187	Firth of Tay and Eden Estuary	0.0044	0.044%	1.5044	15.04%	0.0175	0.175%	1.5175	15.18%
188	Weet's/Camustane/+ Woods	0.0031	0.031%	1.5031	15.03%	0.0125	0.125%	1.5125	15.12%
189	Firth of Tay and Eden Estuary	0.0011	0.011%	1.5011	15.01%	0.0044	0.044%	1.5044	15.04%
190	Firth of Tay and Eden Estuary	0.0027	0.027%	1.5027	15.03%	0.0108	0.108%	1.5108	15.11%
191	Firth of Tay and Eden Estuary	0.0031	0.031%	1.5031	15.03%	0.0123	0.123%	1.5123	15.12%
192	Firth of Tay and Eden Estuary	0.0031	0.031%	1.5031	15.03%	0.0124	0.124%	1.5124	15.12%
193	Tentsmuir	0.0013	0.013%	1.5013	15.01%	0.0054	0.054%	1.5054	15.05%
194	Firth of Tay and Eden Estuary	0.0009	0.009%	1.5009	15.01%	0.0038	0.038%	1.5038	15.04%
195	Firth of Tay and Eden Estuary	0.0024	0.024%	1.5024	15.02%	0.0096	0.096%	1.5096	15.10%
196	Firth of Tay and Eden Estuary	0.0024	0.024%	1.5024	15.02%	0.0095	0.095%	1.5095	15.10%
197	Firth of Tay and Eden Estuary	0.0022	0.022%	1.5022	15.02%	0.0088	0.088%	1.5088	15.09%
198	Firth of Tay and Eden Estuary	0.0021	0.021%	1.5021	15.02%	0.0085	0.085%	1.5085	15.08%
199	Firth of Tay and Eden Estuary	0.0028	0.028%	1.5028	15.03%	0.0113	0.113%	1.5113	15.11%
200	Firth of Tay and Eden Estuary	0.0038	0.038%	1.5038	15.04%	0.0152	0.152%	1.5152	15.15%
201	Firth of Tay and Eden Estuary	0.0019	0.019%	1.5019	15.02%	0.0074	0.074%	1.5074	15.07%
202	Tentsmuir	0.0012	0.012%	1.5012	15.01%	0.0049	0.049%	1.5049	15.05%
203	Firth of Tay and Eden Estuary	0.0026	0.026%	1.5026	15.03%	0.0104	0.104%	1.5104	15.10%
204	Firth of Tay and Eden Estuary	0.0038	0.038%	1.5038	15.04%	0.0153	0.153%	1.5153	15.15%
205	Firth of Tay and Eden Estuary	0.0051	0.051%	1.5051	15.05%	0.0204	0.204%	1.5204	15.20%
206	Firth of Tay and Eden Estuary	0.0033	0.033%	1.5033	15.03%	0.0131	0.131%	1.5131	15.13%
207	Firth of Tay and Eden Estuary	0.0015	0.015%	1.5015	15.01%	0.0060	0.060%	1.5060	15.06%
208	Firth of Tay and Eden Estuary	0.0021	0.021%	1.5021	15.02%	0.0083	0.083%	1.5083	15.08%
209	Firth of Tay and Eden Estuary	0.0010	0.010%	1.5010	15.01%	0.0038	0.038%	1.5038	15.04%
210	Firth of Tay and Eden Estuary	0.0009	0.009%	1.5009	15.01%	0.0035	0.035%	1.5035	15.03%

211	Firth of Tay and Eden Estuary	0.0008	0.008%	1.5008	15.01%	0.0033	0.033%	1.5033	15.03%
212	Firth of Tay and Eden Estuary	0.0008	0.008%	1.5008	15.01%	0.0033	0.033%	1.5033	15.03%
213	Firth of Tay and Eden Estuary	0.0009	0.009%	1.5009	15.01%	0.0036	0.036%	1.5036	15.04%
214	Firth of Tay and Eden Estuary	0.0009	0.009%	1.5009	15.01%	0.0034	0.034%	1.5034	15.03%
215	Firth of Tay and Eden Estuary	0.0008	0.008%	1.5008	15.01%	0.0030	0.030%	1.5030	15.03%
216	Firth of Tay and Eden Estuary	0.0008	0.008%	1.5008	15.01%	0.0032	0.032%	1.5032	15.03%

E1.4 Annual mean NH_3 concentrations

Table E4: Predicted annual mean NH_3 concentrations at sensitive ecological sites, and comparison with the critical level

Ecological receptor ID	Receptor location	Existing DERL Facility				Proposed EfW Facility			
		Mod NH_3 (PC) (µg/m^3)	1% test	Tot NH_3 (PEC) (µg/m^3)	70% test	Mod NH_3 (PC) (µg/m^3)	1% test	Tot NH_3 (PEC) (µg/m^3)	70% test
1	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00017	0.017%	1.20017	120.02%
2	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00019	0.019%	1.20019	120.02%
3	Inner Tay Estuary	0.00001	0.001%	1.20001	120.00%	0.00019	0.019%	1.20019	120.02%
4	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00021	0.021%	1.20021	120.02%
5	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00011	0.011%	1.20011	120.01%
6	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00024	0.024%	1.20024	120.02%
7	Inner Tay Estuary	0.00002	0.002%	1.20002	120.00%	0.00024	0.024%	1.20024	120.02%
8	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00016	0.016%	1.20016	120.02%
9	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00028	0.028%	1.20028	120.03%
10	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00013	0.013%	1.20013	120.01%
11	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00031	0.031%	1.20031	120.03%
12	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00021	0.021%	1.20021	120.02%
13	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00016	0.016%	1.20016	120.02%
14	Gallowhill/Cawmill Woods	0.00005	0.005%	1.20005	120.00%	0.00061	0.061%	1.20061	120.06%
15	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00035	0.035%	1.20035	120.03%
16	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00016	0.016%	1.20016	120.02%
17	Ancient Woodland	0.00004	0.004%	1.20004	120.00%	0.00047	0.047%	1.20047	120.05%
18	Baldrogon Wood	0.00007	0.007%	1.20007	120.01%	0.00085	0.085%	1.20085	120.09%

19	Wynton Wood	0.00006	0.006%	1.20006	120.01%	0.00075	0.075%	1.20075	120.07%
20	Heathland	0.00003	0.003%	1.20003	120.00%	0.00031	0.031%	1.20031	120.03%
21	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00036	0.036%	1.20036	120.04%
22	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00028	0.028%	1.20028	120.03%
23	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00019	0.019%	1.20019	120.02%
24	Ancient Woodland	0.00009	0.009%	1.20009	120.01%	0.00113	0.113%	1.20113	120.11%
25	Ancient Woodland	0.00011	0.011%	1.20011	120.01%	0.00140	0.140%	1.20140	120.14%
26	Balmerino - Wormit Shore	0.00002	0.002%	1.20002	120.00%	0.00020	0.020%	1.20020	120.02%
27	Trottick Mill Ponds	0.00013	0.013%	1.20013	120.01%	0.00157	0.157%	1.20157	120.16%
28	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00035	0.035%	1.20035	120.04%
29	East/West Links Wood	0.00002	0.002%	1.20002	120.00%	0.00024	0.024%	1.20024	120.02%
30	North Hill	0.00002	0.002%	1.20002	120.00%	0.00022	0.022%	1.20022	120.02%
31	River Tay	0.00001	0.001%	1.20001	120.00%	0.00013	0.013%	1.20013	120.01%
32	Woodland	0.00013	0.013%	1.20013	120.01%	0.00160	0.160%	1.20160	120.16%
33	Heathland	0.00003	0.003%	1.20003	120.00%	0.00036	0.036%	1.20036	120.04%
34	Waterbody	0.00008	0.008%	1.20008	120.01%	0.00102	0.102%	1.20102	120.10%
35	Balmuir Wood	0.00006	0.006%	1.20006	120.01%	0.00075	0.075%	1.20075	120.08%
36	River Tay	0.00001	0.001%	1.20001	120.00%	0.00013	0.013%	1.20013	120.01%
37	Dighty Water	0.00018	0.018%	1.20018	120.02%	0.00222	0.222%	1.20222	120.22%
38	Knockhill Wood	0.00002	0.002%	1.20002	120.00%	0.00026	0.026%	1.20026	120.03%
39	Ancient Woodland	0.00011	0.011%	1.20011	120.01%	0.00142	0.142%	1.20142	120.14%
40	Dighty Water	0.00022	0.022%	1.20022	120.02%	0.00268	0.268%	1.20268	120.27%
41	Waterbody	0.00014	0.014%	1.20014	120.01%	0.00174	0.174%	1.20174	120.17%
42	Whitehouse Den	0.00003	0.003%	1.20003	120.00%	0.00033	0.033%	1.20033	120.03%

43	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00043	0.043%	1.20043	120.04%
44	River Tay	0.00001	0.001%	1.20001	120.00%	0.00015	0.015%	1.20015	120.01%
45	Dighty Water	0.00020	0.020%	1.20020	120.02%	0.00254	0.254%	1.20254	120.25%
46	Waterbody	0.00020	0.020%	1.20020	120.02%	0.00254	0.254%	1.20254	120.25%
47	Morendy Wood	0.00002	0.002%	1.20002	120.00%	0.00028	0.028%	1.20028	120.03%
48	Corbie Den	0.00002	0.002%	1.20002	120.00%	0.00028	0.028%	1.20028	120.03%
49	Sheihill Wood	0.00006	0.006%	1.20006	120.01%	0.00072	0.072%	1.20072	120.07%
50	Laverock Law	0.00003	0.003%	1.20003	120.00%	0.00032	0.032%	1.20032	120.03%
51	Woodland	0.00009	0.009%	1.20009	120.01%	0.00116	0.116%	1.20116	120.12%
52	Dighty Water	0.00021	0.021%	1.20021	120.02%	0.00261	0.261%	1.20261	120.26%
53	Ancient Woodland	0.00002	0.002%	1.20002	120.00%	0.00028	0.028%	1.20028	120.03%
54	Roseberry Wood	0.00003	0.003%	1.20003	120.00%	0.00033	0.033%	1.20033	120.03%
55	Heathland	0.00003	0.003%	1.20003	120.00%	0.00033	0.033%	1.20033	120.03%
56	Craig Law	0.00003	0.003%	1.20003	120.00%	0.00037	0.037%	1.20037	120.04%
57	Fithie Burn	0.00012	0.012%	1.20012	120.01%	0.00151	0.151%	1.20151	120.15%
58	Woodland	0.00011	0.011%	1.20011	120.01%	0.00142	0.142%	1.20142	120.14%
59	River Tay	0.00001	0.001%	1.20001	120.00%	0.00016	0.016%	1.20016	120.02%
60	Dighty Water	0.00034	0.034%	1.20034	120.03%	0.00426	0.426%	1.20426	120.43%
61	Woodland	0.00025	0.025%	1.20025	120.02%	0.00307	0.307%	1.20307	120.31%
62	Woodland	0.00012	0.012%	1.20012	120.01%	0.00146	0.146%	1.20146	120.15%
63	Fithie Burn	0.00011	0.011%	1.20011	120.01%	0.00140	0.140%	1.20140	120.14%
64	Woodland	0.00010	0.010%	1.20010	120.01%	0.00129	0.129%	1.20129	120.13%
65	Corbie Den	0.00002	0.002%	1.20002	120.00%	0.00028	0.028%	1.20028	120.03%
66	Woodland	0.00015	0.015%	1.20015	120.02%	0.00188	0.188%	1.20188	120.19%

67	Corbie Den	0.00002	0.002%	1.20002	120.00%	0.00024	0.024%	1.20024	120.02%
68	Pickletillem Marsh	0.00003	0.003%	1.20003	120.00%	0.00033	0.033%	1.20033	120.03%
69	Woodland	0.00011	0.011%	1.20011	120.01%	0.00137	0.137%	1.20137	120.14%
70	Dighty Water	0.00007	0.007%	1.20007	120.01%	0.00090	0.090%	1.20090	120.09%
71	Fithie Burn	0.00011	0.011%	1.20011	120.01%	0.00137	0.137%	1.20137	120.14%
72	Firth of Tay and Eden Estuary	0.00006	0.006%	1.20006	120.01%	0.00074	0.074%	1.20074	120.07%
73	Woodland	0.00009	0.009%	1.20009	120.01%	0.00118	0.118%	1.20118	120.12%
74	East Muirhouse Strip	0.00007	0.007%	1.20007	120.01%	0.00082	0.082%	1.20082	120.08%
75	Brighty Wood	0.00004	0.004%	1.20004	120.00%	0.00053	0.053%	1.20053	120.05%
76	Woodland	0.00018	0.018%	1.20018	120.02%	0.00222	0.222%	1.20222	120.22%
77	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00043	0.043%	1.20043	120.04%
78	Gallowfauld Burn	0.00002	0.002%	1.20002	120.00%	0.00023	0.023%	1.20023	120.02%
79	Woodland	0.00013	0.013%	1.20013	120.01%	0.00157	0.157%	1.20157	120.16%
80	Waterbody	0.00016	0.016%	1.20016	120.02%	0.00193	0.193%	1.20193	120.19%
81	Fithie Burn	0.00012	0.012%	1.20012	120.01%	0.00154	0.154%	1.20154	120.15%
82	Duntrune/Glack Hills	0.00010	0.010%	1.20010	120.01%	0.00121	0.121%	1.20121	120.12%
83	Dighty Water	0.00005	0.005%	1.20005	120.01%	0.00065	0.065%	1.20065	120.06%
84	River Tay	0.00002	0.002%	1.20002	120.00%	0.00019	0.019%	1.20019	120.02%
85	Woodland	0.00003	0.003%	1.20003	120.00%	0.00039	0.039%	1.20039	120.04%
86	Ancient Woodland	0.00002	0.002%	1.20002	120.00%	0.00023	0.023%	1.20023	120.02%
87	St Michael's Wood Marshes	0.00002	0.002%	1.20002	120.00%	0.00031	0.031%	1.20031	120.03%
88	St Michael's Wood	0.00002	0.002%	1.20002	120.00%	0.00031	0.031%	1.20031	120.03%
89	Fithie Burn	0.00037	0.037%	1.20037	120.04%	0.00457	0.457%	1.20457	120.46%
90	Gagie Marsh	0.00005	0.005%	1.20005	120.00%	0.00062	0.062%	1.20062	120.06%

91	Waterbody	0.00019	0.019%	1.20019	120.02%	0.00241	0.241%	1.20241	120.24%
92	Fithie Burn	0.00134	0.134%	1.20134	120.13%	0.01671	1.671%	1.21671	121.67%
93	Heathland	0.00003	0.003%	1.20003	120.00%	0.00034	0.034%	1.20034	120.03%
94	Woodland	0.00015	0.015%	1.20015	120.02%	0.00190	0.190%	1.20190	120.19%
95	Woodland	0.00015	0.015%	1.20015	120.02%	0.00190	0.190%	1.20190	120.19%
96	Fithie Burn	0.00023	0.023%	1.20023	120.02%	0.00281	0.281%	1.20281	120.28%
97	Fithie Burn	0.00015	0.015%	1.20015	120.01%	0.00186	0.186%	1.20186	120.19%
98	Kirkton Wood	0.00003	0.003%	1.20003	120.00%	0.00036	0.036%	1.20036	120.04%
99	Big Latch	0.00004	0.004%	1.20004	120.00%	0.00045	0.045%	1.20045	120.04%
100	Fithie Burn	0.00000	0.000%	1.20000	120.00%	0.00000	0.000%	1.20000	120.00%
101	Woodland	0.00049	0.049%	1.20049	120.05%	0.00605	0.605%	1.20605	120.61%
102	Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00022	0.022%	1.20022	120.02%
103	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00042	0.042%	1.20042	120.04%
104	Tayport - Tentsmuir Coast	0.00003	0.003%	1.20003	120.00%	0.00042	0.042%	1.20042	120.04%
105	Woodland	0.00025	0.025%	1.20025	120.02%	0.00306	0.306%	1.20306	120.31%
106	Dighty Water	0.00041	0.041%	1.20041	120.04%	0.00507	0.507%	1.20507	120.51%
107	Woodland	0.00058	0.058%	1.20058	120.06%	0.00722	0.722%	1.20722	120.72%
108	Murroes Burn	0.00069	0.069%	1.20069	120.07%	0.00861	0.861%	1.20861	120.86%
109	Waterbody	0.00080	0.080%	1.20080	120.08%	0.00997	0.997%	1.20997	121.00%
110	Murroes Burn	0.00039	0.039%	1.20039	120.04%	0.00490	0.490%	1.20490	120.49%
111	Woodland	0.00165	0.165%	1.20165	120.16%	0.02051	2.051%	1.22051	122.05%
112	Murroes Burn	0.00166	0.166%	1.20166	120.17%	0.02068	2.068%	1.22068	122.07%
113	Woodland	0.00197	0.197%	1.20197	120.20%	0.02458	2.458%	1.22458	122.46%
114	Murroes Burn	0.00177	0.177%	1.20177	120.18%	0.02202	2.202%	1.22202	122.20%

115	Kellas Wood	0.00006	0.006%	1.20006	120.01%	0.00078	0.078%	1.20078	120.08%
116	Dighty Water	0.00073	0.073%	1.20073	120.07%	0.00914	0.914%	1.20914	120.91%
117	Little Latch	0.00004	0.004%	1.20004	120.00%	0.00044	0.044%	1.20044	120.04%
118	Waterbody	0.00053	0.053%	1.20053	120.05%	0.00657	0.657%	1.20657	120.66%
119	Murroes Burn	0.00049	0.049%	1.20049	120.05%	0.00611	0.611%	1.20611	120.61%
120	River Tay	0.00002	0.002%	1.20002	120.00%	0.00021	0.021%	1.20021	120.02%
121	Woodland	0.00035	0.035%	1.20035	120.03%	0.00430	0.430%	1.20430	120.43%
122	Murroes Burn	0.00036	0.036%	1.20036	120.04%	0.00442	0.442%	1.20442	120.44%
123	Murroes Burn	0.00020	0.020%	1.20020	120.02%	0.00252	0.252%	1.20252	120.25%
124	Tentsmuir	0.00003	0.003%	1.20003	120.00%	0.00033	0.033%	1.20033	120.03%
125	Dighty Water	0.00075	0.075%	1.20075	120.08%	0.00938	0.938%	1.20938	120.94%
126	Morton Lochs	0.00003	0.003%	1.20003	120.00%	0.00032	0.032%	1.20032	120.03%
127	Woodland	0.00060	0.060%	1.20060	120.06%	0.00743	0.743%	1.20743	120.74%
128	Rhynd Wood	0.00002	0.002%	1.20002	120.00%	0.00029	0.029%	1.20029	120.03%
129	West Wood	0.00003	0.003%	1.20003	120.00%	0.00042	0.042%	1.20042	120.04%
130	Tentsmuir	0.00003	0.003%	1.20003	120.00%	0.00031	0.031%	1.20031	120.03%
131	Morton Lochs	0.00002	0.002%	1.20002	120.00%	0.00031	0.031%	1.20031	120.03%
132	West Wood	0.00004	0.004%	1.20004	120.00%	0.00044	0.044%	1.20044	120.04%
133	Buckler Heads Wood	0.00007	0.007%	1.20007	120.01%	0.00093	0.093%	1.20093	120.09%
134	Firth of Tay and Eden Estuary	0.00004	0.004%	1.20004	120.00%	0.00048	0.048%	1.20048	120.05%
135	Monifeth Bay	0.00004	0.004%	1.20004	120.00%	0.00048	0.048%	1.20048	120.05%
136	Dighty Water	0.00074	0.074%	1.20074	120.07%	0.00917	0.917%	1.20917	120.92%
137	Woodside Wood	0.00010	0.010%	1.20010	120.01%	0.00127	0.127%	1.20127	120.13%
138	Morton Links	0.00002	0.002%	1.20002	120.00%	0.00028	0.028%	1.20028	120.03%

139	Carrot Hill Meadow	0.00002	0.002%	1.20002	120.00%	0.00027	0.027%	1.20027	120.03%
140	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00031	0.031%	1.20031	120.03%
141	Firth of Tay and Eden Estuary	0.00006	0.006%	1.20006	120.01%	0.00079	0.079%	1.20079	120.08%
142	Woodland	0.00010	0.010%	1.20010	120.01%	0.00125	0.125%	1.20125	120.12%
143	Tentsmuir	0.00002	0.002%	1.20002	120.00%	0.00028	0.028%	1.20028	120.03%
144	FID:59 x	0.00020	0.020%	1.20020	120.02%	0.00250	0.250%	1.20250	120.25%
145	Broughty Ferry	0.00008	0.008%	1.20008	120.01%	0.00099	0.099%	1.20099	120.10%
146	Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00021	0.021%	1.20021	120.02%
147	Woodland	0.00066	0.066%	1.20066	120.07%	0.00819	0.819%	1.20819	120.82%
148	Ancient Woodland	0.00032	0.032%	1.20032	120.03%	0.00402	0.402%	1.20402	120.40%
149	Broughty Ferry	0.00010	0.010%	1.20010	120.01%	0.00122	0.122%	1.20122	120.12%
150	Tentsmuir	0.00002	0.002%	1.20002	120.00%	0.00025	0.025%	1.20025	120.02%
151	Firth of Tay and Eden Estuary	0.00008	0.008%	1.20008	120.01%	0.00101	0.101%	1.20101	120.10%
152	Monifeth Bay	0.00008	0.008%	1.20008	120.01%	0.00101	0.101%	1.20101	120.10%
153	Tentsmuir	0.00002	0.002%	1.20002	120.00%	0.00025	0.025%	1.20025	120.02%
154	Tentsmuir	0.00002	0.002%	1.20002	120.00%	0.00029	0.029%	1.20029	120.03%
155	Gallow Hill	0.00049	0.049%	1.20049	120.05%	0.00615	0.615%	1.20615	120.62%
156	Tentsmuir	0.00002	0.002%	1.20002	120.00%	0.00022	0.022%	1.20022	120.02%
157	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00035	0.035%	1.20035	120.04%
158	Firth of Tay and Eden Estuary	0.00005	0.005%	1.20005	120.01%	0.00063	0.063%	1.20063	120.06%
159	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00018	0.018%	1.20018	120.02%
160	Firth of Tay and Eden Estuary	0.00014	0.014%	1.20014	120.01%	0.00169	0.169%	1.20169	120.17%
161	Monifeth Bay	0.00014	0.014%	1.20014	120.01%	0.00169	0.169%	1.20169	120.17%
162	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00019	0.019%	1.20019	120.02%

163	Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00019	0.019%	1.20019	120.02%
164	Firth of Tay and Eden Estuary	0.00018	0.018%	1.20018	120.02%	0.00223	0.223%	1.20223	120.22%
165	Laws Hill	0.00042	0.042%	1.20042	120.04%	0.00522	0.522%	1.20522	120.52%
166	Tentsmuir	0.00003	0.003%	1.20003	120.00%	0.00041	0.041%	1.20041	120.04%
167	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00018	0.018%	1.20018	120.02%
168	Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00018	0.018%	1.20018	120.02%
169	Denfind Plantation	0.00006	0.006%	1.20006	120.01%	0.00080	0.080%	1.20080	120.08%
170	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00018	0.018%	1.20018	120.02%
171	Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00018	0.018%	1.20018	120.02%
172	Firth of Tay and Eden Estuary	0.00004	0.004%	1.20004	120.00%	0.00048	0.048%	1.20048	120.05%
173	Firth of Tay and Eden Estuary	0.00018	0.018%	1.20018	120.02%	0.00225	0.225%	1.20225	120.23%
174	Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00019	0.019%	1.20019	120.02%
175	Tentsmuir	0.00002	0.002%	1.20002	120.00%	0.00026	0.026%	1.20026	120.03%
176	Firth of Tay and Eden Estuary	0.00017	0.017%	1.20017	120.02%	0.00208	0.208%	1.20208	120.21%
177	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00019	0.019%	1.20019	120.02%
178	Firth of Tay and Eden Estuary	0.00004	0.004%	1.20004	120.00%	0.00052	0.052%	1.20052	120.05%
179	Barry Links	0.00018	0.018%	1.20018	120.02%	0.00228	0.228%	1.20228	120.23%
180	Firth of Tay and Eden Estuary	0.00001	0.001%	1.20001	120.00%	0.00016	0.016%	1.20016	120.02%
181	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00021	0.021%	1.20021	120.02%
182	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00029	0.029%	1.20029	120.03%
183	Firth of Tay and Eden Estuary	0.00011	0.011%	1.20011	120.01%	0.00143	0.143%	1.20143	120.14%
184	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00041	0.041%	1.20041	120.04%
185	Ancient Woodland	0.00029	0.029%	1.20029	120.03%	0.00359	0.359%	1.20359	120.36%
186	Firth of Tay and Eden Estuary	0.00014	0.014%	1.20014	120.01%	0.00177	0.177%	1.20177	120.18%

187	Firth of Tay and Eden Estuary	0.00014	0.014%	1.20014	120.01%	0.00175	0.175%	1.20175	120.18%
188	Weet's/Camustane/+ Woods	0.00010	0.010%	1.20010	120.01%	0.00125	0.125%	1.20125	120.12%
189	Firth of Tay and Eden Estuary	0.00004	0.004%	1.20004	120.00%	0.00044	0.044%	1.20044	120.04%
190	Firth of Tay and Eden Estuary	0.00009	0.009%	1.20009	120.01%	0.00108	0.108%	1.20108	120.11%
191	Firth of Tay and Eden Estuary	0.00010	0.010%	1.20010	120.01%	0.00123	0.123%	1.20123	120.12%
192	Firth of Tay and Eden Estuary	0.00010	0.010%	1.20010	120.01%	0.00124	0.124%	1.20124	120.12%
193	Tentsmuir	0.00004	0.004%	1.20004	120.00%	0.00054	0.054%	1.20054	120.05%
194	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00038	0.038%	1.20038	120.04%
195	Firth of Tay and Eden Estuary	0.00008	0.008%	1.20008	120.01%	0.00096	0.096%	1.20096	120.10%
196	Firth of Tay and Eden Estuary	0.00008	0.008%	1.20008	120.01%	0.00095	0.095%	1.20095	120.10%
197	Firth of Tay and Eden Estuary	0.00007	0.007%	1.20007	120.01%	0.00088	0.088%	1.20088	120.09%
198	Firth of Tay and Eden Estuary	0.00007	0.007%	1.20007	120.01%	0.00085	0.085%	1.20085	120.08%
199	Firth of Tay and Eden Estuary	0.00009	0.009%	1.20009	120.01%	0.00113	0.113%	1.20113	120.11%
200	Firth of Tay and Eden Estuary	0.00012	0.012%	1.20012	120.01%	0.00152	0.152%	1.20152	120.15%
201	Firth of Tay and Eden Estuary	0.00006	0.006%	1.20006	120.01%	0.00074	0.074%	1.20074	120.07%
202	Tentsmuir	0.00004	0.004%	1.20004	120.00%	0.00049	0.049%	1.20049	120.05%
203	Firth of Tay and Eden Estuary	0.00008	0.008%	1.20008	120.01%	0.00104	0.104%	1.20104	120.10%
204	Firth of Tay and Eden Estuary	0.00012	0.012%	1.20012	120.01%	0.00153	0.153%	1.20153	120.15%
205	Firth of Tay and Eden Estuary	0.00016	0.016%	1.20016	120.02%	0.00204	0.204%	1.20204	120.20%
206	Firth of Tay and Eden Estuary	0.00011	0.011%	1.20011	120.01%	0.00131	0.131%	1.20131	120.13%
207	Firth of Tay and Eden Estuary	0.00005	0.005%	1.20005	120.00%	0.00060	0.060%	1.20060	120.06%
208	Firth of Tay and Eden Estuary	0.00007	0.007%	1.20007	120.01%	0.00083	0.083%	1.20083	120.08%
209	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00038	0.038%	1.20038	120.04%
210	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00035	0.035%	1.20035	120.03%

211	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00033	0.033%	1.20033	120.03%
212	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00033	0.033%	1.20033	120.03%
213	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00036	0.036%	1.20036	120.04%
214	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00034	0.034%	1.20034	120.03%
215	Firth of Tay and Eden Estuary	0.00002	0.002%	1.20002	120.00%	0.00030	0.030%	1.20030	120.03%
216	Firth of Tay and Eden Estuary	0.00003	0.003%	1.20003	120.00%	0.00032	0.032%	1.20032	120.03%

E1.5 Weekly HF concentrations

Table E5: Predicted weekly mean HF concentrations at sensitive ecological sites, and comparison with the critical level

Ecological receptor ID	Receptor location	Existing DERL Facility		Proposed EfW CHP Facility	
		Mod HF (PC) (µg/m^3)	1% test	Mod HF (PC) (µg/m^3)	1% test
1	Firth of Tay and Eden Estuary	0.000002	0.0004%	0.000171	0.0342%
2	Firth of Tay and Eden Estuary	0.000002	0.0004%	0.000182	0.0365%
3	Inner Tay Estuary	0.000002	0.0004%	0.000182	0.0365%
4	Firth of Tay and Eden Estuary	0.000002	0.0005%	0.000208	0.0416%
5	Firth of Tay and Eden Estuary	0.000001	0.0003%	0.000109	0.0218%
6	Firth of Tay and Eden Estuary	0.000003	0.0006%	0.000255	0.0511%
7	Inner Tay Estuary	0.000003	0.0006%	0.000255	0.0511%
8	Firth of Tay and Eden Estuary	0.000002	0.0005%	0.000206	0.0413%
9	Firth of Tay and Eden Estuary	0.000004	0.0008%	0.000321	0.0642%
10	Firth of Tay and Eden Estuary	0.000002	0.0003%	0.000133	0.0265%
11	Firth of Tay and Eden Estuary	0.000004	0.0008%	0.000353	0.0707%
12	Firth of Tay and Eden Estuary	0.000004	0.0007%	0.000299	0.0598%
13	Firth of Tay and Eden Estuary	0.000002	0.0005%	0.000196	0.0392%
14	Gallowhill/Cawmill Woods	0.000008	0.0016%	0.000639	0.1278%
15	Firth of Tay and Eden Estuary	0.000004	0.0008%	0.000355	0.0709%
16	Firth of Tay and Eden Estuary	0.000002	0.0005%	0.000207	0.0414%
17	Ancient Woodland	0.000009	0.0018%	0.000722	0.1445%
18	Baldrogon Wood	0.000008	0.0015%	0.000599	0.1199%
19	Wynton Wood	0.000006	0.0012%	0.000484	0.0968%

20	Heathland	0.000002	0.0005%	0.000238	0.0475%
21	Firth of Tay and Eden Estuary	0.000006	0.0011%	0.000462	0.0924%
22	Firth of Tay and Eden Estuary	0.000005	0.0010%	0.000419	0.0837%
23	Firth of Tay and Eden Estuary	0.000003	0.0006%	0.000232	0.0463%
24	Ancient Woodland	0.000009	0.0019%	0.000802	0.1604%
25	Ancient Woodland	0.000012	0.0024%	0.000913	0.1826%
26	Balmerino - Wormit Shore	0.000002	0.0004%	0.000182	0.0363%
27	Trottick Mill Ponds	0.000014	0.0029%	0.001085	0.2169%
28	Firth of Tay and Eden Estuary	0.000007	0.0014%	0.000614	0.1229%
29	East/West Links Wood	0.000003	0.0005%	0.000213	0.0425%
30	North Hill	0.000003	0.0005%	0.000194	0.0388%
31	River Tay	0.000001	0.0003%	0.000117	0.0234%
32	Woodland	0.000018	0.0037%	0.001444	0.2887%
33	Heathland	0.000004	0.0008%	0.000282	0.0564%
34	Waterbody	0.000014	0.0028%	0.001128	0.2255%
35	Balmuir Wood	0.000006	0.0011%	0.000445	0.0891%
36	River Tay	0.000001	0.0003%	0.000117	0.0234%
37	Dighty Water	0.000023	0.0046%	0.001779	0.3557%
38	Knockhill Wood	0.000003	0.0005%	0.000218	0.0435%
39	Ancient Woodland	0.000012	0.0024%	0.000901	0.1802%
40	Dighty Water	0.000027	0.0053%	0.002089	0.4177%
41	Waterbody	0.000016	0.0032%	0.001162	0.2324%
42	Whitehouse Den	0.000004	0.0009%	0.000302	0.0603%
43	Firth of Tay and Eden Estuary	0.000008	0.0015%	0.000713	0.1426%

44	River Tay	0.000002	0.0003%	0.000114	0.0229%
45	Dighty Water	0.000023	0.0047%	0.002048	0.4095%
46	Waterbody	0.000031	0.0063%	0.002152	0.4304%
47	Morendy Wood	0.000004	0.0008%	0.000312	0.0624%
48	Corbie Den	0.000004	0.0007%	0.000233	0.0467%
49	Sheihill Wood	0.000008	0.0016%	0.000599	0.1198%
50	Laverock Law	0.000003	0.0006%	0.000270	0.0540%
51	Woodland	0.000011	0.0022%	0.000829	0.1658%
52	Dighty Water	0.000027	0.0054%	0.002259	0.4518%
53	Ancient Woodland	0.000003	0.0007%	0.000221	0.0442%
54	Roseberry Wood	0.000005	0.0010%	0.000389	0.0777%
55	Heathland	0.000004	0.0008%	0.000265	0.0530%
56	Craig Law	0.000004	0.0008%	0.000362	0.0725%
57	Fithie Burn	0.000016	0.0032%	0.001205	0.2411%
58	Woodland	0.000015	0.0031%	0.001149	0.2297%
59	River Tay	0.000002	0.0004%	0.000118	0.0235%
60	Dighty Water	0.000044	0.0088%	0.003791	0.7582%
61	Woodland	0.000027	0.0055%	0.001736	0.3472%
62	Woodland	0.000017	0.0034%	0.001256	0.2513%
63	Fithie Burn	0.000016	0.0033%	0.001197	0.2395%
64	Woodland	0.000015	0.0030%	0.001081	0.2163%
65	Corbie Den	0.000003	0.0006%	0.000188	0.0376%
66	Woodland	0.000021	0.0042%	0.001631	0.3262%
67	Corbie Den	0.000002	0.0005%	0.000168	0.0337%

68	Pickletillem Marsh	0.000005	0.0010%	0.000395	0.0790%
69	Woodland	0.000016	0.0031%	0.001115	0.2231%
70	Dighty Water	0.000027	0.0054%	0.001479	0.2958%
71	Fithie Burn	0.000015	0.0029%	0.001049	0.2099%
72	Firth of Tay and Eden Estuary	0.000012	0.0023%	0.001021	0.2042%
73	Woodland	0.000012	0.0024%	0.000826	0.1652%
74	East Muirhouse Strip	0.000008	0.0016%	0.000533	0.1066%
75	Brighty Wood	0.000005	0.0010%	0.000352	0.0703%
76	Woodland	0.000027	0.0054%	0.001864	0.3727%
77	Firth of Tay and Eden Estuary	0.000006	0.0012%	0.000434	0.0868%
78	Gallowfauld Burn	0.000002	0.0004%	0.000155	0.0310%
79	Woodland	0.000017	0.0035%	0.001135	0.2271%
80	Waterbody	0.000024	0.0047%	0.001437	0.2874%
81	Fithie Burn	0.000017	0.0034%	0.001117	0.2234%
82	Duntrune/Glack Hills	0.000012	0.0025%	0.000802	0.1605%
83	Dighty Water	0.000029	0.0058%	0.001651	0.3301%
84	River Tay	0.000002	0.0003%	0.000127	0.0253%
85	Woodland	0.000005	0.0010%	0.000410	0.0820%
86	Ancient Woodland	0.000002	0.0004%	0.000157	0.0315%
87	St Michael's Wood Marshes	0.000004	0.0007%	0.000279	0.0558%
88	St Michael's Wood	0.000004	0.0007%	0.000279	0.0558%
89	Fithie Burn	0.000093	0.0187%	0.003488	0.6976%
90	Gagie Marsh	0.000005	0.0010%	0.000357	0.0714%
91	Waterbody	0.000031	0.0062%	0.001985	0.3971%

92	Fithie Burn	0.000350	0.0701%	0.013729	2.7457%
93	Heathland	0.000003	0.0006%	0.000224	0.0448%
94	Woodland	0.000022	0.0044%	0.001583	0.3167%
95	Woodland	0.000022	0.0044%	0.001583	0.3167%
96	Fithie Burn	0.000037	0.0074%	0.002314	0.4628%
97	Fithie Burn	0.000022	0.0043%	0.001550	0.3100%
98	Kirkton Wood	0.000004	0.0007%	0.000306	0.0612%
99	Big Latch	0.000004	0.0007%	0.000269	0.0537%
100	Fithie Burn	0.000000	0.0000%	0.000000	0.0000%
101	Woodland	0.000103	0.0205%	0.004750	0.9500%
102	Eden Estuary	0.000002	0.0004%	0.000174	0.0347%
103	Firth of Tay and Eden Estuary	0.000005	0.0011%	0.000407	0.0814%
104	Tayport - Tentsmuir Coast	0.000005	0.0011%	0.000407	0.0814%
105	Woodland	0.000042	0.0084%	0.002189	0.4378%
106	Dighty Water	0.000048	0.0095%	0.004933	0.9866%
107	Woodland	0.000124	0.0248%	0.006116	1.2231%
108	Murroes Burn	0.000150	0.0300%	0.007461	1.4921%
109	Waterbody	0.000168	0.0336%	0.008639	1.7278%
110	Murroes Burn	0.000069	0.0137%	0.004069	0.8138%
111	Woodland	0.000178	0.0357%	0.012934	2.5868%
112	Murroes Burn	0.000174	0.0347%	0.012404	2.4808%
113	Woodland	0.000119	0.0239%	0.010193	2.0386%
114	Murroes Burn	0.000105	0.0210%	0.009753	1.9506%
115	Kellas Wood	0.000006	0.0013%	0.000506	0.1011%

116	Dighty Water	0.000056	0.0112%	0.005770	1.1540%
117	Little Latch	0.000003	0.0006%	0.000242	0.0484%
118	Waterbody	0.000091	0.0181%	0.005714	1.1428%
119	Murroes Burn	0.000082	0.0164%	0.005291	1.0582%
120	River Tay	0.000002	0.0003%	0.000125	0.0250%
121	Woodland	0.000053	0.0107%	0.003732	0.7463%
122	Murroes Burn	0.000055	0.0111%	0.003788	0.7575%
123	Murroes Burn	0.000028	0.0056%	0.002036	0.4073%
124	Tentsmuir	0.000004	0.0008%	0.000294	0.0589%
125	Dighty Water	0.000048	0.0096%	0.004345	0.8690%
126	Morton Lochs	0.000004	0.0008%	0.000297	0.0595%
127	Woodland	0.000042	0.0083%	0.003869	0.7738%
128	Rhynd Wood	0.000003	0.0006%	0.000246	0.0491%
129	West Wood	0.000003	0.0006%	0.000241	0.0482%
130	Tentsmuir	0.000003	0.0007%	0.000266	0.0532%
131	Morton Lochs	0.000003	0.0007%	0.000264	0.0527%
132	West Wood	0.000003	0.0006%	0.000253	0.0507%
133	Buckler Heads Wood	0.000007	0.0015%	0.000566	0.1132%
134	Firth of Tay and Eden Estuary	0.000005	0.0010%	0.000452	0.0904%
135	Monifeth Bay	0.000005	0.0010%	0.000452	0.0904%
136	Dighty Water	0.000041	0.0082%	0.003908	0.7816%
137	Woodside Wood	0.000012	0.0024%	0.000914	0.1828%
138	Morton Links	0.000003	0.0007%	0.000257	0.0514%
139	Carrot Hill Meadow	0.000002	0.0005%	0.000170	0.0340%

140	Firth of Tay and Eden Estuary	0.000003	0.0006%	0.000240	0.0480%
141	Firth of Tay and Eden Estuary	0.000007	0.0014%	0.000611	0.1221%
142	Woodland	0.000014	0.0027%	0.001190	0.2380%
143	Tentsmuir	0.000003	0.0006%	0.000230	0.0460%
144	FID:59 x	0.000025	0.0050%	0.001868	0.3736%
145	Broughty Ferry	0.000010	0.0020%	0.000853	0.1706%
146	Eden Estuary	0.000002	0.0005%	0.000187	0.0373%
147	Woodland	0.000046	0.0092%	0.003485	0.6969%
148	Ancient Woodland	0.000019	0.0038%	0.001661	0.3323%
149	Broughty Ferry	0.000014	0.0028%	0.001181	0.2362%
150	Tentsmuir	0.000003	0.0005%	0.000203	0.0406%
151	Firth of Tay and Eden Estuary	0.000011	0.0022%	0.000918	0.1837%
152	Monifeth Bay	0.000011	0.0022%	0.000918	0.1837%
153	Tentsmuir	0.000002	0.0005%	0.000188	0.0376%
154	Tentsmuir	0.000003	0.0005%	0.000232	0.0464%
155	Gallow Hill	0.000030	0.0061%	0.002139	0.4279%
156	Tentsmuir	0.000002	0.0005%	0.000188	0.0375%
157	Firth of Tay and Eden Estuary	0.000003	0.0006%	0.000259	0.0518%
158	Firth of Tay and Eden Estuary	0.000005	0.0011%	0.000437	0.0873%
159	Firth of Tay and Eden Estuary	0.000002	0.0004%	0.000156	0.0312%
160	Firth of Tay and Eden Estuary	0.000014	0.0029%	0.001210	0.2419%
161	Monifeth Bay	0.000014	0.0029%	0.001210	0.2419%
162	Firth of Tay and Eden Estuary	0.000002	0.0004%	0.000163	0.0326%
163	Eden Estuary	0.000002	0.0004%	0.000163	0.0326%

164	Firth of Tay and Eden Estuary	0.000014	0.0028%	0.001153	0.2306%
165	Laws Hill	0.000027	0.0053%	0.001894	0.3788%
166	Tentsmuir	0.000003	0.0007%	0.000298	0.0597%
167	Firth of Tay and Eden Estuary	0.000002	0.0004%	0.000159	0.0319%
168	Eden Estuary	0.000002	0.0004%	0.000159	0.0319%
169	Denfind Plantation	0.000007	0.0014%	0.000548	0.1096%
170	Firth of Tay and Eden Estuary	0.000002	0.0004%	0.000148	0.0297%
171	Eden Estuary	0.000002	0.0004%	0.000148	0.0297%
172	Firth of Tay and Eden Estuary	0.000004	0.0008%	0.000334	0.0667%
173	Firth of Tay and Eden Estuary	0.000016	0.0033%	0.001367	0.2733%
174	Eden Estuary	0.000002	0.0004%	0.000140	0.0280%
175	Tentsmuir	0.000002	0.0004%	0.000190	0.0380%
176	Firth of Tay and Eden Estuary	0.000015	0.0030%	0.001262	0.2524%
177	Firth of Tay and Eden Estuary	0.000002	0.0003%	0.000136	0.0272%
178	Firth of Tay and Eden Estuary	0.000004	0.0008%	0.000358	0.0715%
179	Barry Links	0.000017	0.0034%	0.001400	0.2799%
180	Firth of Tay and Eden Estuary	0.000002	0.0003%	0.000138	0.0276%
181	Firth of Tay and Eden Estuary	0.000002	0.0004%	0.000165	0.0331%
182	Firth of Tay and Eden Estuary	0.000003	0.0005%	0.000218	0.0436%
183	Firth of Tay and Eden Estuary	0.000010	0.0021%	0.000830	0.1660%
184	Firth of Tay and Eden Estuary	0.000003	0.0007%	0.000295	0.0589%
185	Ancient Woodland	0.000020	0.0040%	0.001609	0.3219%
186	Firth of Tay and Eden Estuary	0.000013	0.0026%	0.001049	0.2098%
187	Firth of Tay and Eden Estuary	0.000013	0.0026%	0.001040	0.2079%

188	Weet's/Camustane/+ Woods	0.000007	0.0015%	0.000595	0.1190%
189	Firth of Tay and Eden Estuary	0.000004	0.0007%	0.000312	0.0624%
190	Firth of Tay and Eden Estuary	0.000009	0.0018%	0.000681	0.1362%
191	Firth of Tay and Eden Estuary	0.000009	0.0019%	0.000726	0.1452%
192	Firth of Tay and Eden Estuary	0.000009	0.0019%	0.000728	0.1457%
193	Tentsmuir	0.000005	0.0010%	0.000404	0.0809%
194	Firth of Tay and Eden Estuary	0.000003	0.0006%	0.000273	0.0545%
195	Firth of Tay and Eden Estuary	0.000008	0.0016%	0.000618	0.1235%
196	Firth of Tay and Eden Estuary	0.000008	0.0016%	0.000616	0.1233%
197	Firth of Tay and Eden Estuary	0.000008	0.0016%	0.000585	0.1171%
198	Firth of Tay and Eden Estuary	0.000007	0.0015%	0.000561	0.1122%
199	Firth of Tay and Eden Estuary	0.000009	0.0018%	0.000683	0.1366%
200	Firth of Tay and Eden Estuary	0.000011	0.0022%	0.000868	0.1735%
201	Firth of Tay and Eden Estuary	0.000007	0.0013%	0.000510	0.1019%
202	Tentsmuir	0.000005	0.0010%	0.000382	0.0764%
203	Firth of Tay and Eden Estuary	0.000011	0.0022%	0.000947	0.1894%
204	Firth of Tay and Eden Estuary	0.000016	0.0032%	0.001328	0.2656%
205	Firth of Tay and Eden Estuary	0.000015	0.0030%	0.001244	0.2488%
206	Firth of Tay and Eden Estuary	0.000014	0.0029%	0.001209	0.2418%
207	Firth of Tay and Eden Estuary	0.000005	0.0011%	0.000493	0.0986%
208	Firth of Tay and Eden Estuary	0.000008	0.0016%	0.000664	0.1327%
209	Firth of Tay and Eden Estuary	0.000006	0.0012%	0.000476	0.0951%
210	Firth of Tay and Eden Estuary	0.000005	0.0009%	0.000348	0.0696%
211	Firth of Tay and Eden Estuary	0.000003	0.0007%	0.000268	0.0536%

212	Firth of Tay and Eden Estuary	0.000003	0.0006%	0.000277	0.0554%
213	Firth of Tay and Eden Estuary	0.000003	0.0007%	0.000287	0.0574%
214	Firth of Tay and Eden Estuary	0.000005	0.0009%	0.000356	0.0713%
215	Firth of Tay and Eden Estuary	0.000003	0.0006%	0.000249	0.0498%
216	Firth of Tay and Eden Estuary	0.000004	0.0008%	0.000295	0.0589%

E1.6 Daily HF concentrations

Table E6: Predicted daily mean HF concentrations at sensitive ecological sites, and comparison with the critical level

Ecological receptor ID	Receptor location	Existing DERL Facility		Proposed EfW CHP Facility	
		Mod HF (PC) (μg/m^3)	1% test	Mod HF (PC) (μg/m^3)	1% test
1	Firth of Tay and Eden Estuary	0.000008	0.0002%	0.000695	0.01%
2	Firth of Tay and Eden Estuary	0.000009	0.0002%	0.000759	0.02%
3	Inner Tay Estuary	0.000009	0.0002%	0.000759	0.02%
4	Firth of Tay and Eden Estuary	0.000010	0.0002%	0.000796	0.02%
5	Firth of Tay and Eden Estuary	0.000006	0.0001%	0.000501	0.01%
6	Firth of Tay and Eden Estuary	0.000010	0.0002%	0.000814	0.02%
7	Inner Tay Estuary	0.000010	0.0002%	0.000814	0.02%
8	Firth of Tay and Eden Estuary	0.000009	0.0002%	0.000724	0.01%
9	Firth of Tay and Eden Estuary	0.000013	0.0003%	0.001047	0.02%
10	Firth of Tay and Eden Estuary	0.000008	0.0002%	0.000657	0.01%
11	Firth of Tay and Eden Estuary	0.000014	0.0003%	0.001182	0.02%
12	Firth of Tay and Eden Estuary	0.000013	0.0003%	0.001012	0.02%
13	Firth of Tay and Eden Estuary	0.000010	0.0002%	0.000844	0.02%
14	Gallowhill/Cawmill Woods	0.000024	0.0005%	0.002099	0.04%
15	Firth of Tay and Eden Estuary	0.000016	0.0003%	0.001323	0.03%
16	Firth of Tay and Eden Estuary	0.000010	0.0002%	0.000870	0.02%
17	Ancient Woodland	0.000035	0.0007%	0.002750	0.06%
18	Baldrogon Wood	0.000025	0.0005%	0.001991	0.04%
19	Wynton Wood	0.000018	0.0004%	0.001558	0.03%

20	Heathland	0.000011	0.0002%	0.001180	0.02%
21	Firth of Tay and Eden Estuary	0.000020	0.0004%	0.001715	0.03%
22	Firth of Tay and Eden Estuary	0.000017	0.0003%	0.001374	0.03%
23	Firth of Tay and Eden Estuary	0.000011	0.0002%	0.000915	0.02%
24	Ancient Woodland	0.000028	0.0006%	0.002105	0.04%
25	Ancient Woodland	0.000039	0.0008%	0.003387	0.07%
26	Balmerino - Wormit Shore	0.000009	0.0002%	0.000678	0.01%
27	Trottick Mill Ponds	0.000050	0.0010%	0.003677	0.07%
28	Firth of Tay and Eden Estuary	0.000026	0.0005%	0.002070	0.04%
29	East/West Links Wood	0.000013	0.0003%	0.000996	0.02%
30	North Hill	0.000013	0.0003%	0.001000	0.02%
31	River Tay	0.000006	0.0001%	0.000347	0.01%
32	Woodland	0.000056	0.0011%	0.004685	0.09%
33	Heathland	0.000019	0.0004%	0.001490	0.03%
34	Waterbody	0.000043	0.0009%	0.003232	0.06%
35	Balmuir Wood	0.000031	0.0006%	0.002400	0.05%
36	River Tay	0.000006	0.0001%	0.000361	0.01%
37	Dighty Water	0.000073	0.0015%	0.006116	0.12%
38	Knockhill Wood	0.000016	0.0003%	0.001237	0.02%
39	Ancient Woodland	0.000059	0.0012%	0.004106	0.08%
40	Dighty Water	0.000086	0.0017%	0.006941	0.14%
41	Waterbody	0.000070	0.0014%	0.004898	0.10%
42	Whitehouse Den	0.000013	0.0003%	0.000917	0.02%
43	Firth of Tay and Eden Estuary	0.000028	0.0006%	0.002654	0.05%

44	River Tay	0.000006	0.0001%	0.000372	0.01%
45	Dighty Water	0.000085	0.0017%	0.007830	0.16%
46	Waterbody	0.000072	0.0014%	0.005015	0.10%
47	Morendy Wood	0.000017	0.0003%	0.001367	0.03%
48	Corbie Den	0.000011	0.0002%	0.000648	0.01%
49	Sheihill Wood	0.000031	0.0006%	0.002338	0.05%
50	Laverock Law	0.000017	0.0003%	0.001428	0.03%
51	Woodland	0.000054	0.0011%	0.004142	0.08%
52	Dighty Water	0.000106	0.0021%	0.008194	0.16%
53	Ancient Woodland	0.000011	0.0002%	0.000643	0.01%
54	Roseberry Wood	0.000021	0.0004%	0.001721	0.03%
55	Heathland	0.000012	0.0002%	0.000786	0.02%
56	Craig Law	0.000021	0.0004%	0.001793	0.04%
57	Fithie Burn	0.000083	0.0017%	0.006098	0.12%
58	Woodland	0.000076	0.0015%	0.005628	0.11%
59	River Tay	0.000006	0.0001%	0.000543	0.01%
60	Dighty Water	0.000176	0.0035%	0.013245	0.26%
61	Woodland	0.000130	0.0026%	0.009524	0.19%
62	Woodland	0.000077	0.0015%	0.005443	0.11%
63	Fithie Burn	0.000069	0.0014%	0.004873	0.10%
64	Woodland	0.000057	0.0011%	0.004058	0.08%
65	Corbie Den	0.000011	0.0002%	0.000908	0.02%
66	Woodland	0.000110	0.0022%	0.007533	0.15%
67	Corbie Den	0.000010	0.0002%	0.000809	0.02%

68	Pickletillem Marsh	0.000015	0.0003%	0.001113	0.02%
69	Woodland	0.000054	0.0011%	0.003707	0.07%
70	Dighty Water	0.000094	0.0019%	0.007661	0.15%
71	Fithie Burn	0.000043	0.0009%	0.003045	0.06%
72	Firth of Tay and Eden Estuary	0.000058	0.0012%	0.004945	0.10%
73	Woodland	0.000038	0.0008%	0.002793	0.06%
74	East Muirhouse Strip	0.000035	0.0007%	0.002602	0.05%
75	Brighty Wood	0.000025	0.0005%	0.001874	0.04%
76	Woodland	0.000090	0.0018%	0.005754	0.12%
77	Firth of Tay and Eden Estuary	0.000026	0.0005%	0.002173	0.04%
78	Gallowfauld Burn	0.000009	0.0002%	0.000752	0.02%
79	Woodland	0.000055	0.0011%	0.004008	0.08%
80	Waterbody	0.000070	0.0014%	0.005012	0.10%
81	Fithie Burn	0.000049	0.0010%	0.003650	0.07%
82	Duntrune/Glack Hills	0.000042	0.0008%	0.003059	0.06%
83	Dighty Water	0.000116	0.0023%	0.010030	0.20%
84	River Tay	0.000007	0.0001%	0.000604	0.01%
85	Woodland	0.000022	0.0004%	0.001733	0.03%
86	Ancient Woodland	0.000009	0.0002%	0.000730	0.01%
87	St Michael's Wood Marshes	0.000016	0.0003%	0.001233	0.02%
88	St Michael's Wood	0.000016	0.0003%	0.001233	0.02%
89	Fithie Burn	0.000211	0.0042%	0.011155	0.22%
90	Gagie Marsh	0.000024	0.0005%	0.001792	0.04%
91	Waterbody	0.000106	0.0021%	0.006512	0.13%

92	Fithie Burn	0.000596	0.0119%	0.022045	0.44%
93	Heathland	0.000012	0.0002%	0.001012	0.02%
94	Woodland	0.000076	0.0015%	0.004667	0.09%
95	Woodland	0.000076	0.0015%	0.004667	0.09%
96	Fithie Burn	0.000117	0.0023%	0.007711	0.15%
97	Fithie Burn	0.000072	0.0014%	0.004511	0.09%
98	Kirkton Wood	0.000017	0.0003%	0.001204	0.02%
99	Big Latch	0.000016	0.0003%	0.001268	0.03%
100	Fithie Burn	0.000000	0.0000%	0.000000	0.00%
101	Woodland	0.000227	0.0045%	0.010958	0.22%
102	Eden Estuary	0.000011	0.0002%	0.000827	0.02%
103	Firth of Tay and Eden Estuary	0.000028	0.0006%	0.001949	0.04%
104	Tayport - Tentsmuir Coast	0.000028	0.0006%	0.001949	0.04%
105	Woodland	0.000099	0.0020%	0.007069	0.14%
106	Dighty Water	0.000148	0.0030%	0.014440	0.29%
107	Woodland	0.000209	0.0042%	0.012945	0.26%
108	Murroes Burn	0.000210	0.0042%	0.013969	0.28%
109	Waterbody	0.000232	0.0046%	0.014436	0.29%
110	Murroes Burn	0.000145	0.0029%	0.009485	0.19%
111	Woodland	0.000316	0.0063%	0.020824	0.42%
112	Murroes Burn	0.000306	0.0061%	0.020169	0.40%
113	Woodland	0.000235	0.0047%	0.019288	0.39%
114	Murroes Burn	0.000204	0.0041%	0.018861	0.38%
115	Kellas Wood	0.000020	0.0004%	0.001497	0.03%

116	Dighty Water	0.000146	0.0029%	0.012359	0.25%
117	Little Latch	0.000013	0.0003%	0.000959	0.02%
118	Waterbody	0.000117	0.0023%	0.009509	0.19%
119	Murroes Burn	0.000109	0.0022%	0.009202	0.18%
120	River Tay	0.000006	0.0001%	0.000505	0.01%
121	Woodland	0.000087	0.0017%	0.007548	0.15%
122	Murroes Burn	0.000079	0.0016%	0.007068	0.14%
123	Murroes Burn	0.000065	0.0013%	0.005106	0.10%
124	Tentsmuir	0.000015	0.0003%	0.001094	0.02%
125	Dighty Water	0.000116	0.0023%	0.008435	0.17%
126	Morton Lochs	0.000014	0.0003%	0.001061	0.02%
127	Woodland	0.000102	0.0020%	0.008736	0.17%
128	Rhynd Wood	0.000011	0.0002%	0.000883	0.02%
129	West Wood	0.000013	0.0003%	0.000989	0.02%
130	Tentsmuir	0.000013	0.0003%	0.001002	0.02%
131	Morton Lochs	0.000013	0.0003%	0.000970	0.02%
132	West Wood	0.000013	0.0003%	0.000946	0.02%
133	Buckler Heads Wood	0.000021	0.0004%	0.001686	0.03%
134	Firth of Tay and Eden Estuary	0.000020	0.0004%	0.001956	0.04%
135	Monifeth Bay	0.000020	0.0004%	0.001956	0.04%
136	Dighty Water	0.000079	0.0016%	0.007371	0.15%
137	Woodside Wood	0.000032	0.0006%	0.002432	0.05%
138	Morton Links	0.000012	0.0002%	0.000923	0.02%
139	Carrot Hill Meadow	0.000010	0.0002%	0.000800	0.02%

140	Firth of Tay and Eden Estuary	0.000011	0.0002%	0.000989	0.02%
141	Firth of Tay and Eden Estuary	0.000034	0.0007%	0.003036	0.06%
142	Woodland	0.000033	0.0007%	0.002978	0.06%
143	Tentsmuir	0.000010	0.0002%	0.000782	0.02%
144	FID:59 x	0.000037	0.0007%	0.003029	0.06%
145	Broughty Ferry	0.000035	0.0007%	0.002974	0.06%
146	Eden Estuary	0.000008	0.0002%	0.000655	0.01%
147	Woodland	0.000067	0.0013%	0.005448	0.11%
148	Ancient Woodland	0.000047	0.0009%	0.003975	0.08%
149	Broughty Ferry	0.000030	0.0006%	0.002736	0.05%
150	Tentsmuir	0.000009	0.0002%	0.000708	0.01%
151	Firth of Tay and Eden Estuary	0.000029	0.0006%	0.002404	0.05%
152	Monifeth Bay	0.000029	0.0006%	0.002404	0.05%
153	Tentsmuir	0.000009	0.0002%	0.000782	0.02%
154	Tentsmuir	0.000011	0.0002%	0.001042	0.02%
155	Gallow Hill	0.000065	0.0013%	0.004545	0.09%
156	Tentsmuir	0.000009	0.0002%	0.000673	0.01%
157	Firth of Tay and Eden Estuary	0.000016	0.0003%	0.001419	0.03%
158	Firth of Tay and Eden Estuary	0.000025	0.0005%	0.002145	0.04%
159	Firth of Tay and Eden Estuary	0.000008	0.0002%	0.000596	0.01%
160	Firth of Tay and Eden Estuary	0.000045	0.0009%	0.003784	0.08%
161	Monifeth Bay	0.000045	0.0009%	0.003784	0.08%
162	Firth of Tay and Eden Estuary	0.000008	0.0002%	0.000599	0.01%
163	Eden Estuary	0.000008	0.0002%	0.000599	0.01%

164	Firth of Tay and Eden Estuary	0.000042	0.0008%	0.003321	0.07%
165	Laws Hill	0.000054	0.0011%	0.003942	0.08%
166	Tentsmuir	0.000018	0.0004%	0.001592	0.03%
167	Firth of Tay and Eden Estuary	0.000008	0.0002%	0.000628	0.01%
168	Eden Estuary	0.000008	0.0002%	0.000628	0.01%
169	Denfind Plantation	0.000023	0.0005%	0.001655	0.03%
170	Firth of Tay and Eden Estuary	0.000007	0.0001%	0.000549	0.01%
171	Eden Estuary	0.000007	0.0001%	0.000549	0.01%
172	Firth of Tay and Eden Estuary	0.000018	0.0004%	0.001616	0.03%
173	Firth of Tay and Eden Estuary	0.000034	0.0007%	0.002883	0.06%
174	Eden Estuary	0.000007	0.0001%	0.000587	0.01%
175	Tentsmuir	0.000011	0.0002%	0.000963	0.02%
176	Firth of Tay and Eden Estuary	0.000032	0.0006%	0.002699	0.05%
177	Firth of Tay and Eden Estuary	0.000007	0.0001%	0.000583	0.01%
178	Firth of Tay and Eden Estuary	0.000019	0.0004%	0.001600	0.03%
179	Barry Links	0.000035	0.0007%	0.002904	0.06%
180	Firth of Tay and Eden Estuary	0.000007	0.0001%	0.000561	0.01%
181	Firth of Tay and Eden Estuary	0.000008	0.0002%	0.000675	0.01%
182	Firth of Tay and Eden Estuary	0.000013	0.0003%	0.001120	0.02%
183	Firth of Tay and Eden Estuary	0.000034	0.0007%	0.002775	0.06%
184	Firth of Tay and Eden Estuary	0.000016	0.0003%	0.001402	0.03%
185	Ancient Woodland	0.000030	0.0006%	0.002529	0.05%
186	Firth of Tay and Eden Estuary	0.000028	0.0006%	0.002250	0.04%
187	Firth of Tay and Eden Estuary	0.000028	0.0006%	0.002228	0.04%

188	Weet's/Camustane/+ Woods	0.000022	0.0004%	0.001729	0.03%
189	Firth of Tay and Eden Estuary	0.000015	0.0003%	0.001305	0.03%
190	Firth of Tay and Eden Estuary	0.000028	0.0006%	0.002270	0.05%
191	Firth of Tay and Eden Estuary	0.000024	0.0005%	0.001906	0.04%
192	Firth of Tay and Eden Estuary	0.000024	0.0005%	0.001889	0.04%
193	Tentsmuir	0.000014	0.0003%	0.001181	0.02%
194	Firth of Tay and Eden Estuary	0.000013	0.0003%	0.001131	0.02%
195	Firth of Tay and Eden Estuary	0.000023	0.0005%	0.001891	0.04%
196	Firth of Tay and Eden Estuary	0.000023	0.0005%	0.001895	0.04%
197	Firth of Tay and Eden Estuary	0.000023	0.0005%	0.001852	0.04%
198	Firth of Tay and Eden Estuary	0.000021	0.0004%	0.001707	0.03%
199	Firth of Tay and Eden Estuary	0.000020	0.0004%	0.001563	0.03%
200	Firth of Tay and Eden Estuary	0.000019	0.0004%	0.001502	0.03%
201	Firth of Tay and Eden Estuary	0.000019	0.0004%	0.001588	0.03%
202	Tentsmuir	0.000014	0.0003%	0.001172	0.02%
203	Firth of Tay and Eden Estuary	0.000032	0.0006%	0.002614	0.05%
204	Firth of Tay and Eden Estuary	0.000042	0.0008%	0.003736	0.07%
205	Firth of Tay and Eden Estuary	0.000046	0.0009%	0.003793	0.08%
206	Firth of Tay and Eden Estuary	0.000036	0.0007%	0.003229	0.06%
207	Firth of Tay and Eden Estuary	0.000028	0.0006%	0.002598	0.05%
208	Firth of Tay and Eden Estuary	0.000033	0.0007%	0.002920	0.06%
209	Firth of Tay and Eden Estuary	0.000023	0.0005%	0.001932	0.04%
210	Firth of Tay and Eden Estuary	0.000016	0.0003%	0.001354	0.03%
211	Firth of Tay and Eden Estuary	0.000012	0.0002%	0.001061	0.02%

212	Firth of Tay and Eden Estuary	0.000012	0.0002%	0.001014	0.02%
213	Firth of Tay and Eden Estuary	0.000016	0.0003%	0.001435	0.03%
214	Firth of Tay and Eden Estuary	0.000017	0.0003%	0.001396	0.03%
215	Firth of Tay and Eden Estuary	0.000011	0.0002%	0.000933	0.02%
216	Firth of Tay and Eden Estuary	0.000013	0.0003%	0.001051	0.02%

E1.7 HCl concentrations

Table E7: Predicted HCl concentrations and total deposition at sensitive ecological sites

Ecological receptor ID	Receptor location	HCl annual mean concentration (PC) (µg/m^3)		DERL facility			EfW CHP facility		
		DERL facility	EfW CHP facility	HCl dry deposition (PC) (kg/ha/yr)	HCl wet deposition (PC) (kg/ha/yr)	HCl annual mean total deposition (PC) (kg/ha/yr)	HCl dry deposition (PC) (kg/ha/yr)	HCl wet deposition (PC) (kg/ha/yr)	HCl annual mean total deposition (PC) (kg/ha/yr)
1	Firth of Tay and Eden Estuary	0.00030	0.0003	0.002	0.000006	0.002	0.0025	0.000007	0.0025
2	Firth of Tay and Eden Estuary	0.00034	0.0004	0.003	0.000007	0.003	0.0029	0.000008	0.0029
3	Inner Tay Estuary	0.00034	0.0004	0.003	0.000007	0.003	0.0029	0.000008	0.0029
4	Firth of Tay and Eden Estuary	0.00038	0.0004	0.003	0.000008	0.003	0.0032	0.000009	0.0032
5	Firth of Tay and Eden Estuary	0.00021	0.0002	0.002	0.000004	0.002	0.0017	0.000005	0.0018
6	Firth of Tay and Eden Estuary	0.00043	0.0005	0.003	0.000009	0.003	0.0037	0.000010	0.0037
7	Inner Tay Estuary	0.00043	0.0005	0.003	0.000009	0.003	0.0037	0.000010	0.0037
8	Firth of Tay and Eden Estuary	0.00030	0.0003	0.002	0.000006	0.002	0.0025	0.000007	0.0025
9	Firth of Tay and Eden Estuary	0.00050	0.0006	0.004	0.000011	0.004	0.0043	0.000012	0.0043
10	Firth of Tay and Eden Estuary	0.00023	0.0003	0.002	0.000005	0.002	0.0020	0.000006	0.0020

11	Firth of Tay and Eden Estuary	0.00057	0.0006	0.004	0.000012	0.004	0.0048	0.000014	0.0048
12	Firth of Tay and Eden Estuary	0.00039	0.0004	0.003	0.000008	0.003	0.0033	0.000009	0.0033
13	Firth of Tay and Eden Estuary	0.00029	0.0003	0.002	0.000006	0.002	0.0025	0.000007	0.0025
14	Gallowhill/Cawmill Woods	0.00111	0.0012	0.020	0.000024	0.020	0.0224	0.000026	0.0224
15	Firth of Tay and Eden Estuary	0.00063	0.0007	0.005	0.000014	0.005	0.0053	0.000015	0.0053
16	Firth of Tay and Eden Estuary	0.00030	0.0003	0.002	0.000006	0.002	0.0025	0.000007	0.0025
17	FID:175 x	0.00086	0.0009	0.016	0.000018	0.016	0.0174	0.000020	0.0174
18	Baldrogon Wood	0.00155	0.0017	0.029	0.000033	0.029	0.0314	0.000037	0.0315
19	Wynton Wood	0.00136	0.0015	0.025	0.000029	0.025	0.0275	0.000032	0.0275
20	FID:1	0.00057	0.0006	0.004	0.000012	0.004	0.0048	0.000013	0.0048
21	Firth of Tay and Eden Estuary	0.00066	0.0007	0.005	0.000014	0.005	0.0056	0.000016	0.0056
22	Firth of Tay and Eden Estuary	0.00050	0.0006	0.004	0.000011	0.004	0.0042	0.000012	0.0042
23	Firth of Tay and Eden Estuary	0.00034	0.0004	0.003	0.000007	0.003	0.0029	0.000008	0.0029
24	FID:195 x	0.00206	0.0023	0.038	0.000044	0.038	0.0416	0.000049	0.0416
25	FID:42	0.00256	0.0028	0.047	0.000055	0.047	0.0517	0.000060	0.0517
26	Balmerino - Wormit Shore	0.00036	0.0004	0.003	0.000008	0.003	0.0031	0.000009	0.0031
27	Trottick Mill Ponds	0.00286	0.0031	0.022	0.000061	0.022	0.0241	0.000067	0.0241
28	Firth of Tay and Eden Estuary	0.00064	0.0007	0.005	0.000014	0.005	0.0054	0.000015	0.0054

29	East/West Links Wood	0.00044	0.0005	0.008	0.000009	0.008	0.0088	0.000010	0.0088
30	North Hill	0.00041	0.0004	0.007	0.000009	0.007	0.0082	0.000010	0.0082
31	River Tay	0.00023	0.0003	0.002	0.000005	0.002	0.0020	0.000005	0.0020
32	FID:50 x	0.00291	0.0032	0.054	0.000063	0.054	0.0588	0.000069	0.0589
33	FID:1	0.00065	0.0007	0.005	0.000014	0.005	0.0054	0.000015	0.0055
34	FID:19	0.00186	0.0020	0.014	0.000040	0.014	0.0157	0.000044	0.0157
35	Balmuir Wood	0.00137	0.0015	0.025	0.000030	0.025	0.0278	0.000032	0.0278
36	River Tay	0.00024	0.0003	0.002	0.000005	0.002	0.0021	0.000006	0.0021
37	Dighty Water	0.00404	0.0044	0.031	0.000087	0.031	0.0340	0.000095	0.0341
38	Knockhill Wood	0.00048	0.0005	0.009	0.000010	0.009	0.0096	0.000011	0.0097
39	FID:81 x	0.00259	0.0028	0.048	0.000056	0.048	0.0524	0.000061	0.0525
40	Dighty Water	0.00489	0.0054	0.037	0.000105	0.038	0.0411	0.000115	0.0413
41	FID:42	0.00316	0.0035	0.024	0.000068	0.024	0.0266	0.000075	0.0267
42	Whitehouse Den	0.00060	0.0007	0.005	0.000013	0.005	0.0051	0.000014	0.0051
43	Firth of Tay and Eden Estuary	0.00078	0.0009	0.006	0.000017	0.006	0.0066	0.000018	0.0066
44	River Tay	0.00027	0.0003	0.002	0.000006	0.002	0.0022	0.000006	0.0022
45	Dighty Water	0.00463	0.0051	0.036	0.000099	0.036	0.0390	0.000109	0.0391
46	FID:41 x	0.00463	0.0051	0.036	0.000099	0.036	0.0390	0.000109	0.0391
47	Morendy Wood	0.00052	0.0006	0.010	0.000011	0.010	0.0105	0.000012	0.0105
48	Corbie Den	0.00050	0.0006	0.009	0.000011	0.009	0.0102	0.000012	0.0102
49	Sheihill Wood	0.00131	0.0014	0.024	0.000028	0.024	0.0266	0.000031	0.0266
50	Laverock Law	0.00059	0.0006	0.011	0.000013	0.011	0.0118	0.000014	0.0119
51	FID:89 x	0.00212	0.0023	0.039	0.000046	0.039	0.0429	0.000050	0.0429

52	Dighty Water	0.00476	0.0052	0.036	0.000102	0.037	0.0400	0.000112	0.0402
53	FID:30	0.00051	0.0006	0.009	0.000011	0.009	0.0104	0.000012	0.0104
54	Roseberry Wood	0.00060	0.0007	0.011	0.000013	0.011	0.0121	0.000014	0.0121
55	FID:0	0.00061	0.0007	0.005	0.000013	0.005	0.0051	0.000014	0.0051
56	Craig Law	0.00067	0.0007	0.012	0.000014	0.012	0.0135	0.000016	0.0135
57	Fithie Burn	0.00274	0.0030	0.021	0.000059	0.021	0.0231	0.000065	0.0232
58	FID:90 x	0.00258	0.0028	0.047	0.000055	0.048	0.0521	0.000061	0.0522
59	River Tay	0.00030	0.0003	0.002	0.000006	0.002	0.0025	0.000007	0.0025
60	Dighty Water	0.00775	0.0085	0.059	0.000166	0.060	0.0653	0.000183	0.0654
61	FID:116 x	0.00558	0.0061	0.103	0.000120	0.103	0.1128	0.000132	0.1129
62	FID:88 x	0.00265	0.0029	0.049	0.000057	0.049	0.0536	0.000063	0.0536
63	Fithie Burn	0.00254	0.0028	0.019	0.000055	0.020	0.0214	0.000060	0.0215
64	FID:85 x	0.00235	0.0026	0.043	0.000050	0.043	0.0474	0.000055	0.0475
65	Corbie Den	0.00050	0.0006	0.009	0.000011	0.009	0.0102	0.000012	0.0102
66	FID:88 x	0.00343	0.0038	0.063	0.000074	0.063	0.0693	0.000081	0.0694
67	Corbie Den	0.00044	0.0005	0.008	0.000010	0.008	0.0090	0.000010	0.0090
68	Pickletillem Marsh	0.00060	0.0007	0.011	0.000013	0.011	0.0122	0.000014	0.0122
69	FID:206 x	0.00249	0.0027	0.046	0.000053	0.046	0.0503	0.000059	0.0503
70	Dighty Water	0.00164	0.0018	0.013	0.000035	0.013	0.0138	0.000039	0.0138
71	Fithie Burn	0.00249	0.0027	0.019	0.000054	0.019	0.0210	0.000059	0.0211
72	Firth of Tay and Eden Estuary	0.00134	0.0015	0.010	0.000029	0.010	0.0113	0.000032	0.0113
73	FID:84 x	0.00214	0.0024	0.039	0.000046	0.039	0.0433	0.000051	0.0434
74	East Muirhouse Strip	0.00149	0.0016	0.028	0.000032	0.028	0.0302	0.000035	0.0302

75	Brighty Wood	0.00096	0.0011	0.018	0.000021	0.018	0.0194	0.000023	0.0194
76	FID:91 x	0.00405	0.0044	0.074	0.000087	0.075	0.0818	0.000095	0.0819
77	Firth of Tay and Eden Estuary	0.00078	0.0009	0.006	0.000017	0.006	0.0066	0.000018	0.0066
78	Gallowfauld Burn	0.00041	0.0005	0.003	0.000009	0.003	0.0035	0.000010	0.0035
79	FID:88 x	0.00286	0.0031	0.053	0.000061	0.053	0.0577	0.000067	0.0578
80	FID:40	0.00352	0.0039	0.027	0.000076	0.027	0.0296	0.000083	0.0297
81	Fithie Burn	0.00280	0.0031	0.021	0.000060	0.022	0.0236	0.000066	0.0237
82	Duntrune/Glack Hills	0.00220	0.0024	0.040	0.000047	0.041	0.0445	0.000052	0.0445
83	Dighty Water	0.00118	0.0013	0.009	0.000025	0.009	0.0099	0.000028	0.0100
84	River Tay	0.00034	0.0004	0.003	0.000007	0.003	0.0029	0.000008	0.0029
85	FID:75	0.00071	0.0008	0.013	0.000015	0.013	0.0144	0.000017	0.0144
86	Corbie Den	0.00043	0.0005	0.008	0.000009	0.008	0.0086	0.000010	0.0086
87	St Michael's Wood Marshes	0.00056	0.0006	0.010	0.000012	0.010	0.0114	0.000013	0.0114
88	St Michael's Wood	0.00056	0.0006	0.010	0.000012	0.010	0.0114	0.000013	0.0114
89	Fithie Burn	0.00832	0.0091	0.064	0.000179	0.064	0.0700	0.000196	0.0702
90	Gagie Marsh	0.00113	0.0012	0.009	0.000024	0.009	0.0095	0.000027	0.0095
91	FID:40 x	0.00440	0.0048	0.034	0.000094	0.034	0.0370	0.000104	0.0371
92	Fithie Burn	0.03043	0.0334	0.233	0.000653	0.234	0.2562	0.000717	0.2569
93	FID:0	0.00063	0.0007	0.005	0.000013	0.005	0.0053	0.000015	0.0053
94	FID:206 x	0.00345	0.0038	0.064	0.000074	0.064	0.0698	0.000081	0.0699
95	FID:88 x	0.00345	0.0038	0.064	0.000074	0.064	0.0698	0.000081	0.0699
96	Fithie Burn	0.00511	0.0056	0.039	0.000110	0.039	0.0430	0.000120	0.0432
97	Fithie Burn	0.00338	0.0037	0.026	0.000073	0.026	0.0285	0.000080	0.0285

98	Kirkton Wood	0.00066	0.0007	0.012	0.000014	0.012	0.0132	0.000015	0.0133
99	Big Latch	0.00081	0.0009	0.015	0.000017	0.015	0.0164	0.000019	0.0164
100	Fithie Burn	0.00000	0.0000	0.000	0.000000	0.000	0.0000	0.000000	0.0000
101	FID:77 x	0.01102	0.0121	0.203	0.000237	0.203	0.2227	0.000260	0.2229
102	Eden Estuary	0.00039	0.0004	0.007	0.000008	0.007	0.0079	0.000009	0.0079
103	Firth of Tay and Eden Estuary	0.00076	0.0008	0.006	0.000016	0.006	0.0064	0.000018	0.0064
104	Tayport - Tentsmuir Coast	0.00076	0.0008	0.006	0.000016	0.006	0.0064	0.000018	0.0064
105	FID:77 x	0.00557	0.0061	0.103	0.000120	0.103	0.1127	0.000131	0.1128
106	Dighty Water	0.00923	0.0101	0.071	0.000198	0.071	0.0777	0.000218	0.0780
107	FID:152 x	0.01316	0.0144	0.242	0.000282	0.242	0.2659	0.000310	0.2662
108	Murroes Burn	0.01569	0.0172	0.120	0.000337	0.121	0.1321	0.000370	0.1325
109	FID:18	0.01817	0.0199	0.139	0.000390	0.140	0.1530	0.000428	0.1534
110	Murroes Burn	0.00892	0.0098	0.068	0.000191	0.069	0.0751	0.000210	0.0753
111	FID:76 x	0.03735	0.0410	0.687	0.000802	0.688	0.7547	0.000881	0.7556
112	Murroes Burn	0.03766	0.0414	0.289	0.000808	0.290	0.3171	0.000888	0.3180
113	FID:76 x	0.04476	0.0492	0.824	0.000961	0.825	0.9046	0.001055	0.9057
114	Murroes Burn	0.04011	0.0440	0.308	0.000861	0.308	0.3377	0.000946	0.3387
115	Kellas Wood	0.00142	0.0016	0.026	0.000030	0.026	0.0286	0.000033	0.0286
116	Dighty Water	0.01665	0.0183	0.128	0.000357	0.128	0.1402	0.000393	0.1406
117	Little Latch	0.00080	0.0009	0.015	0.000017	0.015	0.0161	0.000019	0.0161
118	FID:18	0.01197	0.0131	0.092	0.000257	0.092	0.1008	0.000282	0.1011
119	Murroes Burn	0.01112	0.0122	0.085	0.000239	0.086	0.0937	0.000262	0.0939
120	River Tay	0.00037	0.0004	0.003	0.000008	0.003	0.0031	0.000009	0.0032

121	FID:77 x	0.00782	0.0086	0.144	0.000168	0.144	0.1581	0.000184	0.1583
122	Murroes Burn	0.00806	0.0088	0.062	0.000173	0.062	0.0678	0.000190	0.0680
123	Murroes Burn	0.00459	0.0050	0.035	0.000099	0.035	0.0387	0.000108	0.0388
124	Tentsmuir	0.00060	0.0007	0.005	0.000013	0.005	0.0050	0.000014	0.0050
125	Dighty Water	0.01707	0.0188	0.131	0.000367	0.131	0.1438	0.000403	0.1442
126	Morton Lochs	0.00059	0.0006	0.011	0.000013	0.011	0.0119	0.000014	0.0120
127	FID:75 x	0.01352	0.0149	0.249	0.000290	0.249	0.2733	0.000319	0.2736
128	Rhynd Wood	0.00053	0.0006	0.010	0.000011	0.010	0.0106	0.000012	0.0106
129	West Wood	0.00076	0.0008	0.014	0.000016	0.014	0.0154	0.000018	0.0155
130	Tentsmuir	0.00057	0.0006	0.004	0.000012	0.004	0.0048	0.000013	0.0048
131	Morton Lochs	0.00056	0.0006	0.010	0.000012	0.010	0.0113	0.000013	0.0114
132	West Wood	0.00080	0.0009	0.015	0.000017	0.015	0.0161	0.000019	0.0161
133	Buckler Heads Wood	0.00169	0.0019	0.031	0.000036	0.031	0.0342	0.000040	0.0342
134	Firth of Tay and Eden Estuary	0.00087	0.0010	0.007	0.000019	0.007	0.0073	0.000021	0.0073
135	MonifIieth Bay	0.00087	0.0010	0.007	0.000019	0.007	0.0073	0.000021	0.0073
136	Dighty Water	0.01670	0.0183	0.128	0.000359	0.128	0.1406	0.000394	0.1410
137	Woodside Wood	0.00232	0.0025	0.043	0.000050	0.043	0.0468	0.000055	0.0469
138	Morton Links	0.00052	0.0006	0.009	0.000011	0.009	0.0104	0.000012	0.0104
139	Carrot Hill Meadow	0.00049	0.0005	0.009	0.000011	0.009	0.0099	0.000012	0.0099
140	Firth of Tay and Eden Estuary	0.00057	0.0006	0.004	0.000012	0.004	0.0048	0.000013	0.0048
141	Firth of Tay and Eden Estuary	0.00144	0.0016	0.011	0.000031	0.011	0.0121	0.000034	0.0122
142	FID:82 x	0.00227	0.0025	0.042	0.000049	0.042	0.0460	0.000054	0.0460

143	Tentsmuir	0.00051	0.0006	0.009	0.000011	0.009	0.0102	0.000012	0.0102
144	FID:59 x	0.00455	0.0050	0.084	0.000098	0.084	0.0919	0.000107	0.0921
145	Broughty Ferry	0.00180	0.0020	0.014	0.000039	0.014	0.0152	0.000042	0.0152
146	Eden Estuary	0.00038	0.0004	0.007	0.000008	0.007	0.0076	0.000009	0.0076
147	FID:74 x	0.01492	0.0164	0.275	0.000320	0.275	0.3016	0.000352	0.3020
148	FID:81 x	0.00732	0.0080	0.135	0.000157	0.135	0.1479	0.000173	0.1481
149	Broughty Ferry	0.00223	0.0024	0.017	0.000048	0.017	0.0188	0.000053	0.0188
150	Tentsmuir	0.00045	0.0005	0.008	0.000010	0.008	0.0091	0.000011	0.0091
151	Firth of Tay and Eden Estuary	0.00184	0.0020	0.014	0.000039	0.014	0.0155	0.000043	0.0155
152	Moniflieth Bay	0.00184	0.0020	0.014	0.000039	0.014	0.0155	0.000043	0.0155
153	Tentsmuir	0.00046	0.0005	0.008	0.000010	0.008	0.0092	0.000011	0.0092
154	Tentsmuir	0.00053	0.0006	0.004	0.000011	0.004	0.0045	0.000013	0.0045
155	Gallow Hill	0.01120	0.0123	0.206	0.000240	0.206	0.2264	0.000264	0.2266
156	Tentsmuir	0.00041	0.0004	0.007	0.000009	0.007	0.0082	0.000010	0.0082
157	Firth of Tay and Eden Estuary	0.00064	0.0007	0.005	0.000014	0.005	0.0054	0.000015	0.0054
158	Firth of Tay and Eden Estuary	0.00115	0.0013	0.009	0.000025	0.009	0.0097	0.000027	0.0097
159	Firth of Tay and Eden Estuary	0.00033	0.0004	0.002	0.000007	0.003	0.0027	0.000008	0.0027
160	Firth of Tay and Eden Estuary	0.00307	0.0034	0.024	0.000066	0.024	0.0259	0.000072	0.0259
161	Monifleth Bay	0.00307	0.0034	0.024	0.000066	0.024	0.0259	0.000072	0.0259
162	Firth of Tay and Eden Estuary	0.00034	0.0004	0.003	0.000007	0.003	0.0029	0.000008	0.0029

163	Eden Estuary	0.00034	0.0004	0.006	0.000007	0.006	0.0069	0.000008	0.0069
164	Firth of Tay and Eden Estuary	0.00406	0.0045	0.031	0.000087	0.031	0.0342	0.000096	0.0343
165	Laws Hill	0.00951	0.0104	0.175	0.000204	0.175	0.1921	0.000224	0.1923
166	Tentsmuir	0.00076	0.0008	0.006	0.000016	0.006	0.0064	0.000018	0.0064
167	Firth of Tay and Eden Estuary	0.00034	0.0004	0.003	0.000007	0.003	0.0028	0.000008	0.0028
168	Eden Estuary	0.00034	0.0004	0.006	0.000007	0.006	0.0068	0.000008	0.0068
169	Denfind Plantation	0.00147	0.0016	0.027	0.000031	0.027	0.0296	0.000035	0.0296
170	Firth of Tay and Eden Estuary	0.00033	0.0004	0.003	0.000007	0.003	0.0028	0.000008	0.0028
171	Eden Estuary	0.00033	0.0004	0.006	0.000007	0.006	0.0066	0.000008	0.0066
172	Firth of Tay and Eden Estuary	0.00087	0.0010	0.007	0.000019	0.007	0.0073	0.000020	0.0073
173	Firth of Tay and Eden Estuary	0.00410	0.0045	0.031	0.000088	0.032	0.0346	0.000097	0.0347
174	Eden Estuary	0.00034	0.0004	0.006	0.000007	0.006	0.0068	0.000008	0.0068
175	Tentsmuir	0.00046	0.0005	0.004	0.000010	0.004	0.0039	0.000011	0.0039
176	Firth of Tay and Eden Estuary	0.00379	0.0042	0.029	0.000081	0.029	0.0319	0.000089	0.0320
177	Firth of Tay and Eden Estuary	0.00034	0.0004	0.003	0.000007	0.003	0.0028	0.000008	0.0029
178	Firth of Tay and Eden Estuary	0.00095	0.0010	0.007	0.000020	0.007	0.0080	0.000022	0.0080
179	Barry Links	0.00416	0.0046	0.032	0.000089	0.032	0.0350	0.000098	0.0351
180	Firth of Tay and Eden Estuary	0.00029	0.0003	0.002	0.000006	0.002	0.0025	0.000007	0.0025

181	Firth of Tay and Eden Estuary	0.00038	0.0004	0.003	0.000008	0.003	0.0032	0.000009	0.0032
182	Firth of Tay and Eden Estuary	0.00052	0.0006	0.004	0.000011	0.004	0.0044	0.000012	0.0044
183	Firth of Tay and Eden Estuary	0.00261	0.0029	0.020	0.000056	0.020	0.0220	0.000061	0.0220
184	Firth of Tay and Eden Estuary	0.00074	0.0008	0.006	0.000016	0.006	0.0063	0.000018	0.0063
185	FID:209	0.00653	0.0072	0.120	0.000140	0.120	0.1320	0.000154	0.1322
186	Firth of Tay and Eden Estuary	0.00322	0.0035	0.025	0.000069	0.025	0.0271	0.000076	0.0272
187	Firth of Tay and Eden Estuary	0.00319	0.0035	0.024	0.000069	0.025	0.0269	0.000075	0.0269
188	Weet's/Camustane/+ Woods	0.00227	0.0025	0.042	0.000049	0.042	0.0458	0.000053	0.0459
189	Firth of Tay and Eden Estuary	0.00080	0.0009	0.006	0.000017	0.006	0.0068	0.000019	0.0068
190	Firth of Tay and Eden Estuary	0.00197	0.0022	0.015	0.000042	0.015	0.0166	0.000047	0.0167
191	Firth of Tay and Eden Estuary	0.00224	0.0025	0.017	0.000048	0.017	0.0189	0.000053	0.0189
192	Firth of Tay and Eden Estuary	0.00225	0.0025	0.017	0.000048	0.017	0.0190	0.000053	0.0190
193	Tentsmuir	0.00098	0.0011	0.008	0.000021	0.008	0.0082	0.000023	0.0083
194	Firth of Tay and Eden Estuary	0.00069	0.0008	0.005	0.000015	0.005	0.0058	0.000016	0.0058
195	Firth of Tay and Eden Estuary	0.00174	0.0019	0.013	0.000037	0.013	0.0147	0.000041	0.0147

196	Firth of Tay and Eden Estuary	0.00174	0.0019	0.013	0.000037	0.013	0.0146	0.000041	0.0147
197	Firth of Tay and Eden Estuary	0.00160	0.0018	0.012	0.000034	0.012	0.0134	0.000038	0.0135
198	Firth of Tay and Eden Estuary	0.00155	0.0017	0.012	0.000033	0.012	0.0130	0.000036	0.0131
199	Firth of Tay and Eden Estuary	0.00206	0.0023	0.016	0.000044	0.016	0.0174	0.000049	0.0174
200	Firth of Tay and Eden Estuary	0.00277	0.0030	0.021	0.000059	0.021	0.0233	0.000065	0.0234
201	Firth of Tay and Eden Estuary	0.00135	0.0015	0.010	0.000029	0.010	0.0114	0.000032	0.0114
202	Tentsmuir	0.00089	0.0010	0.007	0.000019	0.007	0.0075	0.000021	0.0075
203	Firth of Tay and Eden Estuary	0.00190	0.0021	0.015	0.000041	0.015	0.0160	0.000045	0.0160
204	Firth of Tay and Eden Estuary	0.00279	0.0031	0.021	0.000060	0.021	0.0235	0.000066	0.0235
205	Firth of Tay and Eden Estuary	0.00371	0.0041	0.028	0.000080	0.029	0.0312	0.000087	0.0313
206	Firth of Tay and Eden Estuary	0.00238	0.0026	0.018	0.000051	0.018	0.0201	0.000056	0.0201
207	Firth of Tay and Eden Estuary	0.00109	0.0012	0.008	0.000023	0.008	0.0092	0.000026	0.0092
208	Firth of Tay and Eden Estuary	0.00151	0.0017	0.012	0.000033	0.012	0.0128	0.000036	0.0128
209	Firth of Tay and Eden Estuary	0.00070	0.0008	0.005	0.000015	0.005	0.0059	0.000016	0.0059
210	Firth of Tay and Eden Estuary	0.00063	0.0007	0.005	0.000014	0.005	0.0053	0.000015	0.0054

211	Firth of Tay and Eden Estuary	0.00060	0.0007	0.005	0.000013	0.005	0.0050	0.000014	0.0051
212	Firth of Tay and Eden Estuary	0.00060	0.0007	0.005	0.000013	0.005	0.0050	0.000014	0.0050
213	Firth of Tay and Eden Estuary	0.00066	0.0007	0.005	0.000014	0.005	0.0056	0.000016	0.0056
214	Firth of Tay and Eden Estuary	0.00063	0.0007	0.005	0.000013	0.005	0.0053	0.000015	0.0053
215	Firth of Tay and Eden Estuary	0.00055	0.0006	0.004	0.000012	0.004	0.0046	0.000013	0.0047
216	Firth of Tay and Eden Estuary	0.00058	0.0006	0.004	0.000012	0.004	0.0049	0.000014	0.0049

E1.8 Nutrient nitrogen deposition

Table E8: Nutrient nitrogen deposition critical loads and background deposition levels

Designated area	Receptor IDs	Most sensitive habitat	DERL and EfW CHP facility	
			CL_{NN} (kg N/ha/yr)	Bgd dep N (kg N/ha/yr)
Firth of Tay and Eden Estuary	1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 15, 16, 21, 22, 23, 28, 43, 72, 77, 103, 134, 140, 141, 151, 157, 158, 159, 160, 162, 164, 167, 170, 172, 173, 176, 177, 178, 180, 181, 182, 183, 184, 186, 187, 189, 190, 191, 192, 194, 195, 196, 197, 198, 199, 200, 201, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216	Estuary/Pioneer, low-mid, mid-upper saltmarshes	20	15.68
Inner Tay Estuary	3, 7	Transition Saltmarsh/Upland flushes fens and swamps	10	14
River Tay	31, 36, 44, 59, 84, 120	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoeto-Nanojuncetea	3	5.18
River Tay	31, 36, 44, 59, 84, 120	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoeto-Nanojuncetea	10	17.92
Pickletillem Marsh	68	Basin Fen/Upland Flushes Fens and Swamps	10	15
St Michael's Wood Marshes	87	Upland Flushes Fens and Swamps	10	12.6
Gagie Marsh	90	Upland Flushes Fens and Swamps	10	16.8
Tayport - Tentsmuir Coast	104	Sand-Dunes/Coastal Vegetated Shingle	8	9.38
Morton Lochs	126, 131	Sand-Dunes/Coastal Vegetated Shingle	8	9.38
Carrot Hill Meadow	139	Spring Fen/Upland Flushes Fens and Swamps	10	14.7
Barry Links	179	Sand-Dunes/Coastal Vegetated Shingle	8	9.94

Table E9: Impacts as a percentage of critical load

Designated area	DERL				EfW CHP facility			
	(PC) Max N (kg N/ha/yr)	(PEDR) Max N + Bgd (kg N/ha/yr)	PC/CL (%)	PEDR/CL (%)	(PC) Max N (kg N/ha/yr)	(PEDR) Max N + Bgd (kg N/ha/yr)	PC/CL (%)	PEDR/CL (%)
Firth of Tay and Eden Estuary	0.006	15.686	0.028	78.428	0.021	15.701	0.104	78.504
Inner Tay Estuary	0.001	14.001	0.006	140.006	0.002	14.002	0.022	140.022
River Tay	0.001	5.181	0.017	172.684	0.002	5.182	0.063	172.730
River Tay	0.001	17.921	0.005	179.205	0.002	17.922	0.019	179.219
Pickletillem Marsh	0.002	15.002	0.016	150.016	0.005	15.005	0.052	150.052
St Michael's Wood Marshes	0.001	12.601	0.015	126.015	0.005	12.605	0.049	126.049
Gagie Marsh	0.002	16.802	0.015	168.015	0.006	16.806	0.057	168.057
Tayport - Tentsmuir Coast	0.001	9.381	0.013	117.263	0.004	9.384	0.048	117.298
Morton Lochs	0.002	9.382	0.019	117.269	0.005	9.385	0.064	117.314
Carrot Hill Meadow	0.001	14.701	0.013	147.013	0.004	14.704	0.043	147.043
Barry Links	0.006	9.946	0.071	124.321	0.021	9.961	0.263	124.513

E1.9 Acid deposition

Table E10: Acid deposition critical loads and background deposition rates

Designated area	Receptor IDs	Most sensitive habitat	DERL and EfW CHP facility				
			CLNmin (kg N/ha/yr)	CLNmax (kg N/ha/yr)	CLS (kg N/ha/yr)	N bgd (kg N/ha/yr)	S bgd (kg N/ha/yr)
Firth of Tay and Eden Estuary	1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 15, 16, 21, 22, 23, 28, 43, 72, 77, 103, 134, 140, 141, 151, 157, 158, 159, 160, 162, 164, 167, 170, 172, 173, 176, 177, 178, 180, 181, 182, 183, 184, 186, 187, 189, 190, 191, 192, 194, 195, 196, 197, 198, 199, 200, 201, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216	n/s	n/s	n/s	n/s	n/s	n/s
Inner Tay Estuary	3, 7	Transition Saltmarsh/Lowland fens	0.438	4.498	4.6	1.0	0.3
Gallowhill/Cawmill Woods	14	n/s	n/s	n/s	n/s	n/s	n/s
FID:175 x	17	n/s	n/s	n/s	n/s	n/s	n/s
Baldrogon Wood	18	n/s	n/s	n/s	n/s	n/s	n/s
Wynton Wood	19	n/s	n/s	n/s	n/s	n/s	n/s
FID:1	20, 33	n/s	n/s	n/s	n/s	n/s	n/s
FID:195 x	24	n/s	n/s	n/s	n/s	n/s	n/s
FID:42	25, 41	n/s	n/s	n/s	n/s	n/s	n/s
Balmerino - Wormit Shore	26	n/s	n/s	n/s	n/s	n/s	n/s
Trottick Mill Ponds	27	n/s	n/s	n/s	n/s	n/s	n/s
East/West Links Wood	29	n/s	n/s	n/s	n/s	n/s	n/s
North Hill	30	n/s	n/s	n/s	n/s	n/s	n/s
River Tay	31, 36, 44, 59, 84, 120	No CLs	No CLs	No CLs	No CLs	No CLs	No CLs
FID:50 x	32	n/s	n/s	n/s	n/s	n/s	n/s

FID:1	20, 33	n/s	n/s	n/s	n/s	n/s	n/s
FID:19	34	n/s	n/s	n/s	n/s	n/s	n/s
Balmuir Wood	35	n/s	n/s	n/s	n/s	n/s	n/s
Dighty Water	37, 40, 45, 52, 60, 70, 83, 106, 116, 125, 136	n/s	n/s	n/s	n/s	n/s	n/s
Knockhill Wood	38	n/s	n/s	n/s	n/s	n/s	n/s
FID:81 x	39, 148	n/s	n/s	n/s	n/s	n/s	n/s
Whitehouse Den	42	n/s	n/s	n/s	n/s	n/s	n/s
FID:41 x	46	n/s	n/s	n/s	n/s	n/s	n/s
Morendy Wood	47	n/s	n/s	n/s	n/s	n/s	n/s
Corbie Den	48, 65, 67, 86	n/s	n/s	n/s	n/s	n/s	n/s
Sheihill Wood	49	n/s	n/s	n/s	n/s	n/s	n/s
Laverock Law	50	n/s	n/s	n/s	n/s	n/s	n/s
FID:89 x	51	n/s	n/s	n/s	n/s	n/s	n/s
FID:30	53	n/s	n/s	n/s	n/s	n/s	n/s
Roseberry Wood	54	n/s	n/s	n/s	n/s	n/s	n/s
FID:0	55, 93	n/s	n/s	n/s	n/s	n/s	n/s
Craig Law	56	n/s	n/s	n/s	n/s	n/s	n/s
Fithie Burn	57, 63, 71, 81, 89, 92, 96, 97, 100	n/s	n/s	n/s	n/s	n/s	n/s
FID:90 x	58	n/s	n/s	n/s	n/s	n/s	n/s
FID:116 x	61	n/s	n/s	n/s	n/s	n/s	n/s
FID:88 x	62, 66, 79, 95	n/s	n/s	n/s	n/s	n/s	n/s
FID:85 x	64	n/s	n/s	n/s	n/s	n/s	n/s
Pickletillem Marsh	68	Basin Fen/Lowland Fens	0.223	4.263	4.4	0.9	0.24
FID:206 x	69, 94	n/s	n/s	n/s	n/s	n/s	n/s
FID:84 x	73	n/s	n/s	n/s	n/s	n/s	n/s
East Muirhouse Strip	74	n/s	n/s	n/s	n/s	n/s	n/s
Brighty Wood	75	n/s	n/s	n/s	n/s	n/s	n/s
FID:91 x	76	n/s	n/s	n/s	n/s	n/s	n/s
Gallowfauld Burn	78	n/s	n/s	n/s	n/s	n/s	n/s
FID:40	80	n/s	n/s	n/s	n/s	n/s	n/s
Duntrune/Glack Hills	82	n/s	n/s	n/s	n/s	n/s	n/s
FID:75	85	n/s	n/s	n/s	n/s	n/s	n/s

St Michael's Wood Marshes	87	Lowland Fens	0.438	1.13	0.79	0.9	0.24
St Michael's Wood	88	n/s	n/s	n/s	n/s	n/s	n/s
Gagie Marsh	90	Lowland Fens	0.223	1.753	1.53	1.2	0.23
FID:40 x	91	n/s	n/s	n/s	n/s	n/s	n/s
Kirkton Wood	98	n/s	n/s	n/s	n/s	n/s	n/s
Big Latch	99	n/s	n/s	n/s	n/s	n/s	n/s
FID:77 x	101, 105, 121	n/s	n/s	n/s	n/s	n/s	n/s
Eden Estuary	102, 146, 163, 168, 171, 174	n/s	n/s	n/s	n/s	n/s	n/s
Tayport - Tentsmuir Coast	104	Sand-Dunes/Coastal Vegetated Shingle	0.223	0.63	0.38	0.67	0.21
FID:152 x	107	n/s	n/s	n/s	n/s	n/s	n/s
Murroes Burn	108, 110, 112, 114, 119, 122, 123	n/s	n/s	n/s	n/s	n/s	n/s
FID:18	109, 118	n/s	n/s	n/s	n/s	n/s	n/s
FID:76 x	111, 113	n/s	n/s	n/s	n/s	n/s	n/s
Kellas Wood	115	n/s	n/s	n/s	n/s	n/s	n/s
Little Latch	117	n/s	n/s	n/s	n/s	n/s	n/s
Tentsmuir	124, 130, 143, 150, 153, 154, 156, 166, 175, 193, 202	n/s	n/s	n/s	n/s	n/s	n/s
Morton Lochs	126, 131	Freshwater (no CLs)	No CLs	No CLs	No CLs	0.58	0.22
Morton Lochs	126, 131	Sand-Dunes/Coastal Vegetated Shingle	0.223	1.3	0.78	0.67	0.21
FID:75 x	127	n/s	n/s	n/s	n/s	n/s	n/s
Rhynd Wood	128	n/s	n/s	n/s	n/s	n/s	n/s
West Wood	129, 132	n/s	n/s	n/s	n/s	n/s	n/s
Buckler Heads Wood	133	n/s	n/s	n/s	n/s	n/s	n/s
MonifIieth Bay	135, 152, 161	n/s	n/s	n/s	n/s	n/s	n/s
Woodside Wood	137	n/s	n/s	n/s	n/s	n/s	n/s
Morton Links	138	n/s	n/s	n/s	n/s	n/s	n/s
Carrot Hill Meadow	139	Spring Fen/Lowland Fens	0.223	1.753	1.53	1.05	0.25
FID:82 x	142	n/s	n/s	n/s	n/s	n/s	n/s
FID:59 x	144	n/s	n/s	n/s	n/s	n/s	n/s
Broughty Ferry	145, 149	n/s	n/s	n/s	n/s	n/s	n/s

FID:74 x	147	n/s	n/s	n/s	n/s	n/s	n/s
Gallow Hill	155	n/s	n/s	n/s	n/s	n/s	n/s
Laws Hill	165	n/s	n/s	n/s	n/s	n/s	n/s
Denfind Plantation	169	n/s	n/s	n/s	n/s	n/s	n/s
Barry Links	179	Sand-Dunes/Coastal Vegetated Shingle	0.223	0.63	0.38	0.71	0.21
FID:209	185	n/s	n/s	n/s	n/s	n/s	n/s
Weet's/Camustane/+ Woods	188	n/s	n/s	n/s	n/s	n/s	n/s

Table E11: Maximum nitrogen and sulphur deposition at the designated areas

Designated area	**DERL**		**EfW CHP facility**	
	Max N dep (keg N/ha/yr)	**Max S dep (keg S/ha/yr)**	**Max N dep (keg N/ha/yr)**	**Max S dep (keg S/ha/yr)**
Inner Tay Estuary	0.000042	0.01451	0.0002	0.00028
Pickletillem Marsh	0.000112	0.04525	0.0004	0.00078
St Michael's Wood Marshes	0.000105	0.04782	0.0004	0.00073
Gagie Marsh	0.000110	0.03563	0.0004	0.00073
Tayport - Tentsmuir Coast	0.000074	0.04191	0.0003	0.00049
Morton Lochs	0.000110	0.04147	0.0004	0.00077
Carrot Hill Meadow	0.000091	0.02950	0.0003	0.00064
Barry Links	0.000404	0.05123	0.0015	0.00270

Table E12: Assessment of acid deposition impact on designated areas

Receptor location	DERL			EfW CHP facility		
	PC % of Critical Load Function	Background % of Critical Load Function	PEC % of Critical Load Function	PC % of Critical Load Function	Background % of Critical Load Function	PEC % of Critical Load Function
Inner Tay Estuary	0.2	28.9	29.1	<0.1	28.9	28.9
Pickletillem Marsh	1.2	26.7	27.9	<0.1	26.7	26.7
St Michael's Wood Marshes	4.4	100.9	105.3	<0.1	100.9	100.9
Gagie Marsh	2.3	81.6	83.9	<0.1	81.6	81.6
Tayport - Tentsmuir Coast	6.3	139.7	146	<0.1	139.7	139.7
Morton Lochs	3.1	67.7	70.8	<0.1	67.7	67.7
Carrot Hill Meadow	1.7	74.2	75.9	<0.1	74.2	74.2
Barry Links	7.9	146	154	<0.1	146	146

Appendix F

Contour Plots of Model Predicted Concentrations

Contents

F1 Predicted Environmental Concentrations due to the EfW CHP facility

Figure F1: EfW CHP facility predicted environmental concentration of annual mean NO_2 concentration (μg/m^3)

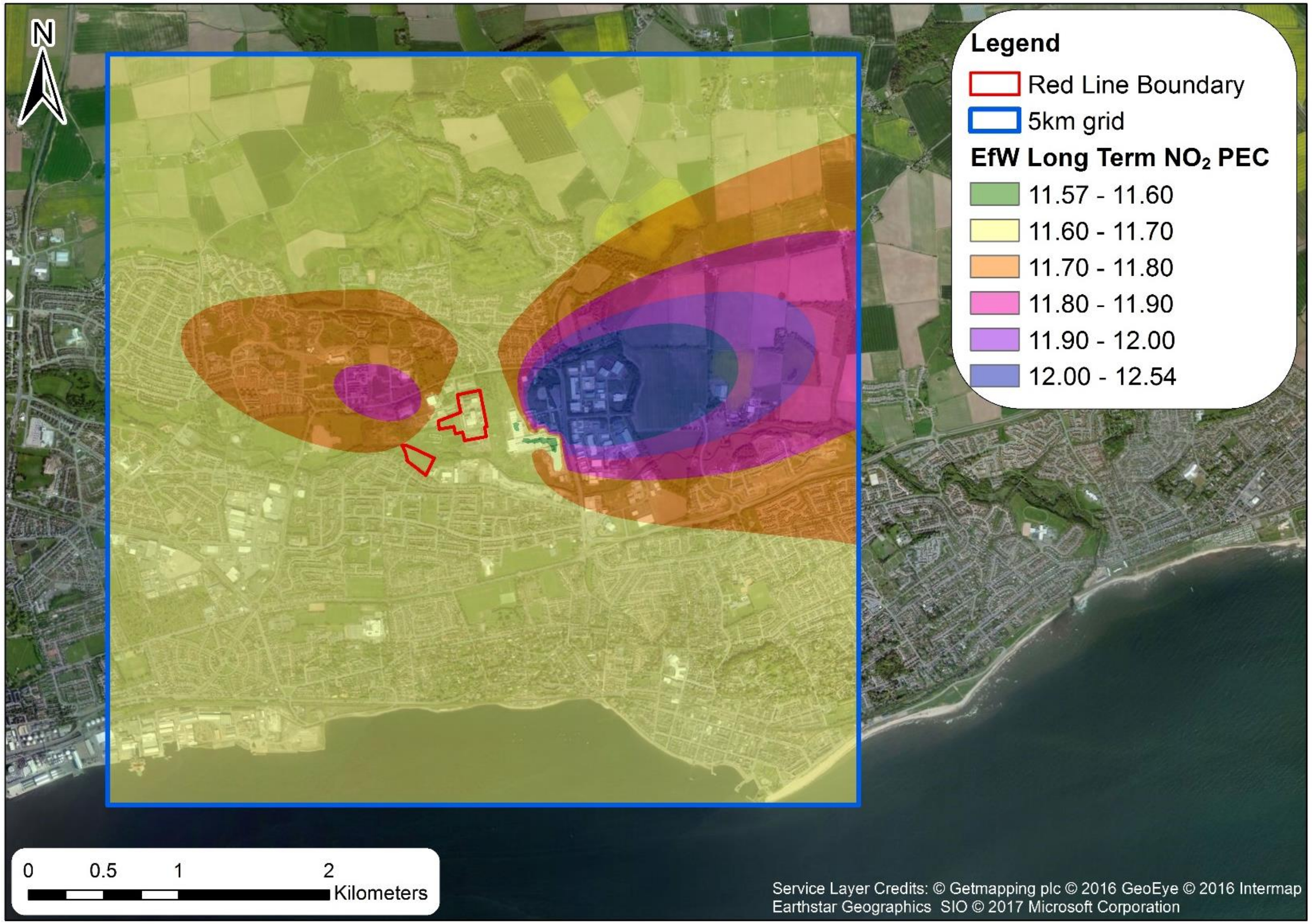


Figure F2: EfW CHP facility predicted environmental concentration of 99.79th percentile 1 hour mean NO_2 concentration ($\mu g/m^3$)

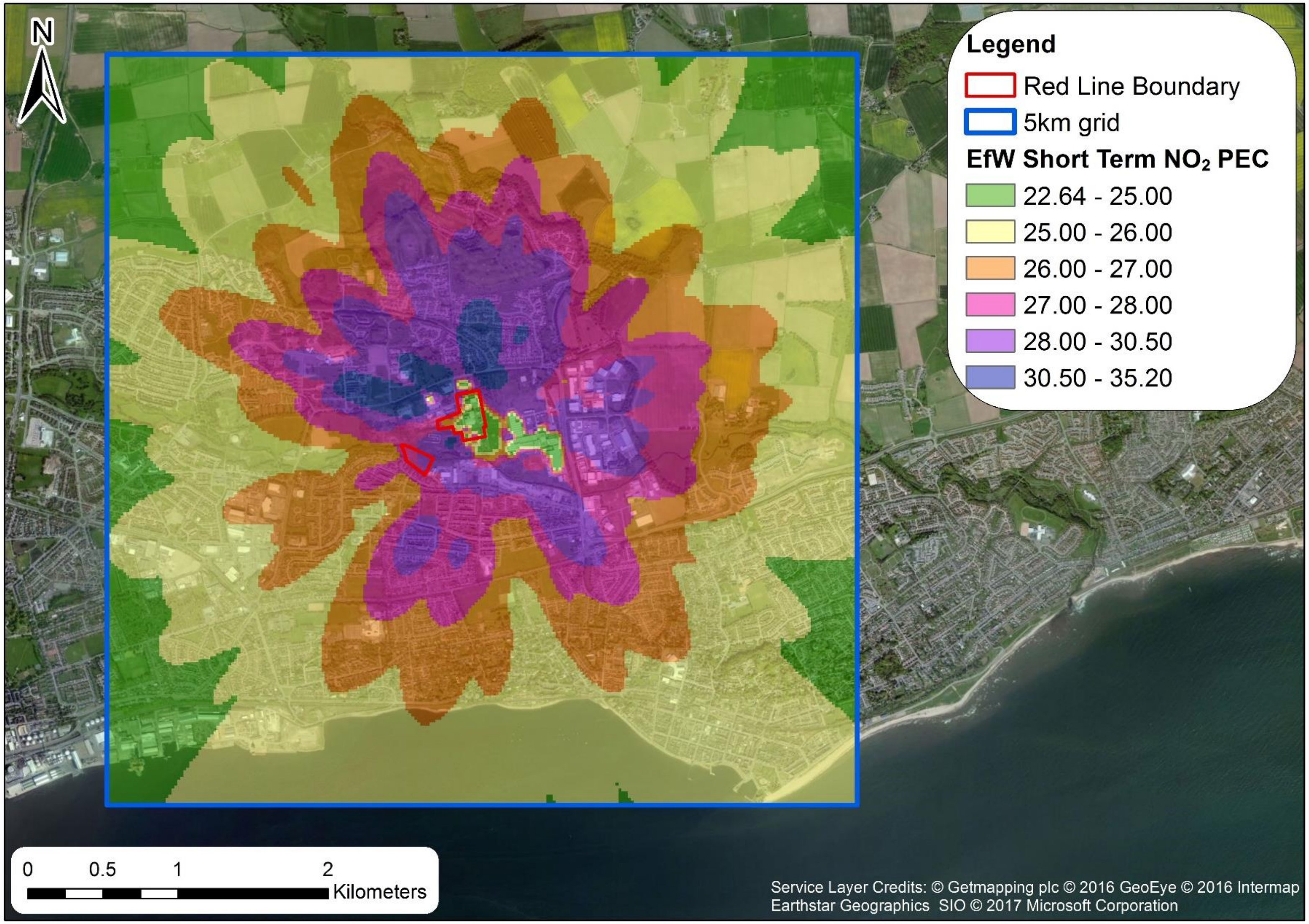


Figure F3: EfW CHP facility predicted environmental concentration of annual mean PM_{10} concentration ($\mu g/m^3$)

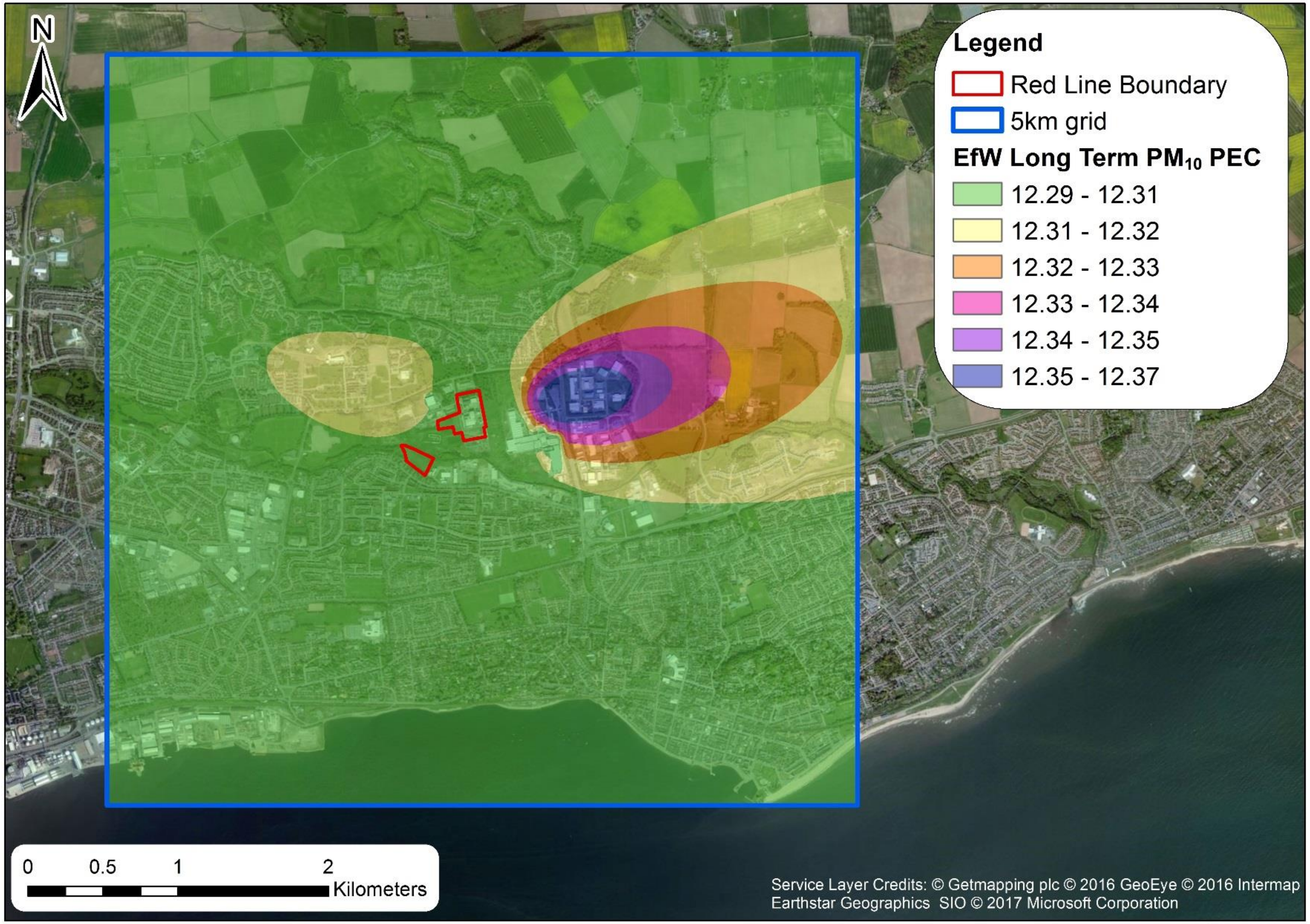


Figure F4: EfW CHP facility predicted environmental concentration of 98.08th percentile 24 hour mean PM_{10} concentration (μg/m³)

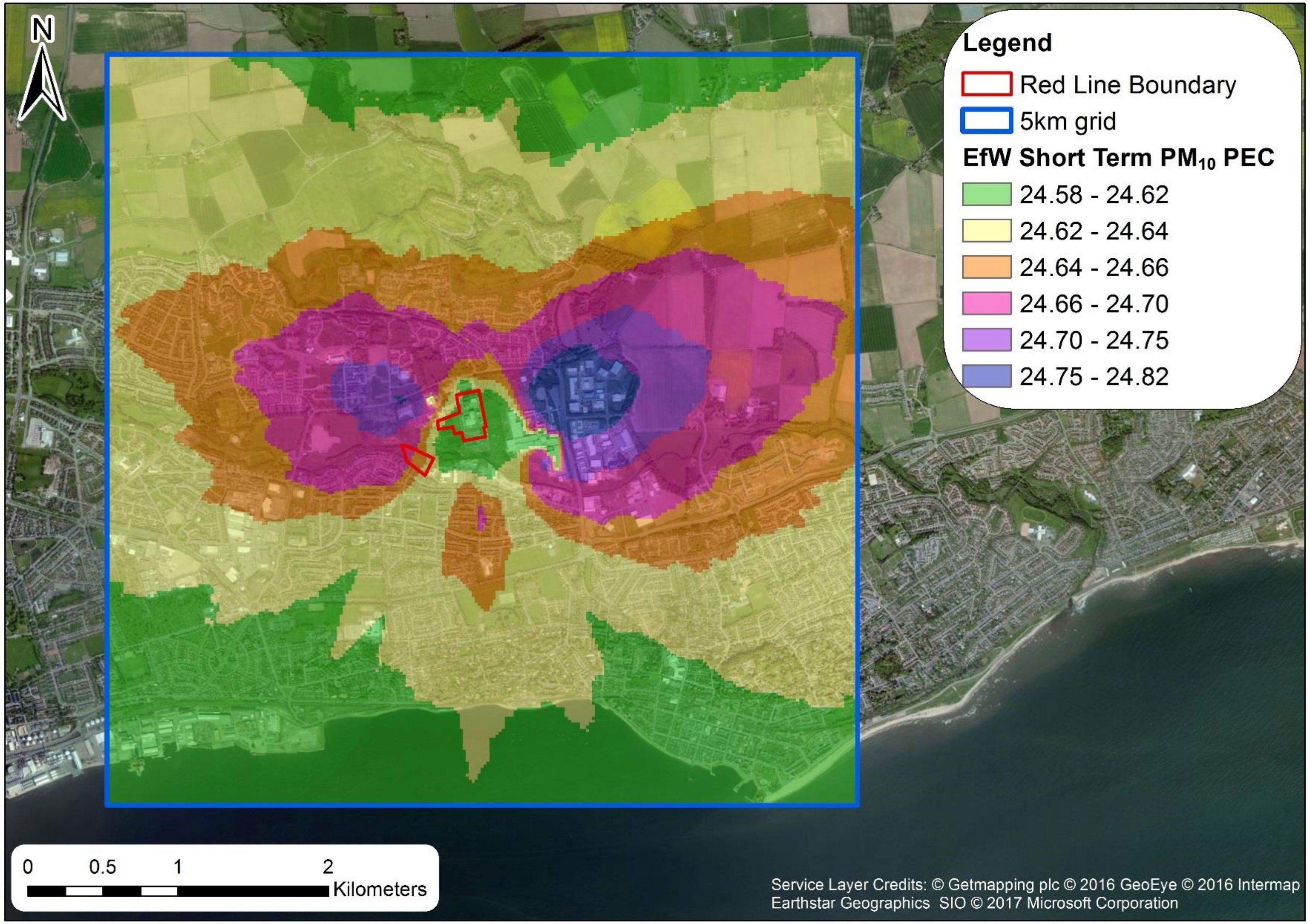


Figure F5: EfW CHP facility predicted environmental concentration of annual mean $PM_{2.5}$ concentration (μg/m^3)

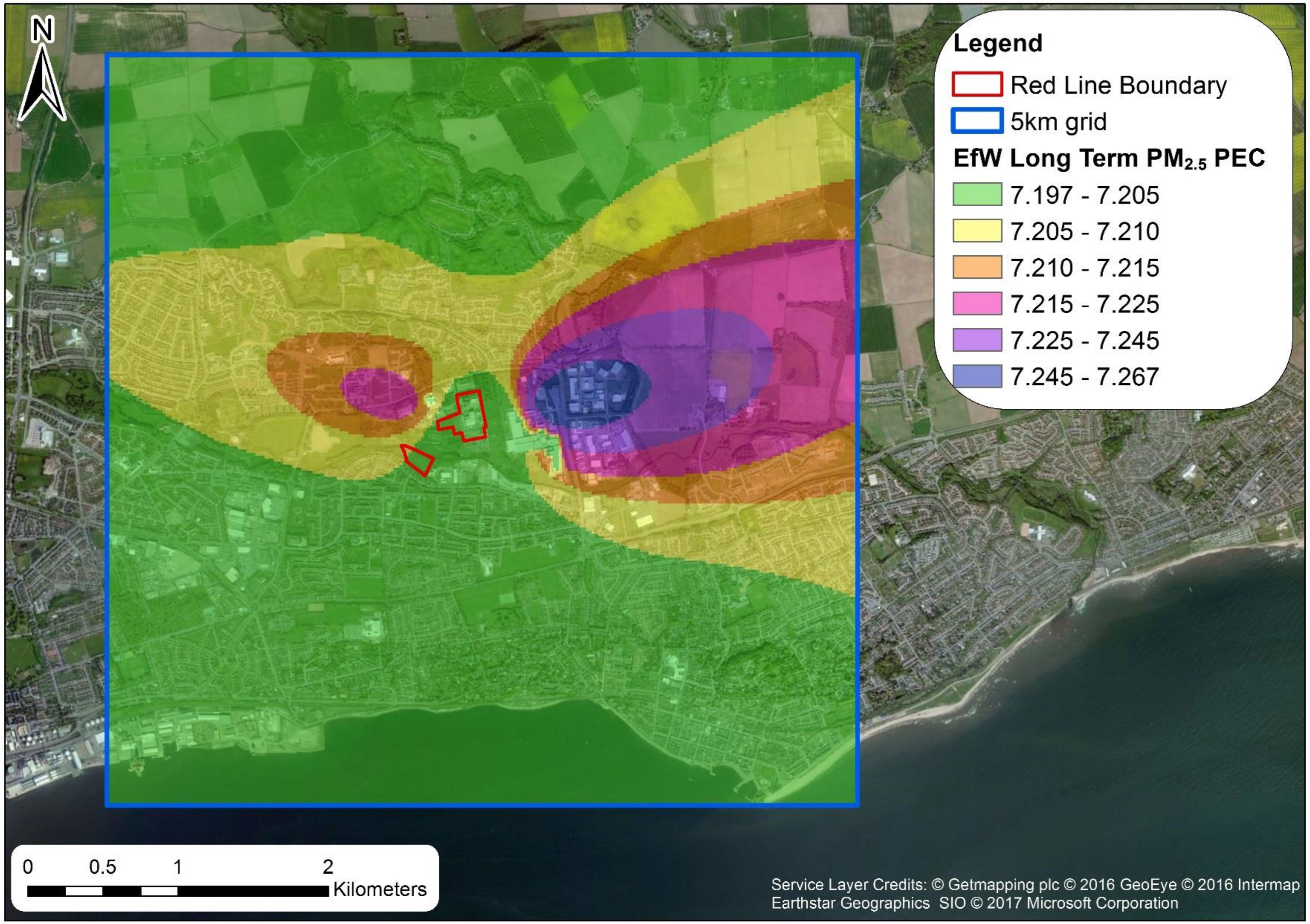
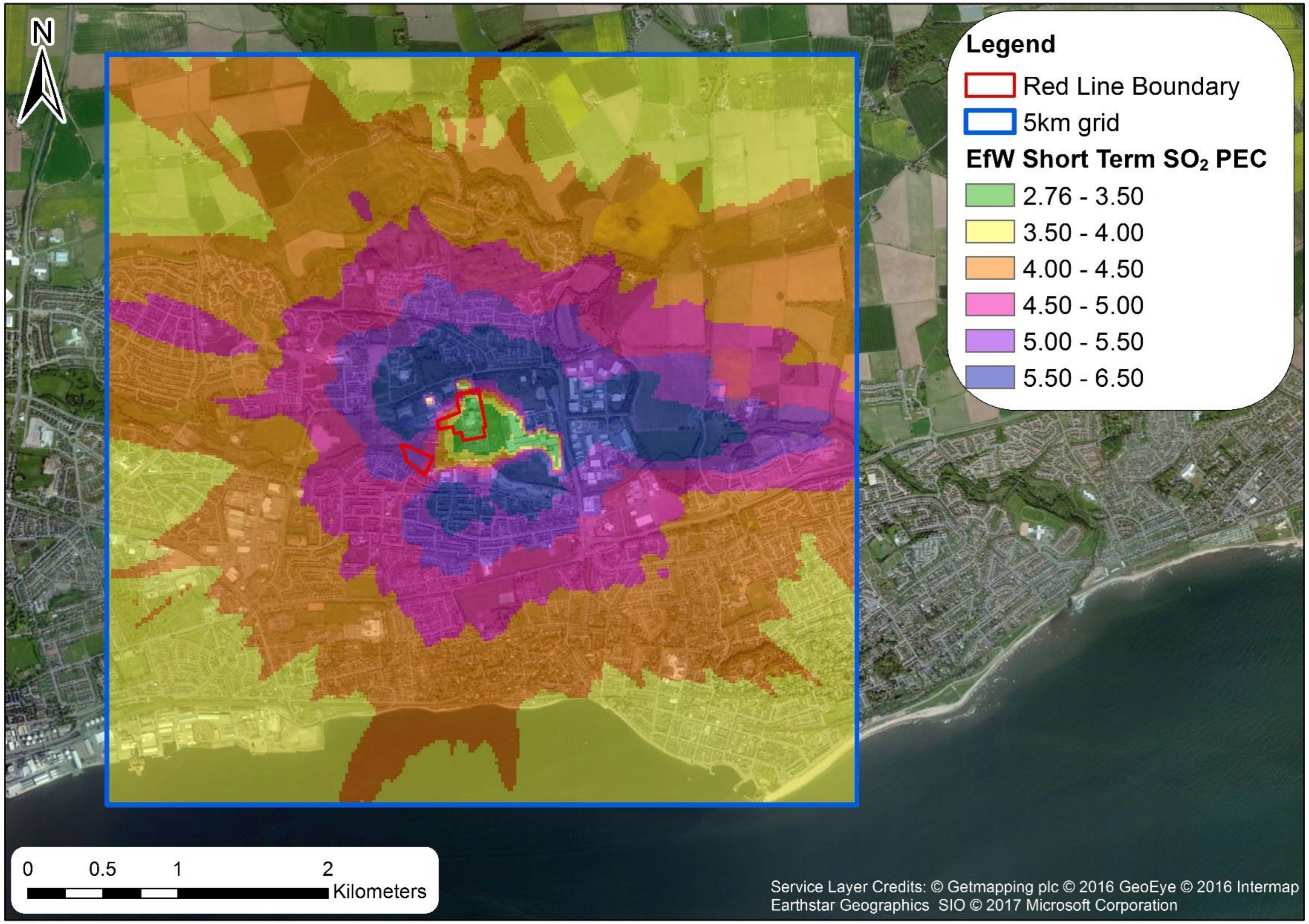


Figure F6: EfW CHP facility predicted environmental concentration of 99.90th percentile 15 minute mean SO_2 concentration ($\mu g/m^3$)



F2 Predicted Environmental Concentrations due to the DERL facility

Figure F7: DERL facility predicted environmental concentration of annual mean NO_2 concentration ($\mu g/m^3$)

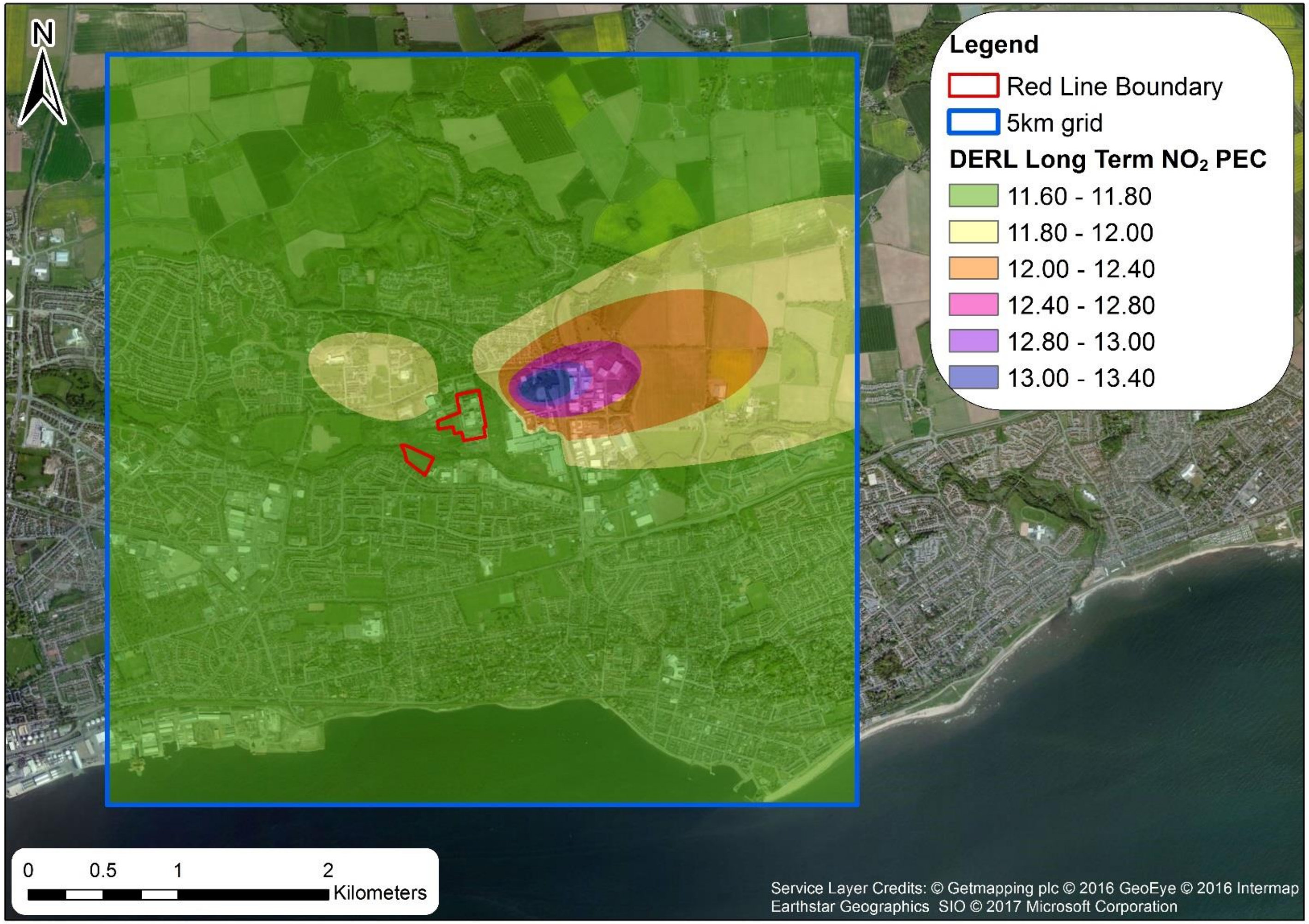


Figure F8: DERL facility predicted environmental concentration of 99.79th percentile 1 hour mean NO_2 concentration ($\mu g/m^3$)

Figure F9: DERL facility predicted environmental concentration of annual mean PM_{10} concentration ($\mu g/m^3$)

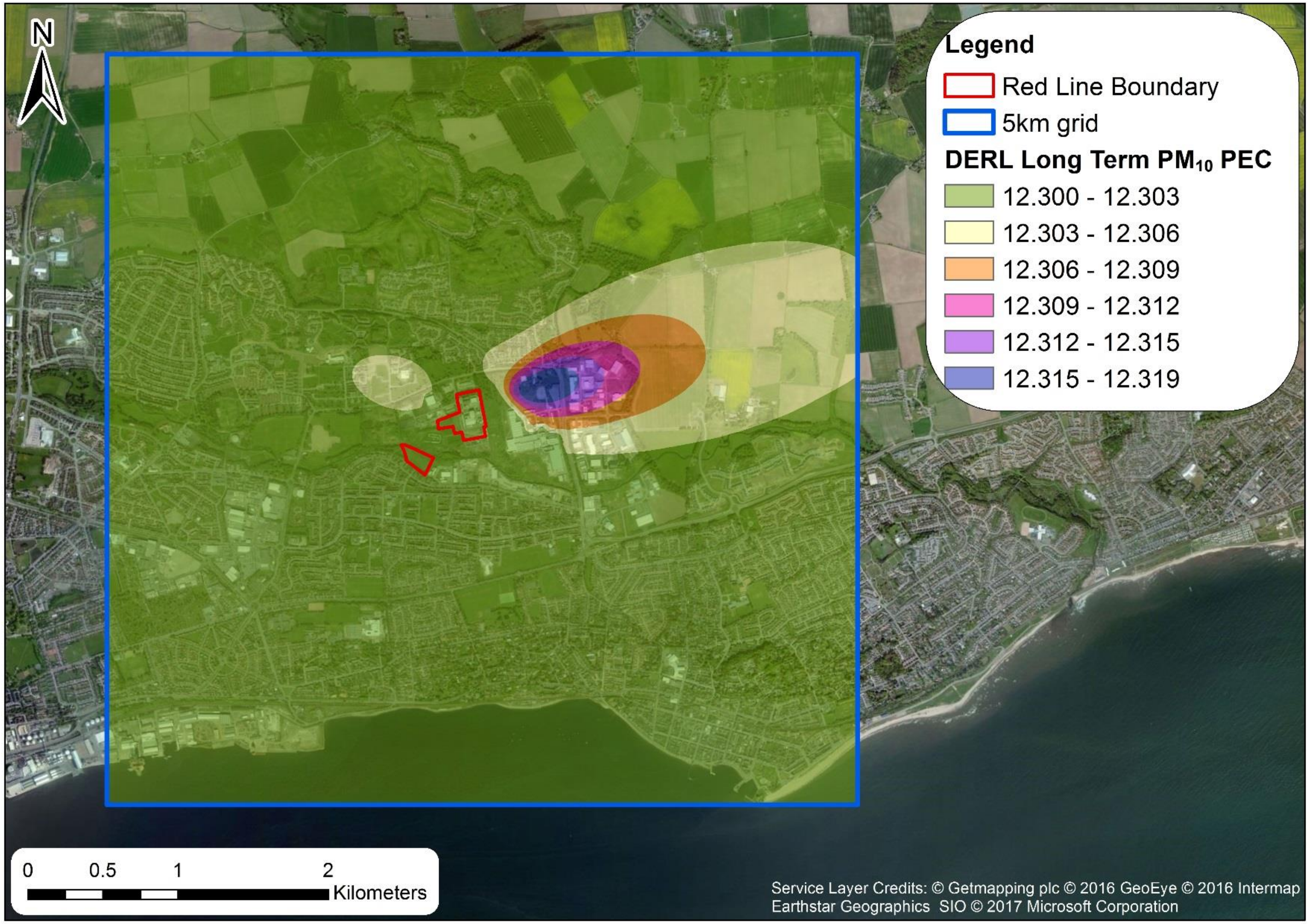


Figure F10: DERL facility predicted environmental concentration of 98.08th percentile 24 hour mean PM_{10} concentration ($\mu g/m^3$)

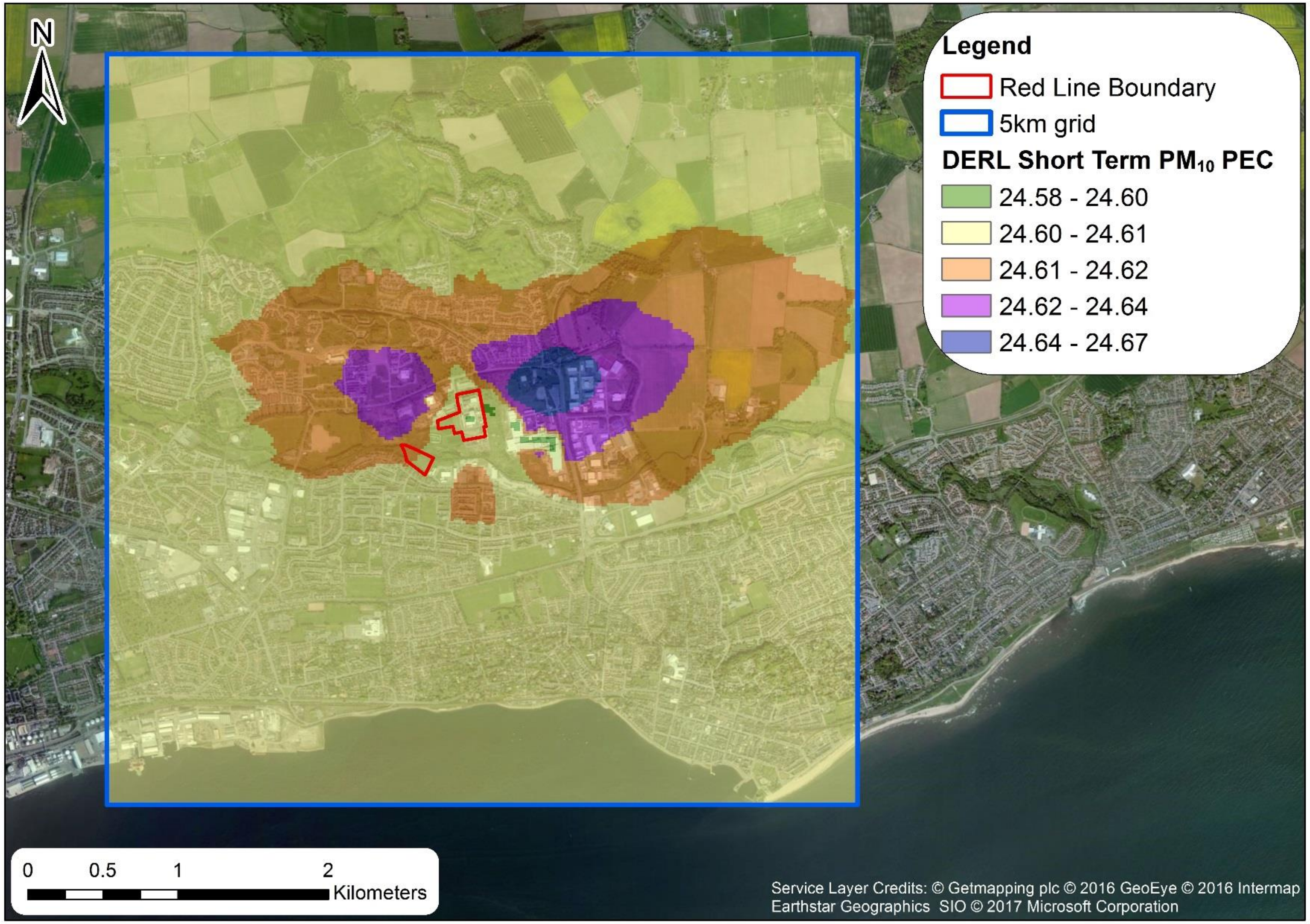


Figure F11: DERL facility predicted environmental concentration of annual mean $PM_{2.5}$ concentration ($\mu g/m^3$)

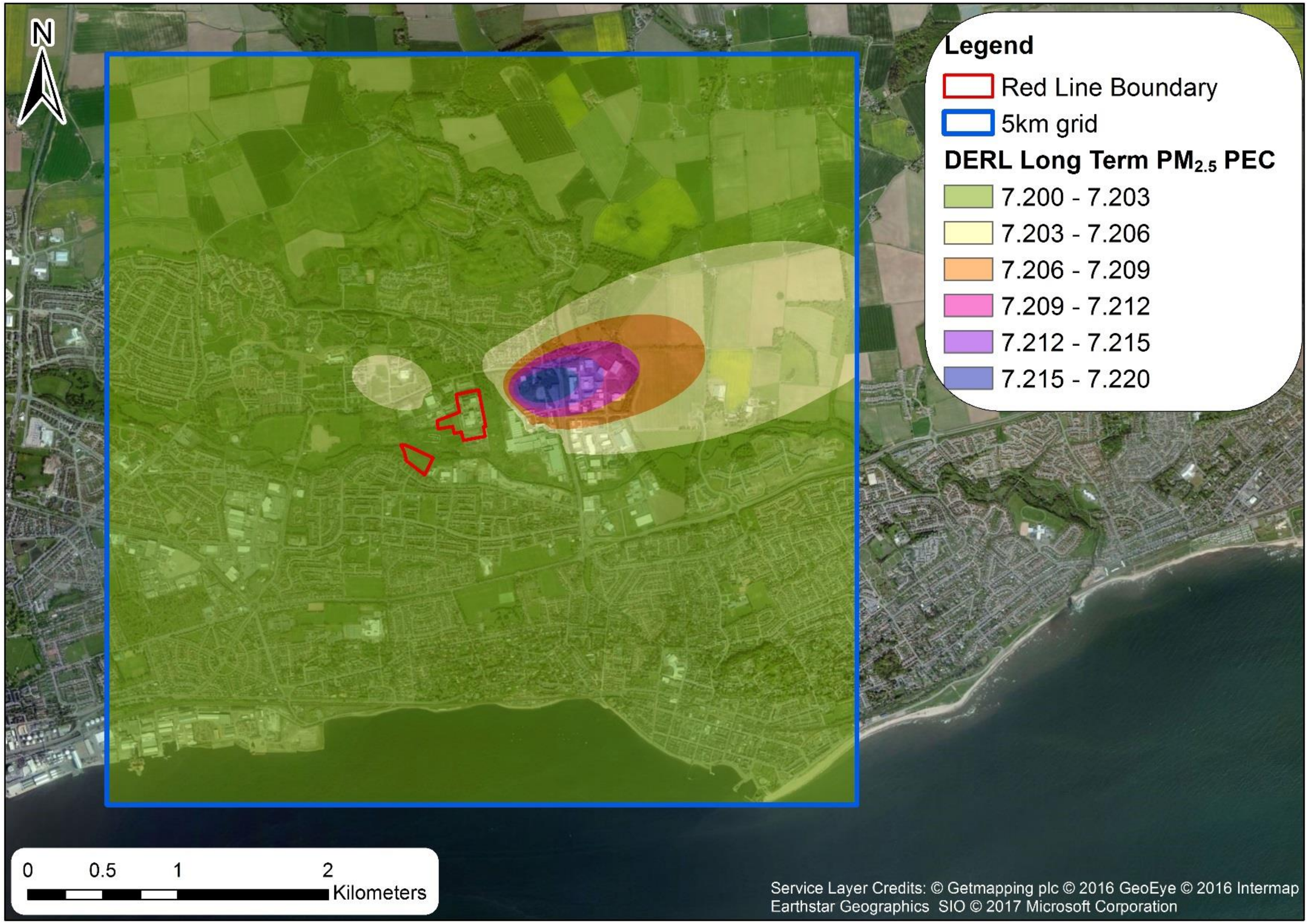
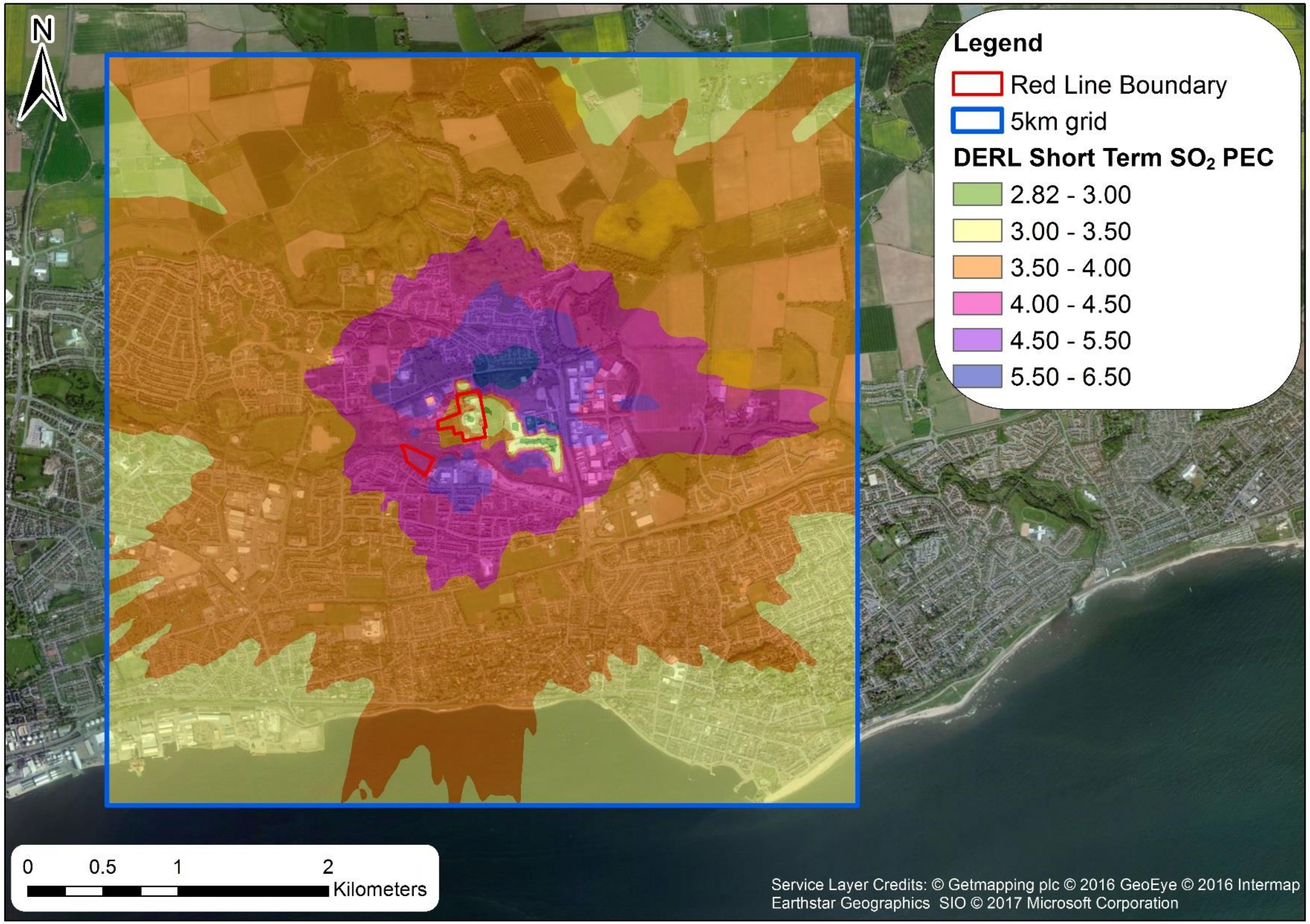


Figure F12: DERL facility predicted environmental concentration of 99.79th percentile 1 hour mean SO_2 concentration ($\mu g/m^3$)



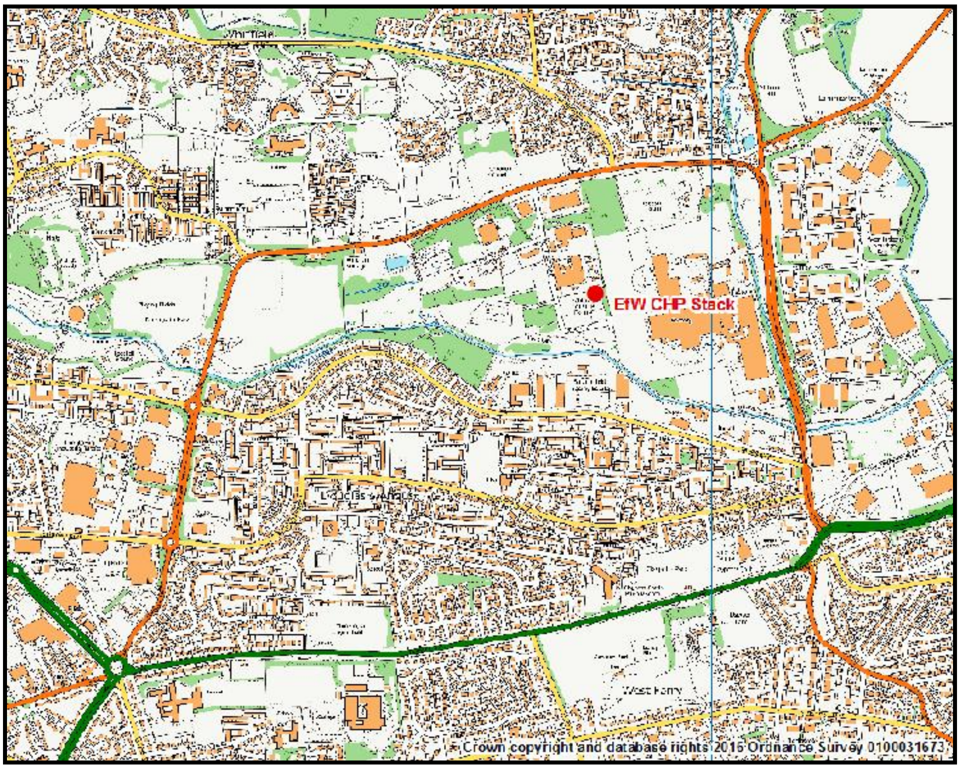
Appendix G

Human Health Risk Assessment

ARUP

Energy from Waste Combined Heat and Power Facility, Dundee:

Human Health Risk Assessment



January 2017

Report Reference: C25-P03-R01

AIR

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CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

This human health risk assessment (HHRA) is part of a suite of documents submitted to Dundee City Council (DCC) in support of an application for planning permission by MVV Environment Services Limited (MVV) (the Applicant) for the construction and operation of an Energy from Waste Combined Heat and Power Facility (EfW CHP facility) (The Proposed Scheme) on land situated on Forties Road, in the north-east of Dundee (the Application Site). The proposed EfW CHP facility would replace the existing Dundee Energy Recycling Ltd (DERL) EfW facility on the neighbouring site on Forties Road. The existing DERL plant has been operational since September 1999 and will cease operating on the successful commissioning of the proposed EfW CHP facility.

This assessment considers the effects of human exposure from emissions to air from the proposed EfW CHP facility.

This assessment has been undertaken to support the planning application for the proposed EfW CHP facility. In general, worst case assumptions are made with regard to the treatment of the emissions from the proposed EfW CHP facility and the exposure of local people to the pollutants emitted. The baseline position for the assessment is the operation of the current DERL facility. Therefore, the exposure to emissions from the proposed EfW CHP facility needs to be considered in addition to exposure to the existing DERL plant emissions via soils which may be contaminated with emissions from the existing facility.

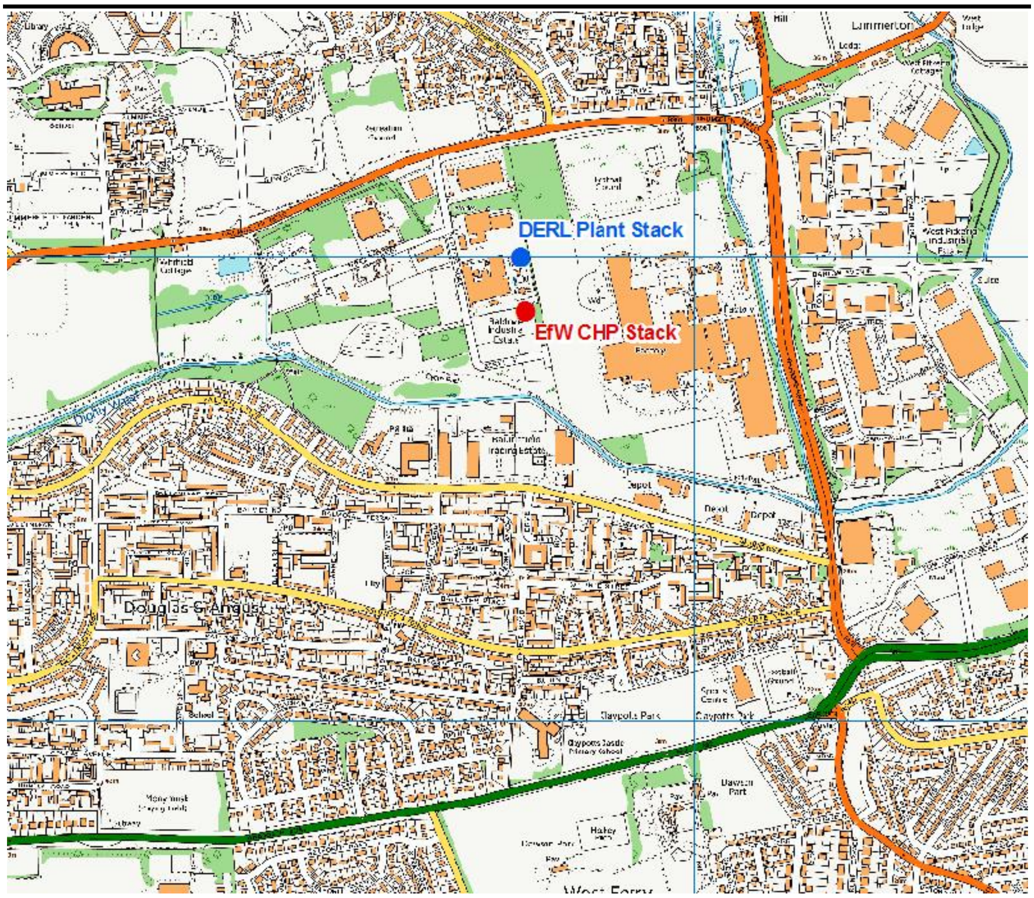
The Application Site is located in an industrial area to the northeast of the centre of Dundee. The nearest residential settlements are at Ballumbie to the north and Douglas and Angus to the south. The locations of the existing DERL plant stack and the proposed EfW CHP stacks are presented in *Figure 1.1*.

The facility would utilise waste material as a fuel and as a consequence it would need to comply with the emission limits imposed by the Industrial Emissions Directive (IED) for the thermal treatment of waste. The assessment considers exposure to emissions to air, and subsequent deposition to soil, only as human exposure to any harmful pollutants discharged directly to the aquatic environment and from solid waste disposal is considered to be negligible and therefore excluded from the assessment.

1.2 PURPOSE OF THE ASSESSMENT

This report documents the findings of the impact of emissions on human health from direct and indirect exposure to emissions to air from the proposed EfW CHP facility. It has been prepared in accordance with our understanding of the requirements of the Environment Agency, as the regulator, for these types of development in England. In particular, this is a human health risk assessment of dioxin/furan emissions from the facility based on either the former Her Majesty's Inspectorate of Pollution (HMIP) or the United States (US) Environmental Protection Agency (EPA) Human Health Risk Assessment Protocol (HHRAP) methodology. Human exposure to dioxins and furans has been compared against the Committee of Toxicity (COT) Tolerable Daily Intake (TDI) of 2 pg/kg per day.

FIGURE 1.1 LOCATION OF THE STACKS ASSOCIATED WITH THE EXISTING AND PROPOSED FACILITIES



An assessment of exposure to dioxin-like polychlorinated biphenyls (PCBs) has also been included. It should be noted that the former HMIP method does not have the capability to consider dioxin-like PCBs and the US EPA HHRAP method is limited in this respect. The HHRAP method does not contain physical properties or exposure parameters for individual dioxin-like PCBs but does provide information for two dioxin-like PCB mixtures (Aroclor 1016 and Aroclor 1254). Therefore, for these two substances typical emissions for dioxin-like PCBs have been included in the Industrial Risk Assessment Program (IRAP) model and these have been assumed to comprise entirely of Aroclor 1016 or Aroclor 1254 depending on which substance gives rise to the highest exposure.

Emissions of trace metals from the existing DERL plant and proposed EfW CHP facility have also been included in the assessment.

For this HHRA, the assessment considers the impact of the proposed EfW CHP facility operating alone over a period of 30 years. The existing DERL plant has operated for approximately 17 years. Therefore, a cumulative assessment of emissions from both facilities has been carried out. The existing DERL plant replaced an incinerator at Baldovie which was closed in 1996 as it was unable to meet the more stringent emission limits in the former European Directive on Waste Incineration (89/429/EC). However, it is considered that any contamination from the older incinerator will be accounted for in background exposure. Therefore, two scenarios have been considered as follows:

- the proposed EfW CHP facility operating alone; and
- cumulative impacts associated with the proposed EfW CHP facility operating but whilst there may be historical contamination of soils from the operation of the existing DERL plant.

It is not possible using the IRAP model to assess historical contamination from the DERL plant whilst the EfW CHP facility is operating in the future. Therefore, it is assumed that the two plant operate together in the future for the duration of the operation of the DERL (assumed to be 20 years). This represents worst-case conditions since there is no assumed loss of the DERL plant contaminants from soils once it ceases to operate.

1.3 SCOPE OF THE ASSESSMENT

The emissions from the facility would contain a number of substances that cannot be evaluated in terms of their effects on human health simply by reference to ambient air quality standards. Health effects could occur through exposure routes other than purely inhalation. As such, an assessment needs to be made of the overall human *exposure* to the substances by the local population and then the *risk* that this exposure causes.

The assessment presented here considers the impact of certain substances released by the facility on the health of the local population at the point of maximum exposure. These substances are those that are 'persistent' in the environment and have several pathways from the point of release to the human receptor. Essentially, they can be described as dioxins/furans and metals. They are present in extremely small quantities and are typically measured in mass units of nanogrammes (ng = 10^{-9} g), picogrammes (pg = 10^{-12} g) and femtogrammes (fg = 10^{-15} g).

Unlike substances such as nitrogen dioxide, which have short term, acute effects on the respiratory system, dioxins/furans and metals have the potential to cause effects through long term, cumulative exposure. A lifetime is the conventional period over which such effects are evaluated. A lifetime is taken to be 70 years.

The exposure scenarios used here represent a highly unrealistic situation in which all exposure assumptions are chosen to represent a worst case and should be treated as an extreme view of the risks to health. While individual high-end exposure estimates may represent actual exposure possibilities (albeit at very low frequency), the possibility of all high end exposure assumptions accumulating in one individual is, for practical purposes, never realised. Therefore, intakes presented here should be regarded as an extreme upper estimate of the actual exposure that would be experienced by the real population in the locality.

1.4 APPROACH TO THE ASSESSMENT

The risk assessment process is based on the application of the US EPA HHRAP [1]. This protocol has been assembled into a commercially available model, Industrial Risk Assessment Program (IRAP, Version 4.5.6) and marketed by Lakes Environmental of Ontario.

The approach seeks to quantify the *hazard* faced by the receptor, the *exposure* of the receptor to the substances identified as being a potential hazard and then to assess the *risk* of the exposure, as follows:

- *Quantification of the exposure*: an exposure evaluation determines the dose and intake of key indicator chemicals for an exposed person. The dose is defined as the amount of a substance contacting body boundaries (in the case of inhalation, the lungs) and intake is the amount of the substance absorbed into the body. The evaluation is based upon worst-case, conservative scenarios, with respect to the following:

  - location of the exposed individual and duration of exposure;
  - exposure rate;
  - emission rate from the source.

- *Risk characterisation*: following the above steps, the risk is characterised by examining the toxicity of the chemicals to which the individual has been exposed, and evaluating the significance of the calculated dose in the context of probabilistic risk.

1 US EPA Office of Solid Waste (September 2005) Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities

2 METHODOLOGY FOR ESTIMATING EXPOSURE TO EMISSIONS

2.1 INTRODUCTION

An exposure assessment for the purposes of characterising the health impact of the facility's emissions requires the following steps:

(1) Measurement or estimation of emissions from the source.

(2) Modelling the fate and transport of the emitted substances through the atmosphere and through soil, water and biota following deposition onto land. Concentrations of the emitted chemicals in the environmental media are estimated at the point of exposure, which may be through inhalation or ingestion.

(3) Calculation of the uptake of the emitted chemicals into humans coming into contact with the affected media and the subsequent distribution in the body.

With regard to Step (3), the exposure assessment considers the uptake of polychlorinated dibenzo-para-dioxins and polychlorinated dibenzofurans (PCDD/Fs, often abbreviated to 'dioxins/furans'), dioxin-like PCBs and metals by various categories of human receptors. In addition, emissions of polycyclic aromatic hydrocarbons (PAHs) are considered, based on typical emissions of one of the more toxic PAHs, that of benzo(a)pyrene (B[a]P).

2.2 POTENTIAL EXPOSURE PATHWAYS

There are two primary exposure 'routes' where humans may come into contact with chemicals that may be of concern:

- direct, via inhalation; or
- indirect, via ingestion of water, soil, vegetation and animals and animal products that become contaminated through the food chain.

There are four other potential exposure pathways of concern following the introduction of substances into the atmosphere:

- ingestion of drinking water;
- dermal (skin) contact with soil;
- incidental ingestion of soil; and
- dermal (skin) contact with water.

2.3 EXPOSURE PATHWAYS CONSIDERED IN THE ASSESSMENT

The possible exposure pathways included in the IRAP model are shown in *Figure 2.1*. Dermal contact with soil is an insignificant exposure pathway on the basis of the infrequent and sporadic nature of the events and the very low dermal absorption factors for this exposure route, coupled with the low plausible total dose that may be experienced (when considered over the lifetime of an individual). Health risk assessments of similar emissions (Pasternach (1989) *The Risk Assessment of Environmental and Human Health Hazards*, John Wiley, New York) have concluded that dermal absorption of soil is at least one order of magnitude less efficient than lung absorption.

Similar arguments are relevant with respect to the elimination of aquatic pathways from consideration; swimming, fishing and other recreational activities are also sporadic and unlikely to lead to significant exposures or uptake of any contamination into the human body via dermal contact with water.

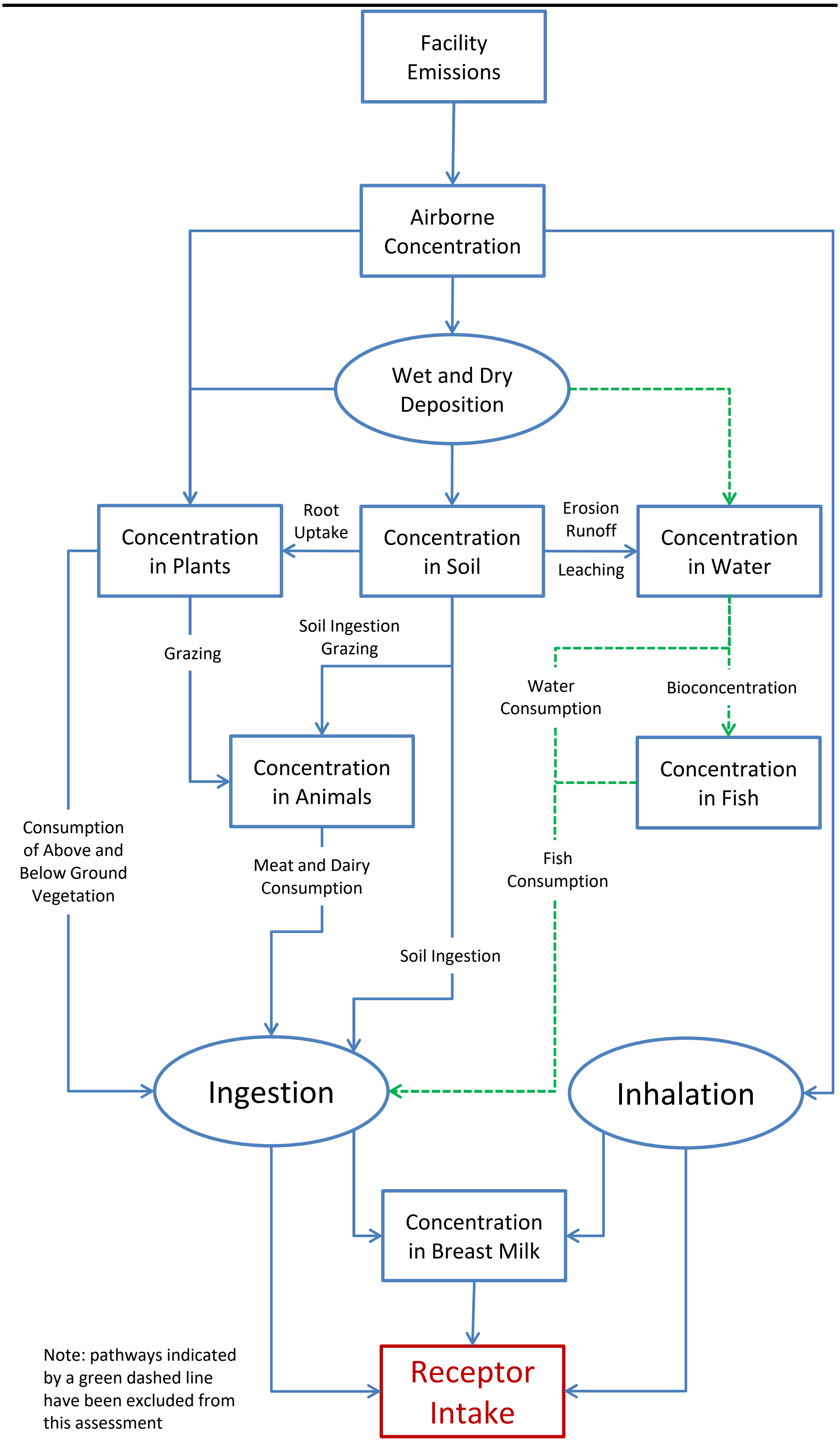
Exposure via drinking water requires contamination of drinking water sources local to the point of consumption. The likelihood of contamination reaching a level of concern in the local water sources and ground water supplies is extremely low, particularly where there is no large scale storage (e.g. reservoirs) or catchment areas for local water supplies. However, the US EPA's HHRAP does include the ingestion of drinking water from surface water sources as a potential exposure pathway where water bodies and water sheds have been defined within the exposure scenario. The ingestion of groundwater as a source of local drinking water is not considered by the HHRAP as it is considered to be an insignificant exposure pathway for combustion emissions.

On the basis of the assessment of the potential significance of the exposure pathways the key exposure pathways which are relevant to the assessment and, hence, subject to examination in detail are as follows:

- inhalation;
- ingestion of food; and
- ingestion of soil.

The ingestion of drinking water from surface water sources is only considered a potential exposure pathway where there is a local surface water body which provides local drinking water. However, there are no drinking water reservoirs in close proximity to the site. Furthermore, it is our experience that drinking water from a reservoir located close to this type of facility makes a very small contribution to the total exposure. Therefore, exposure via drinking water is generally only considered where there is the potential for exposure via the ingestion of fish and the presence of edible fish farms (e.g. trout or salmon farms). Therefore, for the purposes of this EIA, exposure via drinking water has been excluded.

FIGURE 2.1 EXPOSURE PATHWAYS FOR RECEPTORS



The exposures arising from ingestion have been assessed with reference to the following:

- milk from home-reared cows;
- eggs from home-reared chickens;
- home-reared beef;
- home-reared pork;
- home-reared chicken;
- home-grown vegetable and fruit produce;
- breast milk; and
- soil (incidental).

The inclusion of all food groups in the assessment conservatively assumes that both arable and pasture land are present within areas used for farming and that residents located at the predicted maximum annual average ground level concentration grow and consume their own vegetables. This is, in reality, a highly unlikely scenario. It has been adopted, however, as a means of building a high degree of conservatism into the assessment. It should be noted that not all exposure scenarios would result in the ingestion of home-reared meat and animal products and these food products are only considered by the HHRAP for farmers and the families of farmers. Similarly, the ingestion of fish is only considered where there is a local closed water body that is used for fishing and where the diet of the fisher (and family) may be regularly supplemented by fish caught from these local water sources.

There are no closed water bodies within 3 km of the site stocked with edible fish (e.g. trout or salmon) and it is considered that the diet of local residents is unlikely to be regularly supplemented with fish contaminated with emissions from the facility. Therefore, a fisher receptor has been excluded from the assessment.

2.4 EMISSIONS AND DISPERSION MODELLING INPUT DATA

2.4.1 Compounds of Potential Concern (COPCs)

The substances which have been considered in the assessment are referred to as the Compounds of Potential Concern (COPCs). The substances that have been included for this assessment are those that are authorised emissions and which are included in the EPA HHRAP COPC database for the assessment of long term health effects. Although emission limits for PAHs are not currently set, monitoring of PAHs is required by the regulations. Therefore, benzo(a)pyrene has been included in the assessment to represent PAH emissions. Therefore, the following have been considered as COPCs for the facility:

- PCDD/Fs (individual congeners) and dioxin-like PCBs;
- benzo(a)pyrene;

- antimony (Sb);
- arsenic (As);
- cadmium (Cd);
- chromium (Cr), trivalent and hexavalent;
- mercury (Hg);
- lead (Pb); and
- nickel (Ni).

The 2005 protocol excludes thallium (Tl) by virtue of there being no reference dose, reference concentration or cancer slope factors for thallium. This is at variance with the draft 1998 protocol which did include thallium in the assessment of hazards. The toxic properties of thallium are well known and it is our opinion that thallium should be included in the assessment of hazards. Therefore, the 1998 US EPA reference data have been used to assess the hazards associated with exposure to thallium.

2.4.2 Emission Concentrations for the COPCs

Emission Parameters

The proposed EfW CHP facility comprises an individual flue whereas the existing DERL plant comprises two flues combined within a single stack and can be considered as a single emission source. For the EIA, this assessment considers two scenarios: the existing DERL plant; and the proposed ERF.

For the proposed EfW CHP facility, emission parameters are consistent with those used for the air quality assessment, as follows:

- stack height of 90m above ground level;
- an internal stack diameter of 1.58m;
- a nominal emission velocity of 15 m s^{-1}; and
- an exhaust temperature of 130^{o}C.

With respect to the emission velocity, this is considered to represent worst-case conditions. The emission velocity is the minimum velocity that would be considered and any increase in velocity will increase the vertical momentum of the plume and aid dispersion of the emissions.

Metals Emissions

For the metals considered for the health risk assessment, the individual emission concentrations are presented in *Table 2.1*. For the Group 1 metals (cadmium and thallium) and Group 2 metals (mercury) these have been derived from information provided in the Defra report on Emissions from Waste

Management Facilities [2]. For Group 3 metals, emissions have been derived from information provided by the Environment Agency [3] in England and published on the Government UK website [4]. Some of the Group 3 metals are excluded from this assessment, on the grounds that they pose little or no hazard in the context of long term health impacts, and as such are not included in the EPA HHRAP COPC database; these are cobalt, copper, manganese and vanadium. This approach to the release rates for metals is different to that used for the air quality assessment, which has assumed that release rates are constantly at the limit values.

TABLE 2.1 METAL EMISSION RATES USED IN THE IRAP MODEL FOR THE PROPOSED EFW CHP FACILITY

Pollutant	Percentage of Relevant Group	Emission Concentration (mg Nm^{-3})	Emission Rate for the Proposed EfW CHP (g s^{-1})
Antimony	0.3%	0.0015	0.000035
Arsenic	0.2%	0.00100	0.000023
Cadmium	2.7%	0.0014	0.000031
Chromium III	1.7%	0.0085	0.00020
Chromium VI	0.01%	0.000050	0.0000012
Lead	2.2%	0.011	0.00026
Mercury	6.4%	0.0032	0.000075
Nickel	3.0%	0.015	0.00035
Thallium	2.7%	0.0014	0.000031

In accordance with the methodology it is important that loss of mercury to the global cycle is accounted for. For this purpose, the IRAP default values have been used and it is assumed that of the total mercury emitted 51.8% is lost to the global cycle, 48.0% is deposited as divalent mercury and 0.2% is emitted as elemental mercury. The model assumes that human exposure to elemental mercury occurs only through direct inhalation of the vapour phase elemental form. Human exposure to divalent mercury occurs through both indirect and direct inhalation pathways in the form of vapour and particle-bound mercuric chloride.

Therefore, the following emission rates for mercury have been assumed:

- elemental mercury at 1.5×10^{-7} g s^{-1} for the proposed EfW CHP facility; and
- mercuric chloride at 3.6×10^{-5} g s^{-1} for the proposed EfW CHP facility.

2 WR 0608 Emissions from Waste Management Facilities, Report for Defra, ERM (July 2011)
3 Releases from Municipal Waste Incinerators, Guidance on Assessing Group 3 Metal Stack Emissions from Incinerators, Environment Agency, Version 4 (June 2016)
4 https://www.gov.uk/government/publications/waste-incinerators-guidance-on-impact-assessment-for-group-3-metals-stack

For the existing DERL plant, measured emissions data have been used to determine the proportion of each metal emitted from the DERL facility. A summary of metal emissions assumed is provided in *Table 2.2*. Emissions of chromium VI are assumed to be 0.016% of the group emission limit. This factor has been derived from the Environment Agency's guidance of 0.01% multiplied by a factor of 1.6 since measured total chromium for the DERL were 1.6 times higher than the Environment Agency's guidance [3].

TABLE 2.2 METAL EMISSION RATES USED IN THE IRAP MODEL FOR THE DERL PLANT

Pollutant	Emission Concentration (mg Nm^{-3})	Emission Rate for the Existing DERL (g s^{-1})
Antimony	0.0094	0.00011
Arsenic	0.0046	0.000053
Cadmium	0.0088	0.00010
Chromium III	0.0132	0.00015
Chromium VI	0.000078	0.00000089
Lead	0.0095	0.00011
Mercury	0.0045	0.000052
Nickel	0.0093	0.00011
Thallium	0.0044	0.000050
Elemental mercury	0.0000090	0.00000010
Mercuric chloride	0.0022	0.000025

Polychlorinated dibenzo-p- dioxins, polychlorinated dibenzo furans (PCDD/Fs) and Other Organic Emissions

The general term dioxins denotes a family of compounds, with each compound composed of two benzene rings interconnected with two oxygen atoms. There are 75 individual dioxins, with each distinguished by the position of chlorine or other halogen atoms positioned on the benzene rings. Furans are similar in structure to dioxins, but have a carbon bond instead of one of the two oxygen atoms connecting the two benzene rings. There are 135 individual furan compounds. Each individual furan or dioxin compound is referred to as a congener and each has a different toxicity and physical properties with regard to its atmospheric behaviour. It is important, therefore, that the exposure methodology determines the fate and transport of PCDD/Fs on a congener specific basis. It does this by accounting for the varying volatility of the congeners and their different toxicities. Consequently, information regarding the PCDD/F annual mean ground level concentrations on a congener specific basis is required. For the purposes of the exposure assessment, the congener profile for the facility is presented in *Table 2.3*, this has been derived from measured data for the DERL and it is assumed that the proposed EfW CHP facility will have a similar profile since the waste treated will be the same. The international toxic equivalency factors are given and used to derive the toxic equivalent emission (I-TEQ). As a worst-case, it is assumed that PCDD/F emissions are at the maximum emission limit of 0.1 ng I-TEQ Nm^{-3} for both the existing DERL plant and the proposed EfW CHP facility.

TABLE 2.3 PCDD/F CONGENER PROFILE FOR THE EXISTING DERL PLANT AND PROPOSED EFW CHP FACILITY

Congener	Annual Mean Emission Concentration (ng Nm^{-3}) (a)	I-TEF toxic equivalent factors)	Annual Mean Emission Concentration (ng I-TEQ Nm^{-3}) (a)
2,3,7,8-TCDD	0.0074	1.0	0.0074
1,2,3,7,8-PeCDD	0.019	0.5	0.0093
1,2,3,4,7,8-HxCDD	0.019	0.1	0.0019
1,2,3,7,8,9-HxCDD	0.029	0.1	0.0029
1,2,3,6,7,8-HxCDD	0.051	0.1	0.0051
1,2,3,4,6,7,8-HpCDD	0.37	0.01	0.0037
OCDD	1.1	0.001	0.0011
2,3,7,8-TCDF	0.035	0.1	0.0035
2,3,4,7,8-PeCDF	0.076	0.5	0.0382
1,2,3,7,8-PeCDF	0.047	0.05	0.0024
1,2,3,4,7,8-HxCDF	0.068	0.1	0.0068
1,2,3,7,8,9-HxCDF	0.016	0.1	0.0016
1,2,3,6,7,8-HxCDF	0.060	0.1	0.0060
2,3,4,6,7,8-HxCDF	0.083	0.1	0.0083
1,2,3,4,6,7,8-HpCDF	0.16	0.01	0.0016
1,2,3,4,7,8,9-HpCDF	0.021	0.01	0.00021
OCDF	0.082	0.001	0.000082
Total (ng Nm^{-3})	**2.2**		**0.1**

The total emission of dioxin-like PCBs has also been obtained from measured data. Based on these measurements, a total dioxin-like PCBs emission concentration of 8.7×10^{-7} mg m^{-3} (1.4×10^{-8} mg TEQ m^{-3} with an average TEF of 0.016) is assumed.

For benzo(a)pyrene, measured data for the DERL has also been assumed as information available on typical emissions data is limited. Therefore, it is assumed that emissions are 4.9×10^{-5} mg Nm^{-3}).

For the proposed EfW CHP facility, the emission rates for each substance as input to the IRAP model are provided in *Table 2.4*.

TABLE 2.4 PCDD/F AND OTHER ORGANIC EMISSION RATES USED IN THE IRAP MODEL FOR THE PROPOSED EFW CHP FACILITY

Congener	Emission Concentration (mg Nm^{-3})	Emission Rate (g s^{-1})
2,3,7,8-TCDD	0.0074×10^{-6}	1.7×10^{-10}
1,2,3,7,8-PeCDD	0.019×10^{-6}	4.3×10^{-10}
1,2,3,4,7,8-HxCDD	0.019×10^{-6}	4.4×10^{-10}
1,2,3,7,8,9-HxCDD	0.029×10^{-6}	6.6×10^{-10}
1,2,3,6,7,8-HxCDD	0.051×10^{-6}	1.2×10^{-9}
1,2,3,4,6,7,8-HpCDD	0.37×10^{-6}	8.5×10^{-9}
OCDD	1.1×10^{-6}	2.5×10^{-8}
2,3,7,8-TCDF	0.035×10^{-6}	8.1×10^{-10}
2,3,4,7,8-PeCDF	0.076×10^{-6}	1.8×10^{-9}
1,2,3,7,8-PeCDF	0.047×10^{-6}	1.1×10^{-9}
1,2,3,4,7,8-HxCDF	0.068×10^{-6}	1.6×10^{-9}
1,2,3,7,8,9-HxCDF	0.016×10^{-6}	3.8×10^{-10}
1,2,3,6,7,8-HxCDF	0.060×10^{-6}	1.4×10^{-9}
2,3,4,6,7,8-HxCDF	0.083×10^{-6}	1.9×10^{-9}
1,2,3,4,6,7,8-HpCDF	0.16×10^{-6}	3.7×10^{-9}
1,2,3,4,7,8,9-HpCDF	0.021×10^{-6}	5.0×10^{-10}
OCDF	0.82×10^{-6}	1.9×10^{-9}
Aroclor 1016/1254	0.87×10^{-6}	2.0×10^{-8}
Benzo(a)pyrene	4.9×10^{-5}	1.1×10^{-6}
Antimony	0.0015	0.000035
Arsenic	0.0010	0.000023
Cadmium	0.0014	0.000031
Chromium	0.0085	0.00020
Chromium, hexavalent	0.000050	0.0000012
Lead	0.011	0.00026
Mercury	0.0032	0.000075
Nickel	0.015	0.00035
Thallium	0.0014	0.000031
Elemental mercury	0.0000064	1.5×10^{-7}
Mercuric chloride	0.0015	3.6×10^{-5}

2.5 DISPERSION MODELLING ASSUMPTIONS

The air quality assessment has relied upon the use of the UK Atmospheric Dispersion Modelling System (ADMS) to estimate ground level concentrations of pollutants. The IRAP model, however, has been designed to accept only output files from the US EPA ISC or AERMOD dispersion models, reflecting its North American origins and its need to follow the US EPA risk assessment protocol. To maintain consistency with the air quality assessment, it has been possible to use output from the ADMS model with IRAP using the following procedure:

- generation of ISC input files and output files for the study area;
- generation of ADMS output data using the approach outlined in the US EPA risk assessment protocol; and
- inserting the ADMS results into the ISC output files.

For the modelling, all emission properties, building heights, and other relevant factors were retained from the air quality assessment. As the health risk assessment requires information on the deposition of substances to surfaces as well as airborne concentrations of substances, the ADMS dispersion model has also been used to predict the following:

- the airborne concentration of vapour, particle and particle bound substances emitted;
- the wet deposition rate of vapour, particle and particle bound substances; and
- the dry deposition rate of vapour, particle and particle bound substances.

For dry deposition of particles and particle bound contaminants a fixed deposition velocity of 0.01 m s^{-1} has been used. The facility would be equipped with fabric filters and the emitted particles are likely to be predominantly in the size range 1 -2 μm in diameter. For particles of this size, deposition velocities are likely to be of the order of 0.001 to 0.01 m s^{-1}. Therefore, as a worst-case, for the ADMS modelling a value of 0.01 m s^{-1} has been adopted.

2.6 DISPERSION MODELLING RESULTS

A summary of the key results from the ADMS dispersion modelling is presented in *Table 2.5* for the proposed EfW CHP facility. These are the maximum predicted within the model domain using the 2015 Leuchars Airfield meteorological data set. This year was selected as it was the year that provided highest predicted annual mean concentrations based on the air quality assessment carried out for the facility.

TABLE 2.5 MAXIMUM ANNUAL AVERAGE PARTICLE PHASE CONCENTRATIONS AND PARTICLE PHASE DEPOSITION RATES ESTIMATED FOR THE PROPOSED EFW CHP FACILITY

Pollutant	Max Annual Average Concentration (a)	Max Annual Average Deposition Rate (b)
Metals	**(ng m^{-3})**	**(mg m^{-2} $year^{-1}$)**
Antimony	0.0095	0.030
Arsenic	0.0063	0.020
Cadmium	0.0085	0.027
Chromium III	0.054	0.17
Chromium VI	0.00032	0.0010
Lead	0.069	0.22
Nickel	0.095	0.30
Thallium	0.0085	0.027
Elemental mercury	0.000040	0.00013
Mercuric chloride	0.010	0.031
Benzo(a)pyrene	0.00031	0.0010
PCDD/Fs	**(fg m^{-3})**	**(fg m^{-3})**
2,3,7,8-TCDD	0.047	0.15
1,2,3,7,8-PeCDD	0.12	0.37
1,2,3,4,7,8-HxCDD	0.12	0.38
1,2,3,7,8,9-HxCDD	0.18	0.57
1,2,3,6,7,8-HxCDD	0.32	1.0
1,2,3,4,6,7,8-HpCDD	2.3	7.4
OCDD	6.9	22.0
2,3,7,8-TCDF	0.22	0.70
2,3,4,7,8-PeCDF	0.48	1.5
1,2,3,7,8-PeCDF	0.30	0.95
1,2,3,4,7,8-HxCDF	0.4	1.4
1,2,3,7,8,9-HxCDF	0.10	0.33
1,2,3,6,7,8-HxCDF	0.38	1.2
2,3,4,6,7,8-HxCDF	0.53	1.7
1,2,3,4,6,7,8-HpCDF	1.0	3.2
1,2,3,4,7,8,9-HpCDF	0.14	0.43
OCDF	0.51	1.6
Aroclor 1016/1254	5.5	17.5

(a) Where 1 ng m^{-3} is equal to 1 x 10^{-9} g m^{-3} and 1 fg m^{-3} is equal to 1 x 10^{-15} g m^{-3}

(b) Where 1 mg m^{-2} $year^{-1}$ is equal to 1 x 10^{-3} g m^{-2} $year^{-1}$ and 1 ng m^{-2} $year^{-1}$ is equal to 1 x 10^{-9} g m^{-2} $year^{-1}$

3 INPUT PARAMETERS FOR THE IRAP MODEL

3.1 INTRODUCTION

Exposure of an individual to a chemical may occur either by inhalation or ingestion (including food, water and soil). Of interest is the total dose of the chemical received by the individual through the combination of possible routes, and the IRAP model has been developed to estimate the dose received by the human body, often referred to as the external dose.

Exposure to COPCs is a function of the estimated concentration of the substance in the environmental media with which individuals may come into contact (i.e. exposure point concentrations) and the duration of contact. The concentration at the point of contact is itself a function of the transfer through air, soil, water, plants and animals that form part of the overall pathway. Exposure equations have been developed which combine exposure factors (e.g. exposure duration, frequency and medium intake rate) and exposure point concentrations. The dose equations therefore facilitate estimation of the received dose and account for the properties of the route of exposure, i.e. ingestion and inhalation.

For those substances that bio-accumulate, i.e. become more concentrated higher up the food chain, especially in body fats, the exposure through ingestion of meats and milk is of particular significance.

The IRAP model user has the facility to adjust some of the key exposure factors. An example is the diet of the receptor and the proportion of which is local produce, which may be contaminated. Obviously, if a nearby resident eats no food grown locally, then that person's diet cannot be contaminated by the emissions from the source, in this case the proposed EfW CHP facility. It is conventional to investigate two types of receptor, a farmer and a resident. It is assumed that a farmer eats proportionately more locally grown food than a resident. Where the potential exists for the consumption of locally caught fish a fisher receptor may also be considered. For this assessment, the consumption of locally caught fish has been screened out as it is not considered to be a significant exposure pathway (refer *Section 2.3*).

The receptor types can also be divided into adults and children. Children are important receptors because they tend to ingest soil and dusts directly and have lower body weights, so that the effect of the same dose is greater in the child than in the adult.

The IRAP model is designed to accept output files of airborne concentrations and deposition rates. From these, it proceeds to calculate the concentrations of the pollutants of concern in the environmental media, foodstuffs and the human receptor.

The model requires a wide range of input parameters to be defined, these include:

- physical and chemical properties of the COPCs;
- site information, including site specific data; and
- receptor information – for each receptor type (e.g. adult or child, resident or farmer or fisher).

The HHRAP default values, which are incorporated into the IRAP model, have been used for the majority of these input values. These data are provided in the following sections.

3.2 INPUT PARAMETERS FOR THE COPCS

The IRAP model contains a database of physical and chemical parameters for each of 206 COPCs. This database is based on default values provided by the HHRAP and all default values have been used for this assessment.

These parameters are used to determine how each of the COPCs behave in the environment and their presence and accumulation in various food products (meat, fish, animal products, vegetation, soil and water). For cadmium and 2,3,7,8-TCDD (the most toxic of the PCDD/Fs), the default parameters are provided in *Table 3.1.*

TABLE 3.1 IRAP INPUT PARAMETERS FOR CADMIUM AND 2, 3, 7, 8-TCDD

Parameter Description	Symbol	Units	Cadmium	2,3,7,8-TCDD
Chemical abstract service number	CAS No.	-	7440-43-9	1746-01-6
Molecular weight	MW	g $mole^{-1}$	112.4	322.0
Melting point of chemical	T_m	K	593.2	578.7
Vapour pressure	V_p	atm	5.5×10^{-12}	1.97×10^{-12}
Aqueous solubility	S	mg l^{-1}	123000	1.93×10^{-5}
Henry's Law constant	H	atm-m^3 mol^{-1}	0.031	3.29×10^{-5}
Diffusivity of COPC in air	D_a	cm^2 s^{-1}	0.0772	0.104
Diffusivity of COPC in water	Dw	cm^2 s^{-1}	9.6×10^{-6}	5.6×10^{-6}
Octanol-water partition coefficient	K_ow	-	0.85	6,309,573
Organic carbon-water partition coefficient	K_oc	ml g^{-1}	0	3,890,451
Soil-water partition coefficient	Kd_s	ml g^{-1}	75	38,904
Suspended sediments/surface water partition coefficient	Kd_sw	l kg^{-1}	75	291,784
Bed sediment/sediment pore water partition coefficient	Kd_bs	ml g^{-1}	75	155,618

TABLE 3.1 IRAP INPUT PARAMETERS FOR CADMIUM AND 2, 3, 7, 8-TCDD

Parameter Description	Symbol	Units	Cadmium	2,3,7,8-TCDD
COPC loss constant due to biotic and abiotic degradation	K_sg	a^{-1}	0	0.03
Fraction of COPC air concentration in vapour phase	f_v		0.009	0.664
Root concentration factor	RCF	ml g^{-1}	0	39,999
Plant-soil bioconcentration factor for below ground produce	br_root_veg	-	0.064	1.03
Plant-soil bioconcentration factor for leafy vegetables	br_leafy_veg	-	0.125	0.00455
Plant-soil bioconcentration factor for forage	br_forage	-	0.364	0.00455
COPC air-to-plant biotransfer factor for leafy vegetables	bv_leafy_veg	-	0	65,500
COPC air-to-plant biotransfer factor for forage	bv_forage	-	0	65,500
COPC biotransfer factor for milk	ba_milk	day kg^{-1}	6.5×10^{-6}	0.0055
COPC biotransfer factor for beef	ba_beef	day kg^{-1}	1.2×10^{-4}	0.026
COPC biotransfer factor for pork	ba_pork	day kg^{-1}	1.9×10^{-4}	0.032
Bioconcentration factor for COPC in eggs	Bcf_egg	-	0.0025	0.060
Bioconcentration factor for COPC in chicken	Bcf_chicken	-	0	3.32
Fish bioconcentration factor	BCF_fish	l kg^{-1}	907	34,400
Fish bioaccumulation factor	BAF_fish	l kg^{-1}	0	0
Biota-sediment accumulation factor	BSAF_fish	-	0	0.09
Plant-soil bioconcentration factor for grain	br_grain	-	0.062	0.00455
Plant-soil bioconcentration factor for eggs	br_egg	-	0.0025	0.011
COPC biotransfer factor for chicken	ba_chicken	day kg^{-1}	0.11	0.019

Toxicity factors (e.g. reference doses, unit risk factors) are provided in *Table 3.2* for all of the COPCs. These are used to determine the carcinogenic risk or hazard associated with exposure to each COPC via inhalation or ingestion exposure pathways.

TABLE 3.2 TOXICITY FACTORS FOR THE COPCS CONSIDERED FOR THE ASSESSMENT

COPC	Ingestion Reference Dose	Inhalation Reference Concentration	Ingestion Carcinogenic Slope Factor (b)	Inhalation Unit Risk Factor (b)
Symbol	**RfD**	**RfC**	**Ing_csf**	**Inh_URF**
Units	**(mg kg^{-1} d^{-1})**	**(mg m^{-3})**	**(mg kg^{-1} d^{-1})$^{-1}$**	**(µg m^{-3})$^{-1}$**
Metals				
Antimony	0.0004	0.0014	0	0
Arsenic	0.0003	3.0×10^{-5}	1.5	0.0043
Cadmium	0.0004	0.0002	0.38	0.0018
Chromium III	1.5	5.3	0	0
Chromium VI	0.0030	8.0×10^{-6}	0	0.012
Lead	0.000429	0.0015	0.0085	1.2×10^{-5}
Nickel	0.02	0.0002	0	0.00024
Thallium (a)	0.00008	0.00028	0	0
Elemental mercury	8.57×10^{-5}	0.0003	0	0
Mercuric chloride	0.0003	0.0011	0	0
Methyl mercury	0.0001	0.00035	0	0
Benzo(a)pyrene	0	0	7.3	0.0011
PCDD/Fs				
2,3,7,8-TCDD	1×10^{-9}	0	150000	38
1,2,3,7,8-PeCDD	0	0	150000	38
1,2,3,4,7,8-HxCDD	0	0	15000	3.8
1,2,3,7,8,9-HxCDD	0	0	6200	3.8
1,2,3,6,7,8-HxCDD	0	0	6200	3.8
1,2,3,4,6,7,8-HpCDD	0	0	1500	0.38
OCDD	0	0	15	0.011
2,3,7,8-TCDF	0	0	15000	3.8
2,3,4,7,8-PeCDF	0	0	75000	11.4
1,2,3,7,8-PeCDF	0	0	7500	1.14
1,2,3,4,7,8-HxCDF	0	0	15000	3.8
1,2,3,7,8,9-HxCDF	0	0	15000	3.8
1,2,3,6,7,8-HxCDF	0	0	15000	3.8
2,3,4,6,7,8-HxCDF	0	0	15000	3.8
1,2,3,4,6,7,8-HpCDF	0	0	1500	0.38
1,2,3,4,7,8,9-HpCDF	0	0	1500	0.38
OCDF	0	0	15	0.011
Aroclor 1016	7×10^{-5}	2.5×10^{-4}	0	0
Aroclor 1254	2×10^{-5}	7×10^{-5}	0	0

(a) Reference data for thallium have been taken from the 1998 US EPA HHRA protocol
(b) For PCDD/Fs, values derived as advised by Lakes Environmental

The Reference Dose (ingestion) and Reference Concentration (inhalation) for each COPC is used to determine the non-carcinogenic risk associated with exposure. The Carcinogenic Slope Factors (ingestion) are used to determine the carcinogenic risk from ingestion. The Unit Risk Factors are used to determine the carcinogenic risk from inhalation. The methodology used for calculating total non-carcinogenic and carcinogenic risk is provided in *Section 4.2*.

3.3 SITE AND SITE SPECIFIC PARAMETERS

The IRAP health risk assessment model requires information relating to the industrial location and its surroundings. The parameters required include the following.

- The fraction of animal feed (grain, silage and forage) grown on contaminated soils and quantity of animal feed and soil consumed by the various animal species considered.
- The interception fraction for above ground vegetation, forage and silage and length of vegetation exposure to deposition. The yield/standing crop biomass is also required.
- Input data for assessing the risks associated with exposure to breast milk, including:
    - body weight of infant;
    - exposure duration;
    - proportion of ingested COPC stored in fat;
    - proportion of mother's weight that is fat;
    - fraction of fat in breast milk;
    - fraction of ingested contaminant that is absorbed; and
    - half-life of dioxins in adults and ingestion rate of breast milk.
- Other physical parameters (e.g. soil dry bulk density, density of air, soil mixing zone depth).

For all of these parameters the IRAP/EPA HHRAP default values have been used and these are presented in *Annex A*. Other site specific parameters are also required which are not provided by the IRAP model. These parameters were specified for the facility location as follows:

- Annual average evapotranspiration rate of 53.2 cm a^{-1} (assumed to be 70% of total precipitation);
- Annual average precipitation of 76 cm a^{-1} (based on local meteorological data for Leuchars Airfield between 2011 and 2015);
- Annual average irrigation of 0 cm a^{-1};
- Annual average runoff of 7.6 cm a^{-1} (assumed to be 10% of total precipitation);

- An annual average wind velocity of 5.0 m s^{-1} (based on Leuchars Airfield meteorological data for 2011 to 2015); and
- A time period over which deposition occurs of 30 years.

3.4 RECEPTOR INFORMATION

Within the IRAP model there are three possible receptor types; Resident, Farmer and Fisher but not all may be considered appropriate. For this assessment, only Farmer and Resident receptors are considered. Information relating to each receptor type (adult and/or child) is required by the model where these receptor types are used. The information required includes the following:

- Food (meat, dairy products, fish and vegetables), water and soil consumption rates for each receptor type. However, only Fishers are assumed to consume fish and only Farmers are assumed to consume locally reared animals and animal products.
- Fraction of contaminated food, water and soil which is consumed by each receptor type.
- Input data for the inhalation exposure including: inhalation exposure duration, inhalation exposure frequency, inhalation exposure time; and inhalation rate.
- Input data for the ingestion exposure including: exposure duration, exposure frequency, exposure time; and body weight of receptor.

For the purposes of this assessment the default IRAP/HHRAP parameters have been used to define the characteristics of the receptors. The input data used are presented in *Annex B*.

4 EXPOSURE ASSESSMENT

4.1 SELECTION OF RECEPTORS

In addition to defining specific locations for assessment, IRAP can be used to determine the location of maximum impact over an area based on the results of the dispersion model. For each defined land-use area, IRAP selects the locations which represent the maximum predicted concentrations or deposition rates for the area selected. The locations of these various maxima are often co-located resulting in the selection of one to nine receptor locations per defined area. This approach is adopted by IRAP since the maximum receptor impact may occur at any one of the maximum concentration or deposition locations identified.

For the proposed EfW CHP facility, residential exposure within the immediate vicinity is limited by the industrial nature of the site. The nearest residential areas are to the south at Douglas and Angus and to the north to the north of Drumgeith Road and Ballumbie Road. Based on the surrounding residential areas, ten areas where residential exposure may occur have been defined. The urban nature of the land use around the site means that areas used for farming are somewhat limited to areas to the north beyond residential areas. Therefore, two farmer receptor areas have been selected for agricultural land to the north.

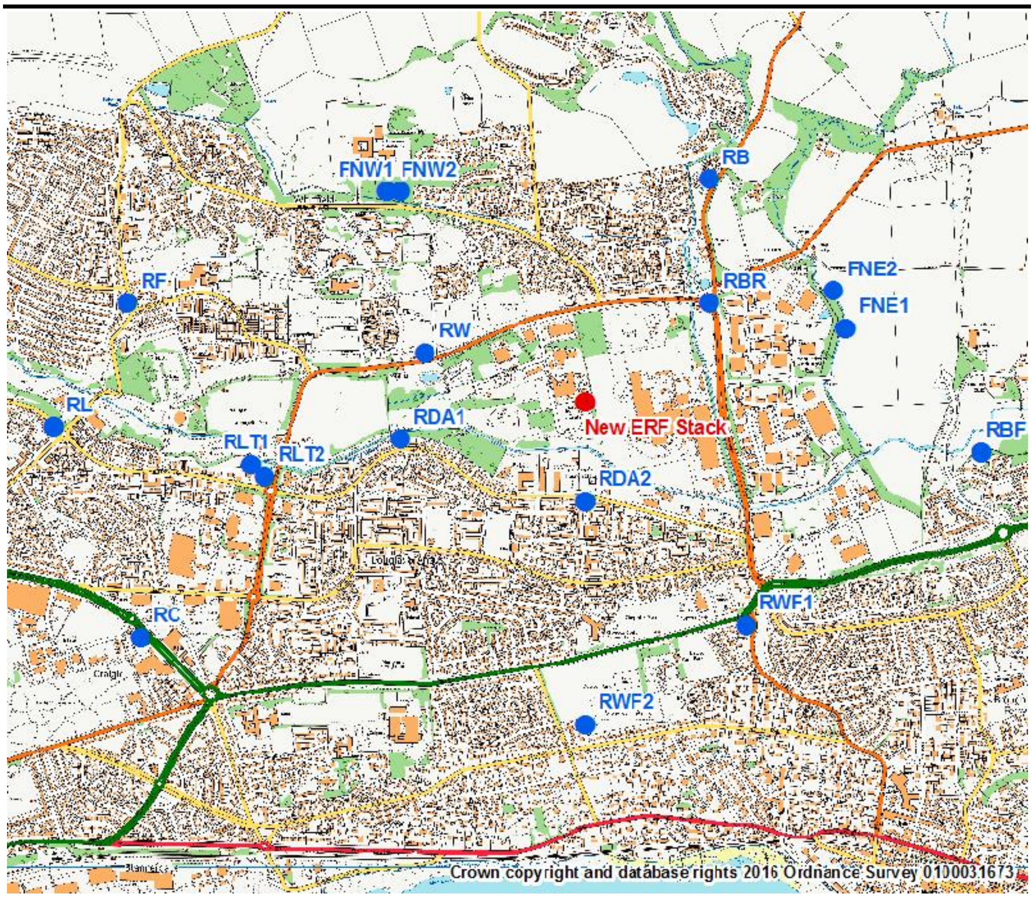
For each type of receptor, up to nine locations are selected based on the maximum predicted airborne concentration, maximum predicted wet deposition rate and maximum dry deposition rate for gas, particle and particle bound phases. These maxima are often co-located, however, and each receptor type could have between one and nine identified receptor locations per defined area.

For the proposed EfW CHP facility, four farmer receptors and thirteen residential receptors have been assessed. For all of the receptor types, adult and child receptors have been considered. The locations of the resident and farmer receptors are presented in *Figure 4.1* and described in *Table 4.1*. At other locations not specifically considered in the assessment, the predicted hazards and risks would be lower than predicted for the discrete receptors considered.

TABLE 4.1 SENSITIVE RECEPTORS CONSIDERED FOR THE HHRA

Receptor Name	Code	Grid Reference	
		x	y
Farmer NE 1	FNE1	345687	733179
Farmer NE 2	FNE2	345637	733329
Farmer NW 1	FNW1	343887	733729
Farmer NW 2	FNW2	343837	733729
Resident Ballumbie	RB	345137	733779
Resident Ballumbie Road	RBR	345137	733279
Resident Broughty Ferry	RBF	346237	732679
Resident Craigie	RC	342837	731929
Resident Douglas & Angus1	RDA1	343887	732729
Resident Douglas & Angus2	RDA2	344637	732479
Resident Fintry	RF	342787	733279
Resident Linlathen	RL	342487	732779
Resident Longtown 1	RLT1	343287	732629
Resident Longtown 2	RLT2	343337	732579
Resident West Ferry 1	RWF1	345287	731979
Resident West Ferry 2	RWF2	344637	731579
Resident Whitfield	RW	343987	733079

FIGURE 4.1 LOCATION OF THE RESIDENT AND FARMER RECEPTORS



4.2 ASSESSMENT OF NON-CARCINOGENIC AND CARCINOGENIC RISK

4.2.1 Non-carcinogenic Risk

The non-carcinogenic effect of the emissions on human health can be assessed in terms of the *Hazard Quotient* (HQ). For ingestion, the HQ is calculated as the Average Daily Dose (ADD) divided by the reference dose (RfD). For example, the HQ for ingestion exposure for cadmium (Cd) is calculated as follows:

$$HQ_{Ing,Cd} = \frac{ADD_{Ing,Cd}}{RfD_{Ing,Cd}}$$

Where:

$$ADD_{Ing,Cd} = \frac{I_{Ing,Cd} \times ED \times EF}{AT \times 365}$$

Where: $ADD_{Ing,\,Cd}$ = ingestion dose for cadmium; ED is the exposure duration (dependent on the receptor type); EF is the exposure frequency (350 days per year); and AT is the averaging time (equal to ED for non-carcinogenic effects and 70 years for carcinogenic risks).

For inhalation, the HQ is calculated as the exposure concentration divided by the reference concentration (RfC). For example, the HQ for inhalation exposure for cadmium (Cd) is calculated as follows:

$$HQ_{Inh,Cd} = \frac{EC_{Cd} \times 0.001}{RfC_{Inh,Cd}}$$

Where:

$$EC_{Cd} = \frac{C_a \times ED \times EF}{AT \times 365}$$

Where: EC_{Cd} is the exposure concentration (µg m^{-3}), $RfC_{Inh,\,Cd}$ is the reference concentration for cadmium (mg m^{-3}) and C_a is the concentration of cadmium in air.

The Reference Dose and Reference Concentration for each COPC and exposure pathway are provided in *Section 3.2*. The RfDs and RfCs are set conservatively, that is they are protective of health and doses at or greater than the RfD or RfC indicate the potential for effect, rather than clear and certain indication of an effect. For example, should the maximum daily intake for the new source, in this case the facility, be equal to the RfD, then the HQ would be equal to 1.0 and this would indicate the potential for a health effect. On the other hand, a hazard quotient of less than unity (1.0) implies that such an exposure would not create an adverse non-carcinogenic health effect.

The *Hazard Index* (HI) is the sum of the individual COPC/pathway HQs and assumes that there are no synergistic or antagonist health effects arising from the release. The smaller the HI, the less risk to human health is implied.

4.2.2 Carcinogenic Risk

The risk of interest in this context is the extra lifetime risk associated with the total dose resulting from exposure to the facility emissions. For each COPC, the US EPA has calculated a carcinogenic slope factor (CSF). These are calculated for ingestion exposure whereas for inhalation exposure, a unit risk factor (URF) has been adopted. A summary of the factors used for this assessment is provided in *Section 3.2*. Where the CSF or URF is zero, this indicates that the COPC is non-carcinogenic via that exposure route. The IRAP model uses these values to calculate a cancer risk for each pollutant and for each pathway for exposure, so that the results can be expressed in a high degree of detail.

The risk associated with the ingestion exposure (food, water and soil) to cadmium is calculated as follows:

$$Risk_{Ing,\,Cd} = ADD_{Ing,\,Cd} \times CSF_{Ing,\,Cd}$$

Where $ADD_{Ing,\,Cd}$ is the sum of the average daily dose from all ingestion exposure routes.

The risk associated with the inhalation of cadmium is calculated as follows:

$$Risk_{Inh,\,Cd} = EC_{Cd} \times URF_{Inh,\,Cd}$$

4.3 IMPACT ASSESSMENT FOR THE PROPOSED EFW CHP FACILITY

4.3.1 Assessment of Non-carcinogenic Effects – Proposed EfW CHP Facility

The Hazard Index (HI) calculated by IRAP for emissions from the proposed EfW CHP facility for each of the receptors (adult and child) is presented in *Table 4.2* (highest values for each receptor type are picked out in bold type).

TABLE 4.2 HAZARD INDEX FOR RESIDENT AND FARMER RECEPTORS - PROPOSED EFW CHP FACILITY

Receptor Name	Hazard Index (HI) – Proposed EfW CHP	
	Adult	Child
Farmer NE 1	**0.0070**	**0.0093**
Farmer NE 2	0.0066	0.0089
Farmer NW 1	0.0014	0.0019
Farmer NW 2	0.0014	0.0019
Resident Ballumbie	0.00019	0.00035
Resident Ballumbie Road	**0.00083**	**0.0015**
Resident Broughty Ferry	0.00031	0.00055
Resident Craigie	0.000049	0.00010
Resident Douglas & Angus1	0.00018	0.00036
Resident Douglas & Angus2	0.00011	0.00029
Resident Fintry	0.00015	0.00028
Resident Linlathen	0.000083	0.00016
Resident Longtown 1	0.00011	0.00022
Resident Longtown 2	0.00011	0.00021
Resident West Ferry 1	0.000064	0.00013
Resident West Ferry 2	0.000060	0.00013
Resident Whitfield	0.00041	0.00078
Criterion	*1.0*	

The HIs are well below unity (1.0) and so it is highly unlikely that emissions of COPCs from the facility would cause an adverse non-carcinogenic health risk. For the proposed EfW CHP facility, the highest HI is predicted for the Farmer Northeast 1 Child and is a factor of around 100 less than unity. The maximum residential HI is 0.0015 for Resident Ballumbie Road (child) and is a factor of 667 less than unity. Despite being located further from the emission source, predicted HIs for farmers are higher than for the residential receptors because of the assumed consumption of animal products.

4.3.2 Assessment of Carcinogenic Effects – Proposed EfW CHP Facility

The total lifetime risk calculated by IRAP for emissions from the facility for each of the receptors (adult and child) is presented in *Table 4.3.*

TABLE 4.3 TOTAL LIFETIME RISK FOR FARMER AND RESIDENT RECEPTORS

Receptor Name	Lifetime Risk – Proposed EfW CHP	
	Adult	Child
Farmer NE 1	**3.4×10^{-6}**	**7.2×10^{-8}**
Farmer NE 2	3.2×10^{-6}	6.9×10^{-7}
Farmer NW 1	6.6×10^{-7}	1.4×10^{-7}
Farmer NW 2	6.5×10^{-7}	1.4×10^{-7}
Resident Ballumbie	1.9×10^{-8}	9.7×10^{-8}
Resident Ballumbie Road	**8.4×10^{-8}**	**4.2×10^{-8}**
Resident Broughty Ferry	3.1×10^{-8}	1.5×10^{-8}
Resident Craigie	5.5×10^{-9}	2.9×10^{-8}
Resident Douglas & Angus1	2.0×10^{-8}	1.0×10^{-8}
Resident Douglas & Angus2	1.6×10^{-8}	9.2×10^{-8}
Resident Fintry	1.5×10^{-8}	7.7×10^{-8}
Resident Linlathen	8.9×10^{-9}	4.5×10^{-8}
Resident Longtown 1	1.2×10^{-8}	6.2×10^{-7}
Resident Longtown 2	1.2×10^{-8}	6.0×10^{-7}
Resident West Ferry 1	7.1×10^{-9}	3.7×10^{-7}
Resident West Ferry 2	7.3×10^{-9}	3.9×10^{-7}
Resident Whitfield	4.3×10^{-8}	2.2×10^{-7}
Criterion	7.0×10^{-5}	

For the proposed EfW CHP facility, the highest carcinogenic risk is predicted for Farmer Northeast 1 (adult) and Resident Ballumbie Road (adult). The additional, total, **lifetime** risks to these receptors are 3.4×10^{-6}, (1 in 294,100) and 8.4×10^{-8} (1 in 11,904,800), respectively. Expressed as an **annual** risk, these risk estimates become 1 in 20,587,000 for Farmer Northeast 1 and 1 in 833,336,000 for Resident Ballumbie Road, assuming a lifetime of 70 years. Such risks are well within an annual risk of 1×10^{-6} (1 in 1 million), conventionally considered to be acceptable for industrial regulation in the UK [5].

4.3.3 Exposure to Dioxins, Furans and Dioxin-like PCBs – Proposed EfW CHP Facility

Comparison of Dioxin/Furan Exposure with WHO and UK Guidance

The World Health Organization (WHO) recommends a tolerable daily intake for dioxins/furans of 1 to 4 pg I-TEQ kg-BW^{-1} d^{-1} (picogrammes as the International Toxic Equivalent per kilogram bodyweight per day) [(6)]. The TDI represents the tolerable daily intake for lifetime exposure and short-term

5 Risk Assessment for Environmental Professionals, CIWEM Publication (December 2001)

6 Assessment of the Health Risk of Dioxins: Re-evaluation of the Tolerable Daily Intake (TD), WHO Consultation, May 25-29 1998, Geneva, Switzerland

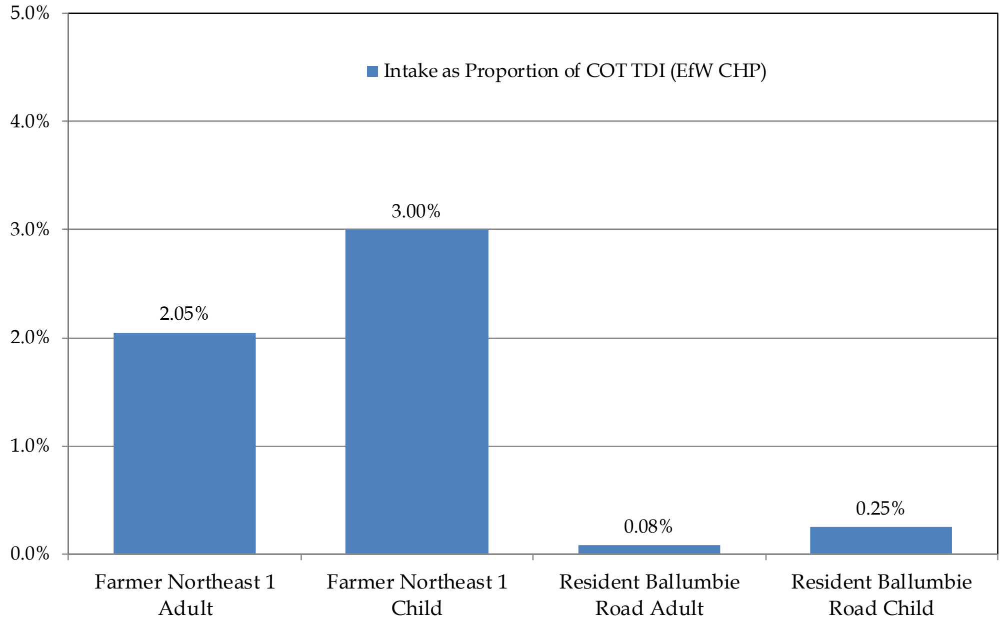
excursions above the TDI would have no consequence provided that the average intake over long periods is not exceeded. The average (lifetime) daily intake of dioxins/furans for the receptors considered is presented in *Table 4.4*. These are also compared to the Committee on Toxicity (COT) TDI of 2 pg I-TEQ kg-BW^{-1} d^{-1} for dioxins, furans and dioxin-like PCBs. These are also presented as a percentage of the Committee on Toxicity (COT) TDI of 2 pg I-TEQ kg-BW^{-1} d^{-1} in *Figure 4.2* for the Farmer Northeast 1 and Resident Ballumbie Road receptors, where highest exposures are predicted.

TABLE 4.4 COMPARISON OF AVERAGE DAILY INTAKES WITH THE UK AND WHO'S TDI FOR DIOXINS/FURANS (pg I-TEQ kg-BW^{-1} d^{-1})

Receptor Name	Proposed EfW CHP Facility	
	Adult	Child
Farmer NE 1	**0.041**	**0.060**
Farmer NE 2	0.039	0.058
Farmer NW 1	0.0085	0.013
Farmer NW 2	0.0084	0.012
Resident Ballumbie	0.00038	0.0012
Resident Ballumbie Road	**0.0016**	**0.0050**
Resident Broughty Ferry	0.00058	0.0018
Resident Craigie	0.00012	0.00037
Resident Douglas & Angus1	0.00043	0.0014
Resident Douglas & Angus2	0.00043	0.0014
Resident Fintry	0.00031	0.00095
Resident Linlathen	0.00018	0.00057
Resident Longtown 1	0.00025	0.00079
Resident Longtown 2	0.00025	0.00077
Resident West Ferry 1	0.00015	0.00048
Resident West Ferry 2	0.00017	0.00053
Resident Whitfield	0.00088	0.0027
WHO TDI	*1 to 4 pg I-TEQ kg-BW^{-1} d^{-1}*	
Committee on Toxicity (COT) TDI	*2 pg I-TEQ kg-BW^{-1} d^{-1}*	

For the proposed EfW CHP facility, the contribution of the facility to the COT TDI is less than 3.0% for the farmer receptors and 0.3% for the residential receptors.

FIGURE 4.2 PREDICTED INTAKE OF DIOXINS AND FURANS FOR THE FARMER AND RESIDENT RECEPTORS AS A PERCENTAGE OF THE COMMITTEE ON TOXICITY TOLERABLE DAILY INTAKE



Total Intake

The contribution of the facility to total intake is calculated as follows:

- predicted incremental intake due to emissions from the facility;
- average daily background intake (i.e. that arising from other sources), referred to as the mean daily intake (MDI);
- the total intake (i.e. the sum of the predicted incremental intake and the MDI);
- a comparison of the total intake with the TDI for dioxin/furans.

For all receptors, the total intakes are presented in *Table 4.5*. Results are presented for both adult and child receptors.

TABLE 4.5 COMPARISON OF TOTAL INTAKE WITH THE COT TDI – PROPOSED EFW CHP FACILITY

Receptor	Total Intake from the Facility (pg I-TEQ kg^{-1} d^{-1})	Total Intake Facility + MDI (pg I-TEQ kg^{-1} d^{-1})	Facility as %age of TDI	Total Intake as %age of TDI
Adult Receptors				
Farmer NE 1	0.041	0.74	2.1%	37.1%
Farmer NE 2	0.039	0.74	2.0%	37.0%
Farmer NW 1	0.0085	0.71	0.4%	35.4%
Farmer NW 2	0.0084	0.71	0.4%	35.4%
Resident Ballumbie	0.00038	0.70	0.0%	35.0%
Resident Ballumbie Road	0.0016	0.70	0.1%	35.1%
Resident Broughty Ferry	0.00058	0.70	0.0%	35.0%
Resident Craigie	0.00012	0.70	0.0%	35.0%
Resident Douglas & Angus1	0.00043	0.70	0.0%	35.0%
Resident Douglas & Angus2	0.00043	0.70	0.0%	35.0%
Resident Fintry	0.00031	0.70	0.0%	35.0%
Resident Linlathen	0.00018	0.70	0.0%	35.0%
Resident Longtown 1	0.00025	0.70	0.0%	35.0%
Resident Longtown 2	0.00025	0.70	0.0%	35.0%
Resident West Ferry 1	0.00015	0.70	0.0%	35.0%
Resident West Ferry 2	0.00017	0.70	0.0%	35.0%
Resident Whitfield	0.00088	0.70	0.0%	35.0%
Child Receptors				
Farmer NE 1	0.060	2.16	3.0%	108.0%
Farmer NE 2	0.058	2.16	2.9%	107.9%
Farmer NW 1	0.013	2.11	0.6%	105.6%
Farmer NW 2	0.012	2.11	0.6%	105.6%
Resident Ballumbie	0.0012	2.10	0.1%	105.1%
Resident Ballumbie Road	0.0050	2.10	0.2%	105.2%
Resident Broughty Ferry	0.0018	2.10	0.1%	105.1%
Resident Craigie	0.00037	2.10	0.0%	105.0%
Resident Douglas & Angus1	0.0014	2.10	0.1%	105.1%
Resident Douglas & Angus2	0.0014	2.10	0.1%	105.1%
Resident Fintry	0.00095	2.10	0.0%	105.0%
Resident Linlathen	0.00057	2.10	0.0%	105.0%
Resident Longtown 1	0.00079	2.10	0.0%	105.0%
Resident Longtown 2	0.00077	2.10	0.0%	105.0%
Resident West Ferry 1	0.00048	2.10	0.0%	105.0%
Resident West Ferry 2	0.00053	2.10	0.0%	105.0%
Resident Whitfield	0.0027	2.10	0.1%	105.1%
COT TDI	2	2	-	-

The MDI is derived from background adult intakes provided in the former Science Report published by the Environment Agency [7] which provides a value of 49 pg WHO-TEQ d^{-1}. The MDI for an adult receptor and child receptor is calculated as follows:

- for an adult receptor a MDI of 0.7 pg I-TEQ kg^{-1} d^{-1} [8] is derived by dividing the background intake by a bodyweight of 70 kg;
- for a child receptor a MDI of 2.1 pg I-TEQ kg^{-1} d^{-1} is derived by dividing the background intake by a bodyweight of 15 kg and applying an adult to child correction factor of 0.65.

For the child receptor, the MDI for dioxin/furans exceeds the TDI without the contribution from the facility. However, in deriving the MDI for the child receptors, a bodyweight of 15 kg has been used in order to be consistent with the IRAP predictions which assume a bodyweight of 15 kg. As a consequence the MDI is higher than it would be for a 20 kg child (typically assumed in the UK) and also represents a worst case. For a 20 kg child (adult to child correction factor of 0.74) the MDI for a child would be 1.8 pg I-TEQ kg^{-1} d^{-1} and below the COT TDI.

For inhalation and oral intake of PCDD/Fs for adults, total intake is well below the TDI. Background exposure represents approximately 35% of total exposure. At worst, the proposed EfW CHP facility contributes 2.1% to the TDI for adults.

For inhalation and oral intake of PCDD/Fs for children, the background intake is in excess of the TDI. At worst the additional contribution from the facility for a child is 0.060 pg TEQ kg^{-1} d^{-1} (3.0% of the COT TDI). Combined with the background exposure for a 20 kg child (1.8 pg TEQ kg^{-1} d^{-1}) the total intake would be below the TDI (93.0%). Furthermore, it should be noted that the TDI for PCCD/Fs is set for the purposes of assessing lifetime exposure and these elevated background exposures for children are therefore not representative of long term exposure.

Infant Breast Milk Exposure to Dioxins and Furans

Another exposure pathway of interest is infant exposure to PCDDs (polychlorinated di benzo(p)dioxins) and PCDFs (polychlorinated dibenzofurans) via the ingestion of their mother's breast milk. This is because the potential for contamination of breast milk is particularly high for dioxin-like compounds such as these, as they are extremely lipophilic (fat soluble) and hence likely to accumulate in breast milk. Further, the infant body weight is

7 Soil Guideline Values for dioxins, furans and dioxin-like PCBs in soil, Environment Agency, Science Report SC050021/Dioxins SGV, September 2009 (withdrawn)

8 No correction is provided between the WHO-TEF and the I-TEF but a sensitivity analysis indicates that correcting between the two systems would have negligible impact on the results

smaller and it could be argued that the effect is therefore proportionately greater than in an adult.

This exposure is measured by the Average Daily Dose (ADD) on the basis of an averaging time of 1 year. In the US, a threshold value of 50 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD TEQ is cited as being potentially harmful. The IRAP model calculates the ADD that would result from an adult receptor breast feeding an infant. A summary of the ADD for each of the infants of the adult receptors considered for the assessment is presented in *Table 4.6.*

TABLE 4.6 ASSESSMENT OF THE AVERAGE DAILY DOSE FOR A BREAST-FED INFANT OF AN ADULT RECEPTOR – PROPOSED EFW CHP FACILITY

Receptor Name	Average Daily Dose from Breast Feeding (pg kg^{-1} d^{-1} of 2,3,7,8-TCDD)
Farmer NE 1	0.52
Farmer NE 2	0.50
Farmer NW 1	0.10
Farmer NW 2	0.10
Resident Ballumbie	0.0036
Resident Ballumbie Road	0.015
Resident Broughty Ferry	0.0055
Resident Craigie	0.0011
Resident Douglas & Angus1	0.0040
Resident Douglas & Angus2	0.0038
Resident Fintry	0.0029
Resident Linlathen	0.0017
Resident Longtown 1	0.0024
Resident Longtown 2	0.0023
Resident West Ferry 1	0.0014
Resident West Ferry 2	0.0016
Resident Whitfield	0.0083
US EPA Criterion	*50*
WHO criterion	*1 to 4*
UK criterion (COT)	2

For the proposed EfW CHP facility, the highest ADDs are calculated for the infants of the farmer receptors and represent at worst less than 1.0% of the US EPA criterion of 50 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD. The calculated ADDs for residential receptors are lower compared to the farmer since the most significant exposure to dioxins/furans is via the food chain, particularly animals and animal products. The farmer receptors are assumed to consume contaminated meat and dairy products. The residential receptors, however, are only assumed to consume vegetable products which are less significant with regard to exposure to dioxins/furans.

For the proposed EfW CHP facility, the ADDs for the infants of the farmer receptors are up to 26% of the COT criterion. The duration of exposure is short, however, and the average daily intake over the lifetime of the individual would be substantially less. Highest exposure is predicted for infants of Farmer Northeast 1 adults, for whom lifetime exposure would consist of the following components:

- One year as a breast fed infant at 0.52 pg I-TEQ kg-BW^{-1} d^{-1};
- Five years as a child farmer at 0.060 pg I-TEQ kg-BW^{-1} d^{-1};
- 40 years as an adult farmer at 0.041 pg I-TEQ kg-BW^{-1} d^{-1};
- 24 years as an adult resident at 0.0016 pg I-TEQ kg-BW^{-1} d^{-1} (worst-case).

This would result in a total average (lifetime) daily intake of 0.036 pg I-TEQ kg-BW^{-1} d^{-1}. This is well below COT TDI and the lower range of the WHO TDI, which is set specifically for lifetime exposure.

The WHO recognises that breast-fed infants would be exposed to higher intakes for a short duration, but also that breast feeding itself provides associated benefits.

4.4 CUMULATIVE IMPACT ASSESSMENT

4.4.1 Introduction

A cumulative assessment has been carried out for the operation of the proposed EfW CHP facility and the previous operation of the existing DERL plant. The existing DERL plant has operated for approximately 17 years (since September 1999). As a consequence, it will have operated after the introduction of stricter controls on emissions from municipal waste incinerators in 1996 which restricted emissions to 1 ng Nm^{-3} but before further regulation in 2003 restricting emissions to the current limit of 0.1 ng m^{-3}. However, it is considered that historical exposure to dioxins (i.e. prior to 2003 will be accounted for in background exposure). Therefore, cumulative effects from exposure to the existing DERL plant are assessed for the plant operating for 20 years but with emissions at the current emission limit of 0.1 ng Nm^{-3}. For present day exposure this represents a worst-case as emissions in 2015 indicated that actual emissions were around 0.05 ng Nm^{-3} (50% of the emission limit). In addition, the assessment assumes that the existing DERL plant operates for the next 20 years alongside the proposed EfW CHP facility rather than the past 20 years as the IRAP model is not able to predict future exposure to historical contamination from a facility that has ceased operating. Therefore, no account has been taken of the removal of the existing DERL plant contaminants in soil via degradation, leaching and other processes over the next 20-30 years. Therefore, the cumulative assessment is considered to represent worst-case conditions.

4.4.2 Cumulative Assessment of Non-carcinogenic Effects

The Hazard Index (HI) calculated by IRAP for the combined exposure to emissions from the existing DERL plant emissions and the proposed EfW CHP facility for each of the receptors (adult and child) is presented in *Table 4.7*.

TABLE 4.7 CUMULATIVE HAZARD INDEX FOR RESIDENT AND FARMER RECEPTORS

Receptor Name	Hazard Index (HI)			
	DERL Adult	DERL Child	Combined Adult	Combined Child
Farmer NE 1	0.018	0.023	0.025	0.032
Farmer NE 2	0.020	0.025	0.027	0.034
Farmer NW 1	0.0042	0.0054	0.0057	0.0072
Farmer NW 2	0.0042	0.0053	0.0056	0.0071
Resident Ballumbie	0.00062	0.0011	0.00081	0.0015
Resident Ballumbie Road	0.0046	0.0078	0.0054	0.0094
Resident Broughty Ferry	0.00065	0.0011	0.00096	0.0017
Resident Craigie	0.00011	0.00022	0.00016	0.00032
Resident Douglas & Angus1	0.00043	0.00082	0.00061	0.0012
Resident Douglas & Angus2	0.00037	0.00078	0.00047	0.0011
Resident Fintry	0.00035	0.00063	0.00049	0.00091
Resident Linlathen	0.00019	0.00035	0.00027	0.00051
Resident Longtown 1	0.00025	0.00048	0.00036	0.00069
Resident Longtown 2	0.00024	0.00046	0.00035	0.00068
Resident West Ferry 1	0.00014	0.00026	0.00020	0.00039
Resident West Ferry 2	0.00014	0.00029	0.00020	0.00043
Resident Whitfield	0.0011	0.0021	0.0015	0.0029
Criterion	*1.0*			

The HIs for combined exposure to the existing DERL plant and the proposed EfW CHP facility are well below unity (1.0) and so it is highly unlikely that emissions of COPCs from the facility would cause an adverse non-carcinogenic health risk when cumulative impacts are considered. For the combined exposure, the highest HI is predicted for the Farmer Northeast 2 Child and is a factor of around 30 less than unity. The maximum combined residential HI is 0.0094 for Resident Ballumbie Road 1 (child) and is a factor of 106 less than unity.

4.4.3 Cumulative Assessment of Carcinogenic Effects

The total lifetime risk calculated by IRAP for the combined exposure to emissions from the existing DERL plant and the proposed EfW CHP facility for each of the receptors (adult and child) is presented in *Table 4.8*.

TABLE 4.8 CUMULATIVE TOTAL LIFETIME RISK FOR FARMER AND RESIDENT RECEPTORS

Receptor Name	Lifetime Risk (HI)			
	DERL Adult	DERL Child	Combined Adult	Combined Child
Farmer NE 1	4.3×10^{-6}	9.3×10^{-7}	7.7×10^{-6}	1.6×10^{-6}
Farmer NE 2	4.8×10^{-6}	1.0×10^{-6}	8.0×10^{-6}	1.7×10^{-6}
Farmer NW 1	9.7×10^{-7}	2.1×10^{-7}	1.6×10^{-6}	3.5×10^{-7}
Farmer NW 2	9.6×10^{-7}	2.1×10^{-7}	1.6×10^{-6}	3.5×10^{-7}
Resident Ballumbie	5.1×10^{-8}	1.9×10^{-8}	7.0×10^{-8}	2.8×10^{-8}
Resident Ballumbie Road	3.7×10^{-7}	1.3×10^{-7}	4.5×10^{-7}	1.7×10^{-7}
Resident Broughty Ferry	5.3×10^{-8}	1.9×10^{-8}	8.3×10^{-8}	3.4×10^{-8}
Resident Craigie	9.5×10^{-9}	3.7×10^{-9}	1.5×10^{-8}	6.5×10^{-9}
Resident Douglas & Angus1	3.6×10^{-8}	1.4×10^{-8}	5.6×10^{-8}	2.4×10^{-8}
Resident Douglas & Angus2	3.1×10^{-8}	1.3×10^{-8}	4.7×10^{-8}	2.2×10^{-8}
Resident Fintry	2.8×10^{-8}	1.1×10^{-8}	4.4×10^{-8}	1.8×10^{-8}
Resident Linlathen	1.5×10^{-8}	5.8×10^{-9}	2.4×10^{-8}	1.0×10^{-8}
Resident Longtown 1	2.1×10^{-8}	7.9×10^{-9}	3.3×10^{-8}	1.4×10^{-8}
Resident Longtown 2	2.0×10^{-8}	7.7×10^{-9}	3.2×10^{-8}	1.4×10^{-8}
Resident West Ferry 1	1.1×10^{-8}	4.4×10^{-9}	1.9×10^{-8}	8.1×10^{-9}
Resident West Ferry 2	1.2×10^{-8}	4.9×10^{-9}	1.9×10^{-8}	8.8×10^{-9}
Resident Whitfield	9.3×10^{-8}	3.4×10^{-8}	1.4×10^{-7}	5.6×10^{-8}
Criterion	7.0×10^{-5}			

The highest carcinogenic risk for combined exposure to the existing DERL plant and proposed EfW CHP facility is predicted for Farmer Northeast 2 (adult) and Resident Ballumbie Road (adult). The additional, total, **lifetime** risks to these receptors are 8.0×10^{-6}, (1 in 125,200) and 4.5×10^{-7} (1 in 2,222,200), respectively. Expressed as an **annual** risk, these risk estimates become 1 in 8,764,000 for Farmer Northeast 2 and 1 in 155,554,000 for Resident Ballumbie Road, assuming a lifetime of 70 years. Such risks are well within an annual risk of 1×10^{-6} (1 in 1 million), conventionally considered to be acceptable for industrial regulation in the UK [9].

4.4.4 Combined Exposure to Dioxins, Furans and Dioxin-like PCBs

Comparison of Dioxin/Furan Exposure with WHO and UK Guidance

For combined emissions from the existing DERL plant and the proposed EfW CHP facility, the average (lifetime) daily intake of dioxins/furans is presented in *Table 4.9*. These are also compared to the Committee on Toxicity (COT) TDI of 2 pg I-TEQ $kg\text{-}BW^{-1}\ d^{-1}$ for dioxins, furans and dioxin-like PCBs.

9 Risk Assessment for Environmental Professionals, CIWEM Publication (December 2001)

TABLE 4.9 COMBINED AVERAGE DAILY INTAKES AS A FRACTION OF THE UK AND WHO'S TDI FOR DIOXINS/FURANS (pg I-TEQ kg-BW^{-1} d^{-1})

Receptor Name	Existing DERL Plant		Combined Exposure	
	Adult	Child	Adult	Child
Farmer NE 1	0.049	0.072	0.090	0.13
Farmer NE 2	0.055	0.080	0.094	0.14
Farmer NW 1	0.011	0.017	0.020	0.029
Farmer NW 2	0.011	0.017	0.020	0.029
Resident Ballumbie	0.00044	0.0014	0.00082	0.0025
Resident Ballumbie Road	0.0029	0.0090	0.0045	0.014
Resident Broughty Ferry	0.00045	0.0014	0.0010	0.0032
Resident Craigie	0.00010	0.00031	0.00022	0.00068
Resident Douglas & Angus1	0.00036	0.0011	0.00079	0.0025
Resident Douglas & Angus2	0.00037	0.0012	0.00080	0.0025
Resident Fintry	0.00026	0.00081	0.00057	0.0018
Resident Linlathen	0.00015	0.00047	0.00033	0.0010
Resident Longtown 1	0.00021	0.00065	0.00046	0.0014
Resident Longtown 2	0.00020	0.00063	0.00045	0.0014
Resident West Ferry 1	0.00012	0.00036	0.00027	0.00084
Resident West Ferry 2	0.00014	0.00043	0.00031	0.00097
Resident Whitfield	0.00085	0.0026	0.0017	0.0054
WHO TDI	*1 to 4 pg I-TEQ kg-BW^{-1} d^{-1}*			
Committee on Toxicity (COT) TDI	*2 pg I-TEQ kg-BW^{-1} d^{-1}*			

For the combined exposure to the existing DERL plant and the proposed EfW CHP facility, the contribution to the COT TDI is less than 6.9% for the farmer receptors and less than 0.7% for the residential receptors.

Infant Breast Milk Exposure to Dioxins and Furans

A summary of the ADD for each of the infants of the adult receptors considered for the assessment is presented in *Table 4.10* for combined exposure to the existing DERL plant and the proposed EfW CHP facility.

For the combined exposure, the highest ADDs are calculated for the infants of the farmer receptors and represent at worst less than 2.4% of the US EPA criterion of 50 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD. The calculated ADDs for residential receptors are lower compared to the farmer. Highest residential exposure is predicted for Resident Ballumbie Road and is 0.1% of the US EPA criterion.

TABLE 4.10 ASSESSMENT OF THE COMBINED AVERAGE DAILY DOSE FOR A BREAST-FED INFANT OF AN ADULT RECEPTOR

Receptor Name	Average Daily Dose from Breast Feeding ($pg\ kg^{-1}\ d^{-1}$ of 2,3,7,8-TCDD)
Farmer NE 1	1.2
Farmer NE 2	1.2
Farmer NW 1	0.25
Farmer NW 2	0.24
Resident Ballumbie	0.0082
Resident Ballumbie Road	0.046
Resident Broughty Ferry	0.010
Resident Craigie	0.0021
Resident Douglas & Angus1	0.0076
Resident Douglas & Angus2	0.0075
Resident Fintry	0.0056
Resident Linlathen	0.0032
Resident Longtown 1	0.0045
Resident Longtown 2	0.0044
Resident West Ferry 1	0.0026
Resident West Ferry 2	0.0029
Resident Whitfield	0.017
US EPA Criterion	*50*
WHO criterion	*1 to 4*
UK criterion (COT)	2

For the combined exposure, the ADDs for the infants of the farmer receptors are up to 60% of the COT criterion. However, as discussed previously, the duration of exposure is short and the average daily intake over the lifetime of the individual would be substantially less at around 0.082 $pg\ kg^{-1}\ d^{-1}$ of 2,3,7,8-TCDD.

The WHO recognises that breast-fed infants would be exposed to higher intakes for a short duration, but also that breast feeding itself provides associated benefits.

5 SUMMARY AND CONCLUSIONS

5.1 SUMMARY

5.1.1 Scope of the Assessment

The possible impacts on human health arising from dioxins and furans (PCDD/F), dioxin-like PCBs and trace metals emitted from the proposed EfW CHP facility have been assessed under the very worst-case scenario, namely that of an individual exposed for a lifetime to the effects of the highest airborne concentrations and consuming mostly locally grown food. This equates to a hypothetical farmer consuming food grown on limited rural areas within the locality. Therefore, this builds a high degree of conservatism into the assessment. The assessment has also identified more plausible pathways of exposure for the individuals considered (e.g. residents). Deposition and subsequent uptake of the compounds of potential concern (COPCs) into the food chain is likely to be the more numerically significant pathway over direct inhalation.

The purpose of the assessment is to determine the impact on human health of the proposed EfW CHP facility. In addition, consideration has been given to the cumulative impacts arising from the previous operation of the existing DERL plant which will have resulted in the deposition of COPCs to soils which may still be present during the operation of the proposed EfW CHP facility.

5.1.2 Non-carcinogenic Health Risks for the Proposed EfW CHP Facility

The Hazard Index (HI) calculated by IRAP are all well below unity (1.0) and so it is highly unlikely that emissions of COPCs from the proposed EfW CHP facility would cause an adverse non-carcinogenic health risk. For the EfW CHP facility, the highest HI is predicted for the Farmer Northeast 1 (child) this is a factor of around 100 less than unity. The maximum residential HI is 0.0015 for Resident Ballumbie Road (child) and is a factor of 667 less than unity. Therefore, the exposure to non-carcinogens is assessed as negligible.

5.1.3 Carcinogenic Health Risks for the Proposed EfW CHP Facility

The additional, **lifetime** carcinogenic risk arising from inhalation and ingestion of COPCs was assessed using US EPA cancer potency factors and unit risk factors, resulting in a worst case estimates for the future operational throughput as follows:

- 3.4×10^{-6} (1 in 294,100) for the farmer; and
- 8.4×10^{-8} (1 in 11,904,800) for the resident.

The assessment of health effects arising from exposure to COPCs indicates that emissions from the proposed EfW CHP facility do not pose a significant risk to health, given what is considered to be an acceptable level of lifetime risk in the UK, i.e. 1 in 14,300 (i.e. equivalent to an annual risk of 1 in 1,000,000 over a lifetime of 70 years).

5.1.4 Exposure to Dioxins, Furans and Dioxin-like PCBs for the Proposed EfW CHP Facility

For the proposed future operational throughput, the contribution of the facility to the COT TDI (2 pg I-TEQ kg-BW^{-1} d^{-1}) is less than 3.0% for the farmer receptors and less than 0.3% for the residential receptors.

Exposure to dioxins via breast milk has also been assessed. The highest intakes at 0.52 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD are calculated for the infants of the farmer receptors and represent at worst 1.0% of the US EPA criterion of 50 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD for exposure to dioxins via breast milk. Although this is up to 26% of the COT criterion, the duration of exposure is short and the average daily intake over the lifetime of the individual would be substantially less at around 0.036 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD even for the worst-case assumptions adopted for the assessment.

The WHO recognises that breast-fed infants would be exposed to higher intakes for a short duration, but also that breast feeding itself provides associated benefits.

5.1.5 Cumulative Impacts of the Existing DERL Plant and the Proposed EfW CHP Facility

The cumulative assessment arising from the previous operation of the existing DERL plant and the future operation of the proposed EfW CHP facility is considered to represent worst-case conditions with respect to emission concentrations and the accumulation of COPCs in soils. The assessment assumes that the existing DERL plant operates for the next 20 years alongside the proposed EfW CHP facility rather than the past 20 years as the IRAP model is not able to predict future exposure to historical contamination from a facility that has ceased operating. This is considered to represent worst-case conditions for the cumulative assessment.

The HIs for combined exposure to the existing DERL plant and the proposed EfW CHP facility are also well below unity (1.0) and so it is highly unlikely that emissions of COPCs from the facility would cause an adverse non-carcinogenic health risk when cumulative impacts are considered. For the combined exposure, the highest HI is predicted for the Farmer Northeast 2 Child and is a factor of around 30 less than unity.

The highest carcinogenic risk for combined exposure to the existing DERL plant and proposed EfW CHP facility is predicted for Farmer Northeast 2 (adult) and

Resident Ballumbie Road (adult). The additional, total, **lifetime** risks to these receptors are 8.0×10^{-6}, (1 in 125,200) and 4.5×10^{-7} (1 in 2,222,200), respectively. Expressed as an **annual** risk, these risk estimates become 1 in 8,764,000 for Farmer Northeast 2 and 1 in 155,554,000 for Resident Ballumbie Road, assuming a lifetime of 70 years. Such risks are well within an annual risk of 1×10^{-6} (1 in 1 million),

For the combined exposure to the existing DERL plant and the proposed EfW CHP facility, the contribution to the COT TDI is less than 6.9% for the farmer receptors, 0.7% for the residential receptors.

The highest intakes at 1.2 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD are calculated for the infants of the farmer receptors and represent at worst 2.4% of the US EPA criterion of 50 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD. Although this is up to 60% of the COT criterion, the duration of exposure is short and the average daily intake over the lifetime of the individual would be substantially less at around 0.082 pg kg^{-1} d^{-1} of 2,3,7,8-TCDD even for the very worst-case assumptions adopted for the cumulative assessment.

5.2 CONCLUSIONS

The risk assessment methodology used in this assessment has been structured so as to create 'realistic' worst case estimates of risk for residents. A number of features in the methodology give rise to this degree of conservatism, most obviously through the assumption that the exposed individual and consumes most of his/her above ground vegetable products derived from this area where deposition would occur. For farmer receptors, the ingestion of home-reared meat and animal products are also considered. This assumes that both arable and pasture land are present within the locality.

For the proposed EfW CHP facility and the cumulative impacts of the proposed EfW CHP facility and existing DERL plant, it has been demonstrated that the maximally exposed individual is not subject to a significant carcinogenic risk or non-carcinogenic hazard, arising from exposures via both inhalation and the ingestion of foods.

Annex A

Site Parameters

Annex A: Site Parameters Defined for the Health Risk Assessment

Parameter	Parameter Value	IRAP Symbol	Units
Soil dry bulk density	1.5	bd	g cm^{-3}
Forage fraction grown on contam. soil eaten by CATTLE	1.0	beef_fi_forage	--
Grain fraction grown on contam. soil eaten by CATTLE	1.0	beef_fi_grain	--
Silage fraction grown on contam. eaten by CATTLE	1.0	beef_fi_silage	--
Qty of forage eaten by CATTLE each day	8.8	beef_qp_forage	kg DW d^{-1}
Qty of grain eaten by CATTLE each day	0.47	beef_qp_grain	kg DW d^{-1}
Qty of silage eaten by CATTLE each day	2.5	beef_qp_silage	kg DW d^{-1}
Grain fraction grown on contam. soil eaten by CHICKEN	1.0	chick_fi_grain	--
Qty of grain eaten by CHICKEN each day	0.2	chick_qp_grain	kg DW d^{-1}
Fish lipid content	0.07	f_lipid	--
Fraction of CHICKEN's diet that is soil	0.1	fd_chicken	--
Universal gas constant	8.205e-5	gas_r	atm-m^3 mol^{-1} K^{-1}
Plant surface loss coefficient	18	kp	a^{-1}
Fraction of mercury emissions NOT lost to the global cycle	0.48	merc_q_corr	--
Fraction of mercury speciated into methyl mercury in produce	0.22	mercmethyl_ag	--
Fraction of mercury speciated into methyl mercury in soil	0.02	mercmethyl_sc	--
Forage fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_forage	--
Grain fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_grain	--
Silage fraction grown contam. soil, eaten by MILK CATTLE	1.0	milk_fi_silage	--
Qty of forage eaten by MILK CATTLE each day	13.2	milk_qp_forage	kg DW d^{-1}
Qty of grain eaten by MILK CATTLE each day	3.0	milk_qp_grain	kg DW d^{-1}
Qty of silage eaten by MILK CATTLE each day	4.1	milk_qp_silage	kg DW d^{-1}
Averaging time	1	milkfat_at	a
Body weight of infant	9.4	milfat_bw_infant	kg
Exposure duration of infant to breast milk	1	milkfat_ed	a
Proportion of ingested dioxin that is stored in fat	0.9	milkfat_f1	--
Proportion of mothers weight that is fat	0.3	milkfat_f2	--
Fraction of fat in breast milk	0.04	milkfat_f3	--
Fraction of ingested contaminant that is absorbed	0.9	milkfat_f4	--
Half-life of dioxin in adults	2555	milkfat_h	d
Ingestion rate of breast milk	0.688	milkfat_ir_milk	kg d^{-1}
Viscosity of air corresponding to air temp.	1.81e-04	mu_a	g cm^{-1} s^{-1}
Fraction of grain grown on contam. soil eaten by PIGS	1.0	pork_fi_grain	--
Fraction of silage grown on contam. soil and eaten by PIGS	1.0	pork_fi_silage	--
Qty of grain eaten by PIGS each day	3.3	pork_qp_grain	kg DW d^{-1}
Qty of silage eaten by PIGS each day	1.4	pork_qp_silage	kg DW d^{-1}
Qty of soil eaten by CATTLE	0.5	qs_beef	kg d^{-1}
Qty of soil eaten by CHICKEN	0.022	qs_chick	kg d^{-1}
Qty of soil eaten by DAIRY CATTLE	0.4	qs_milk	kg d^{-1}
Qty of soil eaten by PIGS	0.37	qs_pork	kg d^{-1}
Density of air	1.2e-3	rho_a	g cm^{-3}
Solids particle density	2.7	rho_s	g cm^{-3}
Interception fraction - edible portion ABOVEGROUND	0.39	rp	--
Interception fraction - edible portion FORAGE	0.5	rp_forage	--
Interception fraction - edible portion SILAGE	0.46	rp_silage	--
Ambient air temperature	298	t	K
Temperature correction factor	1.026	theta	--
Soil volumetric water content	0.2	theta_s	mL cm^{-3}
Length of plant expos. to depos. - ABOVEGROUND	0.16	tp	a
Length of plant expos. to depos. - FORAGE	0.12	tp_forage	a
Length of plant expos. to depos. - SILAGE	0.16	tp_silage	a
Average annual wind speed	3.9	u	m s^{-1}
Dry deposition velocity	0.5	vdv	cm s^{-1}
Dry deposition velocity for mercury	2.9	vdv_hg	cm s^{-1}
Wind velocity	3.9	w	m s^{-1}
Yield/standing crop biomass - edible portion ABOVEGROUND	2.24	yp	kg DW m^{-2}
Yield/standing crop biomass - edible portion FORAGE	0.24	yp_forage	kg DW m^{-2}
Yield/standing crop biomass - edible portion SILAGE	0.8	yp_silage	kg DW m^{-2}
Soil mixing zone depth	2.0	z	cm

ANNEX B

SCENARIO PARAMETERS

Annex B: Exposure Scenario Parameters

Parameter Description	Adult Resident	Child Resident	Adult Farmer	Child Farmer	Adult Fisher	Child Fisher	Units
Averaging time for carcinogens	70	70	70	70	70	70	a
Averaging time for noncarcinogens	30	6	40	6	30	6	a
Consumption rate of BEEF	0.0	0.0	0.00122	0.00075	0.0	0.0	kg kg^{-1} FW d^{-1}
Body weight	70	15	70	15	70	15	kg
Consumption rate of POULTRY	0.0	0.0	0.00066	0.00045	0.0	0.0	kg kg^{-1} FW d^{-1}
Consumption rate of ABOVEGROUND PRODUCE	0.00032	0.00077	0.00047	0.00113	0.00032	0.00077	kg kg^{-1} DW d^{-1}
Consumption rate of BELOWGROUND PRODUCE	0.00014	0.00023	0.00017	0.00028	0.00014	0.00023	kg kg^{-1} DW d^{-1}
Consumption rate of DRINKING WATER	1.4	0.67	1.4	0.67	1.4	0.67	L d^{-1}
Consumption rate of PROTECTED ABOVEGROUND PRODUCE	0.00061	0.0015	0.00064	0.00157	0.00061	0.0015	kg kg^{-1} DW d^{-1}
Consumption rate of SOIL	0.0001	0.0002	0.0001	0.0002	0.0001	0.0002	kg d^{-1}
Exposure duration	30	6	40	6	30	6	yr
Exposure frequency	350	350	350	350	350	350	d a^{-1}
Consumption rate of EGGS	0.0	0.0	0.00075	0.00054	0.0	0.0	kg kg^{-1} FW d^{-1}
Fraction of contaminated ABOVEGROUND PRODUCE	1.0	1.0	1.0	1.0	1.0	1.0	--
Fraction of contaminated DRINKING WATER	1.0	1.0	1.0	1.0	1.0	1.0	--
Fraction contaminated SOIL	1.0	1.0	1.0	1.0	1.0	1.0	--
Consumption rate of FISH	0.0	0.0	0.0	0.0	0.00125	0.00088	kg kg^{-1} FW d^{-1}
Fraction of contaminated FISH	1.0	1.0	1.0	1.0	1.0	1.0	--
Inhalation exposure duration	30	6	40	6	30	6	a
Inhalation exposure frequency	350	350	350	350	350	350	d a^{-1}
Inhalation exposure time	24	24	24	24	24	24	h d^{-1}
Fraction of contaminated BEEF	1	1	1	1	1	1	--
Fraction of contaminated POULTRY	1	1	1	1	1	1	--
Fraction of contaminated EGGS	1	1	1	1	1	1	--
Fraction of contaminated MILK	1	1	1	1	1	1	--
Fraction of contaminated PORK	1	1	1	1	1	1	--
Inhalation rate	0.83	0.30	0.83	0.30	0.83	0.30	m^3 h^{-1}
Consumption rate of MILK	0.0	0.0	0.01367	0.02268	0.0	0.0	kg kg^{-1} FW d^{-1}
Consumption rate of PORK	0.0	0.0	0.00055	0.00042	0.0	0.0	kg kg^{-1} FW d^{-1}
Time period at the beginning of combustion	0	0	0	0	0	0	a
Length of exposure duration	30	6	40	6	30	6	a