



Human Health Risk Assessment

Lostock Sustainable Energy Plant

E.ON Energy from Waste UK Limited/Brunner Mond



Quality Management

Prepared by:	Liz Williams	Senior Consultant
Prepared by:	Dr. Ahlim Hashm	Technical director
Authorised by:	Dr. Ahlim Hashm	Technical director
Date:	January 2010	
Revision:	0.0	
Project Number:	BES0388	
Document Reference:	BES0388R	

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RPS Planning and Development Ltd. Registered in England No. 02947164
Centurion Court, 85 Milton Park, Abingdon, Oxfordshire, OX14 4RYA Member of the RPS Group Plc

RPS Planning and Development
Park House
Greyfriars Road
Cardiff
CF10 3AF
T: +44 (0) 2920 668662
F: +44 (0) 2920 668622
E: rpsca@rpsgroup.com
W: www.rpsgroup.com



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1 Introduction

1.1 Background

A detailed human health risk assessment to identify potential health risks associated with exposure to emissions from the proposed Sustainable Energy Plant at Lostock has been completed in line with best practice methodologies.

1.2 Scope of Work

This assessment evaluates the possible effects on the health of populations likely to be exposed to emissions from the proposed facility. The geographic scope of the study is based on the closest receptors within an approximate 3-kilometre radius for residential, farmer and commercial receptors where the most significant deposition is generally observed. Defra 2004¹ considered that 1-km radius from the source of emission is a suitable range for assessment of health from dispersion modelling.

Considering that the assessment is related to exposure through direct inhalation of affected air, and indirect exposure through ingestion of affected food, locally grown on soil impacted by the emission through deposition and accumulation, the only relevant sources of emission from the proposed facility considered in this assessment are the stacks emissions. The substances emitted from the stacks (termed hereafter the contaminants of potential concern COPC) can be considered under the following categories:

- Substances for which any effects are likely to be acute. These effects tend to occur shortly after exposure. These can be subdivided into two groups
 - Acid gases, such as sulphur dioxide, nitrogen dioxide, hydrochloric and hydrofluoric acids,
 - Other substances, such as carbon monoxide, and fine particulate matter.
- Chemicals for which any effects are likely to be chronic. These effects tend to arise from prolonged exposure. The chemicals can be subdivided into two groups:
 - Metals
 - Semi-volatile and non-volatile organic chemicals such as dioxins and furans, benzo(a)pyrene (BaP) and polychlorinated biphenyls (PCBs)

Exposure to the contaminants of potential concern can be by a variety of possible exposure pathways including direct exposure by inhalation of gases and fine particulates, and indirect exposure following the deposition of trace contaminants to land and water and subsequent transfer by biogeochemical processes through soils, water and vegetation into the food chain. The assessment has evaluated potential impacts on human health from the proposed facility's emissions, both in terms of the long-term inhalation, and the overall long-term exposure through additional viable routes such as the food chain. Therefore the assessment was carried out on persistent substances that have the potential to accumulate in the environment over the emission life of the facility. These include all the above listed chemicals for which effects are likely to be chronic.

In accordance with the recommended UK tiered approach to risk assessment, this site assessment has first considered worst-case scenarios for all receptors in assuming multiple exposure conditions where all pathways of exposure in each land use scenario were considered to be viable. Some of these assumptions are both extremely conservative and also very unlikely. These worst case assumptions have been used in the first instance as part of a screening study, to identify receptors that can be excluded from further assessment. Receptors failing the screening assessment are considered in further detail, with the exposure assumptions refined to reflect a more realistic exposure scenario, as appropriate.

2 Methodology

2.1 Background

In its review of environmental and health effects of waste management, the Department for Environment, Food and Rural Affairs' (Defra)¹ reported that a direct measurement of exposure attributable to facilities such as that proposed by Brunner Mond and E.ON Energy from Waste UK Limited (the applicants) in partnership, at Lostock cannot be made due to the complexity of the pollutant mixture, the possibility of exposure through multiple pathways, wider environmental and lifestyle influences and the generally non-specific health outcomes.

In order to manage the difficulties of directly measuring effects and to provide a predictive analysis, the assessment was based on modelling the various exposure routes, applying outputs from the air quality assessment and factoring in the influence of the local meteorological conditions and characteristics such as stack height, velocity and temperature of discharge. Such modelling acts as a means of establishing a worst-case exposure attributable to the source as the basis of the health assessment.

Exposure to emissions from such facilities can be through a number of pathways, with the inhalation and the food chain being the most critical. For certain persistent pollutants, such as trace metals, dioxins and furans, benzo(a)pyrene and polychlorinated biphenyls the cumulative indirect exposure via the ingestion of contaminated food is of paramount importance. Therefore potential exposure through this important pathway has been accounted for in addition to the inhalation.

In the absence of an equivalent UK method, the Industrial Risk Assessment Program-Human Health (IRAP-h View - version 4.0), which is based on the United States Environment Protection Agency (USEPA) Human Health Risk Assessment Protocol (HHRAP 2005), has been used to calculate the transport and fate of trace contaminants emitted in the stack exhaust gases. The default exposure parameters and toxicological data were replaced by those recommended by DEFRA and the Environment Agency's Science reports SC050021/SR3² (updates and replaces the CLR10, 2002³) and R&D Publication TOX reports^{4,5,6,7,8,9,10}. This is based on the recommendation of the DEFRA and the Environment Agency's Science reports SC050021/SR2¹¹ (update and replaces the CLR9 2002¹²) which requires that when selecting appropriate toxicological data, UK

proclamations should be given preference. It also requires that, where available, UK data should be used for the derivation of background exposure.

These modified parameters include averaging times for carcinogens and non-carcinogens, human body weight, consumption and inhalation rates, exposure frequencies and durations. The only UK source that reported values for mixing depths is the UK GasSim model manual. The recommended values are 50 cm and 5 cm for tilled and non-tilled soils respectively. In this assessment, the USEPA default values of 20 cm and 2 cm soil mixing depths were used being more conservative than the GasSim model values.

The level of exposure to trace metals, dioxins and furans, BaP and PCBs emitted from the proposed facility has been quantified at selected sensitive receptors within the vicinity of the site. In residential locations, the key exposure pathways have included the ingestion of soils and home-grown produce. On agricultural premises, potential exposure through the ingestion of home-grown produce, ingestion of beef, milk, pork, poultry and eggs, produced at farms within the vicinity of the site has been included, as appropriate.

Throughout this assessment, where there is some uncertainty in respect of the data, a precautionary approach (conservative) has been used to estimate the possible risks from exposure to emissions from the proposed facility. The purpose of this approach is to ensure that full allowance is made for any uncertainties in the interpretation of the data provided in order to be protective of human health.

2.2 Approach to Risk Assessment

The DEFRA common framework¹³ providing general guidance for risk assessment and management has been used as the founding principle for the assessment and appraisal of potential impact on human health from the proposed facility.

This common framework includes guidelines setting out the basic principles which the regulatory authorities would normally intend to use in the assessment and management of environmental risks and which are recommended for all public-domain risk assessments. They are intended to provide decision-makers, practitioners and the public with a consistent language and approach for environmental risk assessment and management.

The guidelines provide a tiered approach to environmental risk assessment and management where the level of effort put into assessing each risk is proportionate to its

priority (in relation to other risks) and its complexity (in relation to an understanding of the likely impacts).

The staged approach developed for this project, consistent with the current UK risk assessment guidelines is presented in the following sub-sections.

2.2.1 Stage 1 Development of Conceptual Model of the Site

The risk assessment procedure utilises the source-pathway-receptor concept in constructing a Site Conceptual Model (SCM) and assessing potential risks. The source-pathway-receptor 'pollutant linkage' scenario provides a useful basis for generating a site conceptual model, which can be used to identify critical pathways on which a quantitative analysis may be undertaken. The SCM establishes, in a qualitative manner, the following:

- Principal sources of contamination on the site - emissions from the proposed development
- Contaminants of potential concern - The European Parliament Directive WID 2000/76/EC list of pollutants in addition to other relevant organic pollutants
- Behaviour of contaminants within contaminated media – i.e., airborne, deposited on soils, taken up by home grown vegetables and other agricultural products
- All relevant receptors;
- Location of potential exposure points;
- Plausible pathways connecting sources of contamination and sensitive receptors; accidental ingestion of soil and contaminated home grown produce and other routes of exposure through the food chain.

2.2.2 Stage 2: Hazard Identification

This includes identification of:

- the type and spatial distribution of hazardous substances;
- the media containing such hazardous materials;
- the concentration of the hazardous substance in the identified media;
- exposure scenarios, whether residential, agricultural, etc;
- exposure routes - ingestion of soil, ingestion of beef, etc; and
- exposure factors for each scenario and route.

2.2.3 Stage 3 Hazard/Risk Characterisation and Assessment

This includes:

- identifying the toxicity of the identified contaminants of concern with relevance to chronic exposures;
- identification of the nature of the potential effect; and
- calculation of the magnitude of risks/ derivation of risk-based criteria using a site specific risk assessment model to evaluate the significance of harm from exposure to identified contaminants of concern with consideration to sensitive receptors.

2.2.4 Stage 4 Risk Control and Management

At stage 4 of the assessment, strategies to control and manage potential risks through appropriate mitigation measures are identified if needed. This may be achieved through the management of the source or the exposure pathways to prevent the exposure of the receptors, where needed.

3 Risk Assessment

3.1 The Site Conceptual Model

The development of a site conceptual model (SCM) is the first stage of the risk assessment. The model is used to identify the potential sources, critical pathways and receptors that require assessment as described in the following paragraphs.

3.1.1 Sources

For the purpose of assessing potential health impact associated with the effect of emissions from the proposed Sustainable Energy Plant, the stacks are the only relevant source of emission from the proposed facility. The European Directive 2000/76/EC (WID) prescribes air emission limits for the following pollutants:

- oxides of nitrogen (NO_x);
- sulphur dioxide SO₂;
- particles;
- carbon monoxide;
- hydrogen chloride;
- hydrogen fluoride;
- dioxins and furans;
- group 1 metals;
- group 2 metals; and
- group 3 metals.

Only the metals and dioxins of the above list are considered to be of relevance to long-term exposure (chronic). Group 1 metals includes cadmium and thallium and their compounds, group 2 includes mercury and its compounds while group 3 includes antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel, vanadium and their compounds. Some of these metals, such as cobalt, copper, manganese and vanadium, were excluded from this assessment on the basis that they pose little or no risk and as such were not included in the EPA HHRAP COPC database.

All contaminants that were deemed by the UK Department for Environment, Food and Rural Affairs and the Environment Agency as priority contaminants (CLR8 2002¹⁴) were considered in the assessment. These include cadmium, mercury in the form of mercuric chloride and mercury vapour, arsenic, chromium (hexavalent and other chromiums), lead, antimony, dioxins and furans. Despite its absence from the UK list of priority contaminants and hence the absence of UK toxicological data, thallium was considered in the assessment due to its high toxicity. A review has been undertaken to identify any available toxicological data for thallium and none was found in current literature. The USEPA Risk Assessment Information System (RAIS) had previously provided a list of toxicological data for the different thallium compounds. These have been withdrawn recently. The ATSDR has also removed their provisional values due to uncertainties associated with thallium toxicity assessment. In the absence of current toxicological data on thallium, the withdrawn USEPA values were considered for an indicative assessment. The most conservative of the USEPA previously reported values (lowest allowable Reference Dose-RfD- of 8.0E-05 mg/kgbw-day) was used in the model.

Although the European Directive 2000/76/EC (WID), does not prescribe air emission limits for PCBs and benzo(a)pyrene, these were included in the assessment due to the commonly raised concern about these chemicals and their likely presence in the emission. The emission values used for these chemicals were based on the long-term emission concentrations taken from the Integrated Pollution Prevention and Control (IPCC) Reference Document on the Best Available Techniques for Waste Incineration

The annual rates of air concentrations and depositions of the metals and dioxins/furans were estimated through air dispersion modelling using ADMS. Details on the modelling approach are presented in the air quality chapter of the ES. The air parameters are presented in Annex A.

The emissions for the stack are presented in Table 3-1 and Table 3-2.

Table 3-1 Emission of Metals

Metal Group	Metals	Emission Conc – group total (mg.m ⁻³) [*]	Emission Rate (g.s ⁻¹)
Group 1	Cadmium	0.0015#	2.362E-04
	Thallium		2.362E-04
Group 2	Mercury	0.0015#	2.362E-04

Metal Group	Metals	Emission Conc – group total (mg.m ⁻³)*	Emission Rate (g.s ⁻¹)
Group 3	Antimony	0.5	3.071E-04**
	Arsenic		3.071E-04**
	Chromium-total		1.545E-03**
	Lead		2.208E-03**
	Nickel		1.564E-03**

* Normalised

** Emission rate based on percentage of NAEI typical emission rates per metal

^ Emission rate based on typical NAEI mercury emission for incinerator burning MSW (2007)

Emission rate based on typical emission rates for similar plant

Table 3-2 Emission of Dioxins and Other Organics

Congener	Annual Mean Emission Conc (ng.m ⁻³)*	Annual Mean Emission Conc, (mg.m ⁻³)*	Emission Rate (g.s ⁻¹)
2,3,7,8-TCDD	3.1E-03	3.1E-09	4.881E-10
1,2,3,7,8-PeCDD	2.5E-02	2.5E-08	3.936E-09
1,2,3,4,7,8-HxCDD	2.9E-02	2.9E-08	4.566E-09
1,2,3,7,8,9-HxCDD	2.1E-02	2.1E-08	3.306E-09
1,2,3,6,7,8-HxCDD	2.6E-02	2.6E-08	4.094E-09
1,2,3,4,6,7,8-HpCDD	1.7E-01	1.7E-07	2.677E-08
OCDD	4.0E-01	4.0E-07	6.298E-08
2,3,7,8-TCDF	2.7E-02	2.7E-08	4.251E-09
2,3,4,7,8-PeCDF	5.4E-02	5.4E-08	8.502E-09
1,2,3,7,8-PeCDF	2.8E-02	2.8E-08	4.408E-09
1,2,3,4,7,8-HxCDF	2.2E-01	2.2E-07	3.464E-08
1,2,3,7,8,9-HxCDF	4.2E-03	4.2E-09	6.613E-10
1,2,3,6,7,8-HxCDF	8.1E-02	8.1E-08	1.275E-08
2,3,4,6,7,8-HxCDF	8.7E-02	8.7E-08	1.370E-08
1,2,3,4,6,7,8-HpCDF	4.4E-01	4.4E-07	6.928E-08
1,2,3,4,7,8,9-HpCDF	4.3E-02	4.3E-08	6.770E-09
OCDF	3.6E-01	3.6E-07	5.668E-08
Total (ng I-TEQ m ⁻³)	1.0E-01	1.0E-07	1.574E-08
BaP	-	1.00E-03	1.574E-04
PCBs**	-	1.10E-09	1.732E-10

* Normalised

** In the absence of information on the constituents of the total PCBs, the USEPA methodology for selecting a surrogate compound was used in the modelling

3.1.2 Receptors

It is generally recommended that for human health risk assessment, resources for characterising the exposure setting should initially be focused on the areas surrounding the emission sources and extending out to about 3-km, where the most significant deposition has been generally observed. Such area may be extended where sensitive receptors have not been identified within the selected domain but are known to be present further afield within about 10-km of the source. For this assessment the 3-km radius was considered in the assessment as all type of sensitive receptors were identified within the domain. The air dispersion modelling plots also showed that the highest air and deposition concentrations are within this selected radius.

The purpose of characterising the exposure setting is to identify current human activities or land uses that provide the basis for evaluation of recommended exposure scenarios that may result due to exposure to emissions from the sources

IRAP-h View allows the digitisation of areas of concern where risk receptors and exposure scenarios can be selected for evaluation. Once an area has been defined, the model identifies, within each of the specified areas, all the grid nodes with the highest yearly averages for each modelled air parameter (e.g., air concentration, dry deposition, wet deposition) for each phase (e.g., vapour, particle, particle-bound) to each emission source. This will result in the selection of one or more receptor grid nodes as the location of one or more exposure scenario locations that meet the following criteria:

- Highest vapour phase air concentration
- Highest vapour phase dry deposition rate
- Highest vapour phase wet deposition rate
- Highest particle phase air concentration
- Highest particle phase dry deposition rate
- Highest particle phase wet deposition rate
- Highest particle-bound phase air concentration
- Highest particle-bound phase dry deposition rate
- Highest particle-bound phase wet deposition rate

The closest urban and rural residential areas surrounding the sites where the most significant deposition is anticipated to occur were selected as presented in Figure 1. The models selected between 1-3 receptor grid nodes in each of the selected areas presenting the highest annual air parameters. Each of the model's selected grid node

receptors was assigned the most sensitive exposure scenario based on its land use from the map observation. Where there was uncertainty with respect to the land use scenario, the most sensitive was used. Twenty risk receptor areas including residential, commercial and farms were selected. The model identified 41 grid node receptors with the highest air parameters. These included 26 farms, 11 residential and 4 commercial receptors. Table 3-3 below presents the different areas and their selected receptors based on the ADMS dispersion modelling results. The IRAP-h View model does not allow the modelling of commercial receptors due to their lower sensitivity. However, 4 commercial receptors were selected for this assessment due to their close proximity to the sources. They were modelled as adult residential receptors using UK commercial receptor exposure parameters. The main aim of the commercial assessment is to include potential exposure of breast feeding infants through the exposure of their working mothers.

Table 3-3 List of Receptors

Receptor area	Grid node receptors	NGR--x ⁽¹⁾	NGR—y ⁽¹⁾	Bearing	Receptor area	Grid node receptors
RI_1	RCPTR_1	368720	374180	E	Springbank Farm	Farm
	RCPTR_2	369320	373760	E	Springbank Farm	Farm
RI_2	RCPTR_3	368600	374600	W	Lostock Gralam	Residential
	RCPTR_4	368660	374600	W	Lostock Gralam	Residential
RI_3	RCPTR_5	368540	374480	NE	Commercial Premises	Commercial
	RCPTR_6	368600	374540	NE	Commercial Premises	Commercial
RI_4	RCPTR_7	367820	374180	N	Works	Commercial
	RCPTR_8	368420	374480	N	Works	Commercial
RI_5	RCPTR_9	367400	374360	N	Wincham	Residential
	RCPTR_10	368480	374600	N	Wincham	Residential
RI_6	RCPTR_11	365720	373160	S	Rudheath	Residential
	RCPTR_12	367220	373880	S	Rudheath	Residential
	RCPTR_13	367160	373880	S	Rudheath	Residential
RI_7	RCPTR_14	368480	375560	NE	Bank Farm	Farm
	RCPTR_15	369320	375800	NE	Bank Farm	Farm
RI_8	RCPTR_16	369080	376280	NE	Home Farm	Farm
	RCPTR_17	369440	375860	NE	Home Farm	Farm
RI_9	RCPTR_18	367880	375440	N	Rose Farm	Farm
	RCPTR_19	368300	375080	N	Rose Farm	Farm
RI_10	RCPTR_20	367040	374780	NW	Village Farm	Farm
	RCPTR_21	367460	374840	NW	Village Farm	Farm
RI_11	RCPTR_22	369380	373580	SE	Lostock Green	Residential
	RCPTR_23	369380	373760	SE	Lostock Green	Residential

Receptor area	Grid node receptors	NGR--x ⁽¹⁾	NGR—y ⁽¹⁾	Bearing	Receptor area	Grid node receptors
RI_12	RCPTR_24	368840	372800	SE	Melvin Holme	Farm
	RCPTR_25	369320	373580	SE	Melvin Holme	Farm
RI_13	RCPTR_26	368600	372560	SE	Ashbrook Farm	Farm
	RCPTR_27	368660	372740	SE	Ashbrook Farm	Farm
RI_14	RCPTR_28	368300	371480	S	Gadbrook Farm	Farm
	RCPTR_29	368780	371780	S	Gadbrook Farm	Farm
RI_15	RCPTR_30	367700	372080	S	Park Farm	Farm
	RCPTR_31	367700	372140	S	Park Farm	Farm
RI_16	RCPTR_32	365900	373220	SW	Bleakhouse Farm	Farm
	RCPTR_33	366920	373340	SW	Bleakhouse Farm	Farm
RI_17	RCPTR_34	367220	372080	SW	Billenge Green Farm	Farm
	RCPTR_35	367460	372260	SW	Billenge Green Farm	Farm
RI_18	RCPTR_36	369380	374960	NE	Possible Farmland	Farm
	RCPTR_37	369500	375560	NE	Possible Farmland	Farm
RI_19	RCPTR_38	367640	375740	N	Manor Farm	Farm
	RCPTR_39	367760	375620	N	Manor Farm	Farm
RI_20	RCPTR_40	368240	376040	NE	Higher Wincham	Residential
	RCPTR_41	369200	376280	NE	Higher Wincham	Residential

For residential and farmer scenarios, in accordance with the UK guidelines as published in SC050021/SR2¹¹, the critical receptor is considered to be a female child aged 0-6.

3.1.3 Pathways of Exposure

The two primary pathways of exposure considered in this assessment are inhalation and ingestion.

On the basis of the significance of exposure and consequently risks associated with the exposure, the following pathways were identified as the relevant pathways of exposure:

- Inhalation
- Ingestion of soil
- Ingestion of locally produced food

Exposure through food consumption from the following products were considered:

- Home-grown produce - all farms and residential properties
- Eggs produced and used on receptor farms - all farms

- Chicken produced and used on receptor farms - all farms
- Beef produced and used on receptor farms - all farms
- Pork produced and used on receptor farms - all farms
- Milk produced and used on receptor farms - all farms
- Breast milk – all residential, farm and commercial receptors

It should be noted that not all pathways of exposure considered in this assessment are likely to apply to any one receptor and therefore the assessment is likely to be very conservative.

Potential exposure through the ingestion of drinking water requires the contamination of the local drinking water sources. The USEPA HHRAP includes the ingestion of locally abstracted surface water as a potential pathway of exposure to allow for modelling of special sites where such pathway of exposure is likely to be of potential concern. The ingestion of groundwater as a potential source of exposure is not considered a feasible pathway of exposure for this location and therefore is not included in the assessment procedure.

No surface water abstraction points for drinking water were identified within 10 km of the site (the most impacted area). Therefore, potential exposure through this pathway was not considered in this assessment.

3.1.4 Hazard Identification

Hazard identification aims to identify contaminants of concern, their distribution in the different media and consequently their levels of exposure. In the absence of UK protocols for estimating the level of human exposure to COPCs through all relevant pathways of exposure, the USEPA “Human Health Risk Assessment Protocol HHRAP 2005”¹⁵ was used to estimate all exposures utilising the predicted air concentration and depositions rates provided by the air dispersion modelling. UK data were used for consumption of home grown vegetables in residential land use while US data for consumption of other foodstuffs were included in the exposure modelling.

Estimation of COPC Concentration in Media

The IRAP-h View model used for the assessment is equipped with a database of physical and chemical parameters used to calculate the media concentrations for all relevant COPCs. These are chemical specific values based on current international knowledge of chemicals.

In addition to the default values, which were used for this assessment, site-specific data are required for some of the parameters. These include the following:

- annual average evapotranspiration;
- annual average precipitation;
- annual average runoff; and
- annual average wind velocity.

The above data for the subject site were acquired from the MET office (MORECS data-Square 105 - averages for the years 1971-2000) as follows:

- Actual evaporation (the amount of water which is removed from the (crop+soil) combination into the air – 57.10 cm/year)
- Annual average rain fall – 80.10 cm/year
- Hydrologically effective rainfall / Runoff. The sum of rainfall less evaporation is known as the hydrologically effective rainfall, including that recharge to groundwater and flow to rivers (runoff). – 11.51 cm/year)

Average wind velocity was calculated from the meteorological data used in the air dispersion modelling and was found to be 3.9 m/s based on the local met data used for the air dispersion modelling.

Concentration in Soil

COPC concentrations in soil are calculated from the wet and dry deposition of particulates and vapour to the soil. Soil conditions such as pH, structure, organic matter content and moisture content will affect the distribution and mobility of contaminants. Losses from the soil by mechanisms such as leaching, erosion, runoff, degradation and volatilisation may reduce the concentrations of COPC in soil over time. These are utilised in the model, where appropriate, by using rates that depend on the physical and chemical characteristics of the soil.

Concentration in Produce

Indirect exposure resulting from ingestion of produce depends on the total concentration of COPCs in the leaves, fruit, and tuber portions of the plant.

Due to differences in contamination mechanisms, it is generally recommended to separate produce into two broad categories for the purposes of risk assessment: above-

ground produce and below-ground produce. In addition, above-ground produce can be further subdivided into exposed and protected above-ground produce.

Above-ground exposed produce is typically assumed to be contaminated by the following main mechanisms:

- direct deposition of particles — wet and dry deposition of particle phase COPCs on the leaves and fruits of plants;
- vapour transfer uptake of vapour phase COPCs by plants through their foliage; and
- root uptake of COPCs available from the soil and their transfer to the above-ground portions of the plant.

The USEPA recommends calculation of the total COPC concentration in above-ground exposed produce as the sum of contamination occurring through all of these mechanisms. However, edible portions of above-ground protected produce, such as peas and corn, are enclosed within an outer covering. They are therefore protected from contamination from deposition and vapour transfer. Root uptake of COPCs is the primary mechanism through which above-ground protected produce becomes contaminated.

Concentration in Beef and Milk

It is generally recommended by USEPA that COPC concentrations are estimated in beef tissue and milk products on the basis of the amount of COPCs that cattle consume through their diet. The human health risk assessment (HHRA) assumes that the cattle's diet consists of:

- forage (primarily pasture grass and hay); and
- silage (forage that has been stored and fermented), and
- grain.

Additional contamination may occur through the cattle ingestion of soil. The HHRA calculates the total COPC concentration in the feed items (e.g., forage, silage, and grain) as a sum of contamination occurring through the following mechanisms:

- direct deposition of particles – wet and dry deposition of particle phase COPCs onto forage and silage;
- vapour transfer - uptake of vapour phase COPCs by plants through their foliage; and

- root uptake - root uptake of COPCs available from the soil and their transfer to the above-ground portions of forage, silage, and grain.

It is also assumed, as recommended by the USEPA, that 100 percent of the plant materials eaten by cattle are grown on soil contaminated by emission sources. This is likely to be a highly pessimistic assumption for UK farming practice. COPC concentrations in forage and silage result from deposition onto exposed plant surfaces; the same is assumed for above-ground produce.

COPC concentration in beef tissue is calculated from the daily amount of a COPC that is consumed by cattle through the ingestion of contaminated feed items (plant) and soil by including biotransfer and metabolism factors. These transform the daily animal intake of a COPC (mg/day) into an animal COPC tissue concentration (mg COPC/kg tissue).

The metabolism factor (MF) estimates the amount of COPC that remains in fat and muscle. In the absence of data to support the derivation of chemical-specific MFs, a conservative MF of 1.0 is recommended by the USEPA HHRAP. For all chemicals considered in this assessment a MF of 1.0 was used.

Soil bio-availability (Bs) is the ratio between bioconcentrations for soil and vegetation. The efficiency of transfer from soil may differ from the efficiency of transfer from plant material for some COPCs. If the transfer efficiency is lower for soils, then the ratio would be less than 1.0. If it is equal to or greater than that of vegetation, the Bs value would be equal to or greater than 1.0. A value of 1.0 is recommended by USEPA and was used for calculating all the above-presented concentrations.

Data used for calculating the concentration of COPCs in each media and the human ingestion rates for different food are presented in Annex B.

COPC concentration in milk is calculated from the daily amount of a COPC that is consumed by dairy cattle through the ingestion of contaminated feed items (plant) and soil by including biotransfer and metabolism factors to transform the daily animal intake of a COPC (mg/day) into an animal COPC milk concentration (mg COPC/kg milk).

Concentration in Pork

COPC concentrations in pork tissue are estimated on the basis of the amount of COPCs that swine consume through a diet consisting of silage and grain. Additional COPC contamination of pork tissue may occur through their ingestion of soil.

Concentration in Poultry and Egg

Estimates of the COPC concentrations in chicken and eggs are based on the amount of COPCs that chickens consume through ingestion of grain and soil. The HHRA assumes that chickens are husbanded in a manner that allows contact with soil, i.e. free range. Consequently, chickens are assumed to consume 10 percent of their diet as soil, consistent with the study by Stephens et al, 1995¹⁶. Although highly unlikely in practice, for the screening assessment it is assumed, as recommended, that the remainder of the diet (90 percent) consists of grain grown at the exposure scenario location. Therefore, it was appropriate to assume that 100 percent of the grain consumed is contaminated.

Quantifying Exposure

Calculating COPC-specific exposure rates for each exposure pathway involves estimation of certain factors such as the media concentration and consumption rates.

Plant consumption rates for the residential scenario were obtained from EA report SC050021/SR3².

In the absence of UK data for consumption rates of other than soil and home grown vegetables, these were estimated based on the recommendations and default values provided by the USEPA as discussed in previous sections. These are presented in Annex B.

3.1.5 Hazard/ Risk Characterisation and Assessment

Risk characterisation involves combining the exposure quantities and the toxicity benchmarks to calculate the excess lifetime cancer risks and non-cancer risk for each of the pathways and receptors

Cancer risk from exposure to emissions is the probability that a human receptor will develop cancer, based on a unique set of exposure, model, and toxicity assumptions. For example, a risk of 1E-05 is interpreted to mean that an individual has up to a one in 100,000 chance of developing cancer during their lifetime from the evaluated exposure.

The current UK approach, for assessment of risk to human health, is based on the utilisation of the Index Dose (ID) for evaluating the level of risk for non-threshold effects including cancer risk. According to the Science report-SC050021/SR2¹¹ "Human health toxicological assessment of contaminants in Soil" replacing the withdrawn CLR9¹², two current approaches are adopted for deriving an Index Dose for non-threshold effects. These include the derivation of ID by Bench Mark Dose (BMD) modelling of the tumour

data and application of a large default uncertainty factor of 10,000 to the critical BMDL₁₀ (i.e. lower confidence limit of the benchmark dose which results in a 10% excess in incidence of cancer in a group of animals). Alternative approaches may be used, including quantitative dose-response modelling of suitable human cancer data while acknowledging the imprecision of quantitative estimates of cancer risk. In such case, the ID should be based on estimates of the dose corresponding to an excess lifetime cancer risk of 1 in 100,000 (10E-5).

All the available UK toxicological reports provided within the framework of contaminated land risk assessment at the time of this assessment are based on derivation of ID using the second approach as described in the CLR9¹² report.

The current UK position is that the risk level of 1E-05 is used for all carcinogenic contaminants considered in this assessment except for arsenic where a value of 1E-03 is used for the oral exposure pathway (Science report SC050021/TOX 1)⁷ and chromium where a value of 1E-04 is used for the inhalation pathway (R&D Publication TOX 4).

Furthermore, current UK guidance recommends the use of alternative approaches such as the Margin of Exposure (MoE) for contaminants where the carcinogenic level of risk is derived from animal studies such as benzo(a)pyrene (BaP). In the absence of formal confirmation from DEFRA and the EA regarding the approach to be adopted for BaP, both the ID and the MoE approaches will be used.

The USEPA model utilised for this assessment does not recognise the use of ID for carcinogenic assessment. Therefore RPS has converted UK IDs into equivalent slope factors to manipulate the model for UK toxicological data. The default results from the model are therefore presented in the form of the probability of risk (i.e., 1E-05). To present the results in a form compatible with the UK methodology, the ratio of the exposure to the health criteria (UK IDs) are also presented in the results section of this document.

The term "Hazard Quotient" is used in the IRAP model to describe the risk associated with the potential for developing non-cancer health effects as a result of exposure to COPC. The hazard quotient is not a probability but rather a comparison of a receptor's potential exposure relative to a standard exposure level. The standard exposure level is calculated over a similar exposure period and is estimated to pose no unacceptable risk in terms of adverse health effects to potential receptors.

Quantitatively Estimating Hazard Quotients and Cancer Risks

Standard risk assessment models assume that, for most chemicals with non-cancer effects, the non-cancer effects exhibit a threshold response. This means, there is a level of exposure below which no adverse effects will be observed. The default approaches used by the model to assess the potential for health effects associated with a threshold relationship involve:

- comparing an estimate of ingested exposure to a Tolerable Daily Intake (TDI) for oral exposure (the term Reference Dose (RfD) is used in the US toxicological reports to describe it);
- comparing an estimated chemical-specific air concentration to the Reference Concentration (RfC) for direct inhalation exposures.

A Tolerable Daily Intake TDI is a daily oral intake rate that is estimated to pose no unacceptable risk of adverse health effects, even to sensitive populations over a specific exposure duration, while RfC is an estimated daily concentration of a chemical in air, the exposure to which over a specific exposure duration poses no unacceptable risk of adverse health effects, even to sensitive populations.

As discussed above, the cancer risk estimates represent the probability that an individual will develop cancer over a lifetime as a result of a specific exposure to a carcinogenic chemical. Based on the ID approach, assessment of the potential for health effects is carried out by comparing the estimate of exposure to the index dose associated with a specified acceptable level of risk (1E-05).

The UK approach to risk assessment from land contamination for non-carcinogen compounds is based on the health criteria with consideration given to potential background exposure through other sources such as food and water. Where background exposure is equal to or greater than 50% of the health criterion or is unknown, 50% of the health criterion is used as the acceptable level from exposure to land contamination with the remaining 50% left to other sources to allow for exposure through the ingestion of food, water and other sources.

The background exposure through the inhalation pathway was considered within this risk assessment for all the threshold compounds by deducting the mean daily intake from the tolerable daily intake for inhalation. Considering that the most sensitive receptors are the farmers who are presumed to be self-sufficient and producing most of

their food items on the farm, the background exposure through the ingestion pathway from food was not added to the total exposure to avoid double counting.

Baseline land quality, especially the background level of COPCs within the locality of the facility, is an unknown quantity which it is not practically feasible to quantify at a receptor scale. This is due to the very heterogeneous nature of the soil as a natural media caused by geological and anthropogenic influence from the varying use of land over time.

Consequently, potential contribution to the COPCs intake from soil background contamination is taken into consideration in a qualitative manner. This is done by presenting the concentration of soil contamination caused by the identified sources for the assessment alongside the soil concentrations considered to be acceptable (UK soil guideline values) and assess the significance of the sources contribution to the total. Also current UK rural and urban soil concentration of the assessed contaminants as provided in "The UK Soil and Herbage pollutant Survey, EA 2007) were used as indicative of the background soil contamination level to predict the final soil concentration at receptors.

Risk Assessment

The risk assessment presented in this report has followed the following elements of work:

- estimates of the combined cancer risks and non-cancer (Hazard Quotients) for all identified receptors
- estimates of risk and hazards associated with exposure to relevant COPCs
- estimates of risk and hazards associated with pathways of exposure
- compare air concentrations with UK relevant air quality criteria
- estimates of blood levels associated with exposure to lead
- evaluation of infant exposure via breast milk to COPCs with appropriate biotransfer factors
- estimates of the soil concentrations at most affected receptors to compare with urban and rural soil concentrations and with UK Soil Guide Values
- estimates of the concentrations of certain metals in food items such as milk, meat and vegetables and compare them with national standards.

The total cancer risk and total hazard quotient estimated by the model, based on the air dispersion modelling prediction of air concentrations and depositions by ADMS for maximum emissions from the proposed Sustainable Energy Plant for all identified receptors are presented in Table 3-4 and Table 3-5 below.

Table 3-4 Risk Summary for All Resident Receptors

Receptor Name	Ratio of Combined Exposures to Relevant HCV for Cancer Risk	Total Cancer Risk Presented as a Probability	Total Hazard Quotient
RCPTR_10	1.66E-01	1.66E-06	1.02E-02
RCPTR_11	1.43E-02	1.43E-07	8.76E-04
RCPTR_12	3.23E-02	3.23E-07	1.97E-03
RCPTR_13	3.23E-02	3.23E-07	1.97E-03
RCPTR_22	8.85E-02	8.85E-07	5.41E-03
RCPTR_23	9.98E-02	9.98E-07	6.10E-03
RCPTR_3	2.98E-01	2.98E-06	1.82E-02
RCPTR_4	3.02E-01	3.02E-06	1.85E-02
RCPTR_40	4.90E-02	4.90E-07	2.99E-03
RCPTR_41	8.00E-02	8.00E-07	4.89E-03
RCPTR_9	1.80E-02	1.80E-07	1.10E-03

Table 3-5 Risk Summary for All Farm Receptors

Receptor Name	Ratio of Combined Exposures to Relevant HCV for Cancer Risk	Total Cancer Risk Presented as a Probability	Total Hazard Quotient
RCPTR_1	3.65E-02	3.65E-07	1.23E-02
RCPTR_14	1.51E-01	1.51E-06	5.11E-02
RCPTR_15	2.89E-01	2.89E-06	9.74E-02
RCPTR_16	1.48E-01	1.48E-06	5.00E-02
RCPTR_17	2.72E-01	2.72E-06	9.17E-02
RCPTR_18	1.54E-01	1.54E-06	5.19E-02
RCPTR_19	1.97E-01	1.97E-06	6.66E-02
RCPTR_2	2.11E-01	2.11E-06	7.14E-02
RCPTR_20	3.30E-02	3.30E-07	1.11E-02
RCPTR_21	7.06E-02	7.06E-07	2.38E-02
RCPTR_24	4.70E-02	4.70E-07	1.59E-02
RCPTR_25	1.84E-01	1.84E-06	6.21E-02
RCPTR_26	4.07E-02	4.07E-07	1.37E-02
RCPTR_27	4.50E-02	4.50E-07	1.52E-02

Receptor Name	Ratio of Combined Exposures to Relevant HCV for Cancer Risk	Total Cancer Risk Presented as a Probability	Total Hazard Quotient
RCPTR_28	2.15E-02	2.15E-07	7.26E-03
RCPTR_29	2.76E-02	2.76E-07	9.31E-03
RCPTR_30	2.66E-02	2.66E-07	8.97E-03
RCPTR_31	2.73E-02	2.73E-07	9.22E-03
RCPTR_32	3.27E-02	3.27E-07	1.10E-02
RCPTR_33	4.56E-02	4.56E-07	1.54E-02
RCPTR_34	2.90E-02	2.90E-07	9.78E-03
RCPTR_35	3.11E-02	3.11E-07	1.05E-02
RCPTR_36	1.47E-01	1.47E-06	4.96E-02
RCPTR_37	2.42E-01	2.42E-06	8.18E-02
RCPTR_38	1.27E-01	1.27E-06	4.27E-02
RCPTR_39	1.36E-01	1.36E-06	4.60E-02

The presented values in the above tables provide the cumulative cancer risk from all contaminants for all pathways of exposure combined together. Therefore they cannot be compared with acceptable criteria applicable to exposure to individual compounds (with the exception of compounds that are considered to have cumulative effects such as the different congeners of dioxins and furans) and to one pathway of exposure, unless the health effect is systemic.

As stated in Section 3.1.5 of this report, a range of risk values between 1E-05 –1E-03 for cancer risk and a hazard index (ratio of exposure to relevant health criteria) of 1 is used in the UK for assessment of individual contaminants. It should be noted however that even the combined risks from all contaminants are well below these target level for each individual compound, indicating the low level of risk.

It can be seen from the above results that the highest identified cancer risk and non-cancer risk (hazard index) for residential receptors are in the location of receptor 4 while the highest identified cancer risk and hazard index for a farmer receptor are in the location of receptors 15. These receptors will be discussed in further detail.

The cancer risks (expressed as a probability and as ratios of exposures to the health criteria -Index Doses) and the non-cancer risk (expressed as hazard quotients which represent the ratio of exposure to the health criteria -Tolerable Daily Intake) for individual

compounds for the most affected residential and farmer receptors are presented in Table 3-6, Table 3-7 and Table 3-8.

The cancer risk as a probability is provided for the combined risk from all pathways of exposure (values in brackets) for each compound, while the ratio of exposure to the index dose is provided for individual pathways below it. For non-cancer risk, the combined risk from all pathways of exposure is provided (in brackets) with the hazard quotient for each pathway provided below it.

Table 3-6 Cancer Risk for Metals & BaP

		Receptor 4 residential		Receptor 15 farmer	
COPC	HCV (mg/kg-day)	Exposure (mg/kg-day)	Total Cancer Risk *	Exposure (mg/kg-day)	Total Cancer Risk *
Arsenic			(7.22E-08)		(5.71E-07)
Ingestion	3.0E-04	2.27E-08	7.56E-05	1.65E-07	5.52E-04
Inhalation	2.0E-06	8.92E-09	4.46E-03	3.99E-09	2.00E-03
Chromium, hexavalent			(2.24E-06)		(1.00E-06)
Ingestion	-	-	-	-	-
Inhalation	1.0E-06	2.24E-08	2.24E-02	1.00E-08	1.00E-02
Benzo(a)pyrene			(6.61E-07)		(1.31E-06)
Ingestion	2.0E-05	1.55E-08	7.77E-04	2.04E-06	1.02E-01
Inhalation	7.0E-08	4.57E-09	6.53E-02	2.05E-09	2.92E-02

Table 3-7 Non-Cancer Risk for Metals

		Receptor 4 residential		Receptor 15 farmer	
COPC	HCV (mg/kg-day)	Exposure (mg/kg-day)	Total Hazard Quotient **	Exposure (mg/kg-day)	Total Hazard Quotient **
Antimony			(2.23E-05)		(1.05E-05)
Ingestion	4.0E-04	1.97E-11	4.93E-08	1.89E-10	4.72E-07
Inhalation	4.0E-04	8.92E-09	2.23E-05	3.99E-09	9.98E-06
Cadmium			(3.03E-03)		(1.48E-03)
Ingestion	3.6E-04	8.72E-09	2.42E-05	4.92E-08	1.37E-04
Inhalation	1.14E-06	3.42E-09	3.00E-03	1.53E-09	1.34E-03
Chromium			(8.27E-08)		(1.37E-06)
Ingestion	1.5	1.02E-07	6.79E-08	2.05E-06	1.37E-06
Inhalation	1.514	2.24E-08	1.48E-08	1.00E-08	6.63E-09

		Receptor 4 residential		Receptor 15 farmer	
COPC	HCV (mg/kg-day)	Exposure (mg/kg-day)	Total Hazard Quotient **	Exposure (mg/kg-day)	Total Hazard Quotient **
Chromium, hexavalent			(3.41E-05)		(6.89E-04)
Ingestion	3.0E-03	1.02E-07	3.41E-05	2.07E-06	6.89E-04
Inhalation	-	-	-	-	-
Lead			(1.45E-03)		(1.09E-03)
Ingestion	3.57E-03	1.64E-07	4.60E-05	1.64E-06	4.60E-04
Inhalation	4.57E-05	6.41E-08	1.40E-03	2.87E-08	6.28E-04
Mercuric chloride			(1.57E-04)		(2.89E-04)
Ingestion	2.0E-03	2.00E-07	1.00E-04	5.27E-07	2.64E-04
Inhalation	5.7E-05	3.27E-09	5.74E-05	1.47E-09	2.57E-05
Mercury			(2.40E-07)		(1.07E-07)
Ingestion	-	-	-	-	-
Inhalation	5.7E-05	1.37E-11	2.40E-07	6.12E-12	1.07E-07
Methyl mercury			(2.07E-05)		(4.95E-05)
Ingestion	2.3E-04	4.76E-09	2.07E-05	1.14E-08	4.95E-05
Inhalation	-	-	-	-	-
Nickel			(9.36E-03)		(4.43E-03)
Ingestion	1.2E-02	1.15E-07	9.60E-06	2.94E-06	2.45E-04
Inhalation	4.86E-06	4.55E-08	9.35E-03	2.03E-08	4.19E-03
Thallium (I)			(3.99E-04)		(6.96E-03)
Ingestion	8.0E-05	3.19E-08	3.99E-04	5.57E-07	6.96E-03
Inhalation	-	-	-	-	-

Table 3-8 Non-Cancer Risk for Dioxins and Furans & PCBs

		Receptor 4 residential		Receptor 15 farmer	
COPC	HCV (mg/kg-day)	Exposure (mg/kg-day)	Total Hazard Quotient **	Exposure (mg/kg-day)	Total Hazard Quotient **
HeptaCDD, 1,2,3,4,6,7,8			(6.84E-05)		(5.46E-04)
Ingestion	2.0E-07	1.37E-11	6.84E-05	1.09E-10	5.46E-04

COPC	HCV (mg/kg-day)	Receptor 4 residential		Receptor 15 farmer	
		Exposure (mg/kg-day)	Total Hazard Quotient **	Exposure (mg/kg-day)	Total Hazard Quotient **
HeptaCDF, 1,2,3,4,6,7,8 Ingestion	2.0E-07	3.54E-11	(1.77E-04) 1.77E-04	5.01E-10	(2.51E-03) 2.51E-03
HeptaCDF, 1,2,3,4,7,8,9 Ingestion	2.0E-07	3.46E-12	(1.73E-05) 1.73E-05	6.07E-11	(3.03E-04) 3.03E-04
HexaCDD, 1,2,3,4,7,8 Ingestion	2.0E-08	2.33E-12	(1.16E-04) 1.16E-04	2.37E-11	(1.18E-03) 1.18E-03
HexaCDD, 1,2,3,6,7,8 Ingestion	2.0E-08	2.08E-12	(1.04E-04) 1.04E-04	3.31E-11	(1.66E-03) 1.66E-03
HexaCDD, 1,2,3,7,8,9 Ingestion	2.0E-08	1.68E-12	(8.42E-05) 8.42E-05	2.58E-11	(1.29E-03) 1.29E-03
HexaCDF, 1,2,3,4,7,8 Ingestion	2.0E-08	1.76E-11	(8.81E-04) 8.81E-04	3.27E-10	(1.64E-02) 1.64E-02
HexaCDF, 1,2,3,6,7,8 Ingestion	2.0E-08	6.49E-12	(3.25E-04) 3.25E-04	1.21E-10	(6.03E-03) 6.03E-03
HexaCDF, 1,2,3,7,8,9 Ingestion	2.0E-08	3.35E-13	(1.67E-05) 1.67E-05	6.35E-12	(3.18E-04) 3.18E-04
HexaCDF, 2,3,4,6,7,8 Ingestion	2.0E-08	6.97E-12	(3.48E-04) 3.48E-04	1.30E-10	(6.49E-03) 6.49E-03
OctaCDD, 1,2,3,4,6,7,8,9 Ingestion	6.67E-06	3.22E-11	(4.83E-06) 4.83E-06	2.14E-10	(3.21E-05) 3.21E-05
OctaCDF, 1,2,3,4,6,7,8,9 Ingestion	6.67E-06	2.90E-11	(4.35E-06) 4.35E-06	2.34E-10	(3.52E-05) 3.52E-05
PentaCDD, 1,2,3,7,8 Ingestion	2.0E-09	1.99E-12	(9.93E-04) 9.93E-04	5.07E-11	(2.54E-02) 2.54E-02
PentaCDF, 1,2,3,7,8 Ingestion	6.67E-08	2.18E-12	(3.27E-05) 3.27E-05	4.59E-11	(6.88E-04) 6.88E-04
PentaCDF, 2,3,4,7,8 Ingestion	6.67E-09	4.23E-12	(6.35E-04) 6.35E-04	1.04E-10	(1.56E-02) 1.56E-02
TetraCDD, 2,3,7,8 Ingestion	2.0E-09	2.16E-13	(1.08E-04) 1.08E-04	4.05E-12	(2.03E-03) 2.03E-03
TetraCDF, 2,3,7,8 Ingestion	2.0E-08	1.90E-12	(9.51E-05) 9.51E-05	4.00E-11	(2.00E-03) 2.00E-03
PCBs Ingestion	6.67E-05	7.57E-14	(1.13E-09) 1.13E-09	4.61E-13	(6.91E-09) 6.91E-09
Sum of Dioxins & Furans & PCBs TEQ	2.0E-09	8.02E-12	4.01E-03	1.65E-10	8.24E-02

*values in brackets are the combined cancer risk (all pathways of exposure) expressed as a probability

** values in brackets are the combined non-cancer risk (all pathways of exposure)

It can be seen from the above results that for all the assessed compounds, the non-threshold and threshold risks are significantly below their target levels. Expressed as a probability, all cancer risks are well below the target level of $1E-05$ for all contaminants, $1E-03$ for the ingestion pathway for arsenic and $1E-04$ for the inhalation pathway for hexavalent chromium VI. This is confirmed by the ratio of exposure to the index dose values being significantly lower than the target level of 1 for all contaminants. Similarly the hazard quotients for all contaminants that have a threshold effect were significantly below the target level of 1.

The highest cancer risk for metals was associated with chromium VI in the location of receptor 4. The ratio of exposure to the index dose for the inhalation exposure is $2.24E-02$, which is significantly lower than the target level of 1.

Expressed as a probability, the cancer risk is estimated to be $2.24E-06$, significantly lower than that the target level of $1E-04$ for the inhalation risk of chromium VI.

The second highest cancer risk from metals is associated with arsenic in the location of receptor 15. Arsenic has a carcinogenic effect in both the ingestion and inhalation pathways. The ratio of exposure to the index dose is $5.52E-04$ through the ingestion pathway and $2.00E-03$ through the inhalation pathway respectively. Both are significantly lower than the target level of 1.

Expressed as a probability, the combined cancer risk from arsenic is estimated to be $5.71E-07$, including a risk value of $5.52E-07$ from ingestion and $2.0E-08$ from inhalation, both significantly lower than the target level of $1E-03$ and $1E-05$ respectively.

The highest cancer risk associated with benzo(a)pyrene is in the location of receptor 15. Benzo(a)pyrene has a carcinogenic effect in both the ingestion and inhalation pathways. The ratio of exposure to the index dose is $1.02E-01$ through the ingestion pathway and $2.92E-02$ through the inhalation pathway. Both are significantly lower than the target level of 1.

The highest non-cancer risk was associated with nickel in the location of receptor 4 modelled. The hazard quotient was estimated to be $9.36E-03$, lower than the target level of 1.

The highest non-cancer risk for the farmer receptor from metals was associated with thallium at a hazard quotient of $6.96E-03$, lower than the target level of 1. It is of note that provisional toxicological data for thallium was formerly available from USEPA,

however this data has now been withdrawn due to the uncertainty relating to their derivation. In order to provide a comprehensive assessment thallium is still included within our modelling assessment.

The highest non-cancer risk from dioxins was associated with PentaCDD, 1,2,3,7,8 - in the location of receptor 15. The hazard quotient through the ingestion pathway was estimated to be 2.54E-02 which is significantly lower than the target level of 1. The hazard quotient for the combined risk from all dioxins and furans and dioxin-like PCBs (based on the TEQ) is also significantly lower than the target level of 1 at a value of 8.24E-02.

The hazard quotient from PCBs at receptor 15 (assumed to comprise mainly of dioxin-like PCBs (PCB 118 and 123))¹⁷ was predicted to be 6.91E-09 for the ingestion pathway lower than the target level of 1.

It should be borne in mind that the above presented exposure scenario for receptor (15-farmer) and receptor (4-resident) represents a highly implausible situation in which all exposure assumptions are chosen to represent a worst case scenario and should therefore be considered as an extreme view of the risk to health. However and despite the numerous highly conservative assumptions, as can be seen from the above presented results, all hazard indices and cancer risks are well below their target levels and therefore it is very unlikely that exposure to emission from the facility would cause an adverse health risk.

Benzo(a)Pyrene

As discussed in Section 3.1.5, an alternative approach to the above discussed method for estimating cancer risk from exposure to BaP, was proposed in the form of Margin of Exposure.

In accordance with the SR2¹¹, when an established health criteria value is not available or where values are based on animal studies (as is the case with benzo(a)pyrene), a non-quantitative approach to risk assessment can be used to provide an indication of the level of concern for human health. One such approach detailed is the Margin of Exposure Approach (MoE). This compares the anticipated human exposure of a contaminant from a source to a benchmark dose level (BMDL). The BMDL_x is defined as the dose that corresponds to a specific change (x%) in an adverse response compared to the response in untreated animals. The benchmark dose (BMD) is determined by modelling a dose-response curve in the region of the dose-response relationship where

biologically observable data are available. To take experimental uncertainty into consideration the BMDL₁₀ is recommended (i.e. lower confidence limit of the benchmark dose which results in a 10% excess in incidence of cancer in a group of animals).

Publications by UK agencies identified papers published by the Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC)¹⁸. This summarises the research of two animal studies (Culp et al and Kroese et al) and the COC applied the benchmark dose method to these studies to determine BMDL values. This generated BMDL₁₀ values ranging from 0.52 to 4.82 mg/kg/day, although the majority of studies recorded values greater than 2 mg/kg/day. At present, the lower value of 0.52 mg/kg/day has been chosen as the BMDL₁₀ value for risk assessment.

The MoE ratio is calculated by dividing the total exposure by the BMDL₁₀.

The COC details in their research the following in relation to MoE ratios:

- <10,000 – may pose a risk
- 10,000 to 1,000,000 – unlikely to pose a risk
- >1,000,000 – highly unlikely to pose a risk

The total exposure for the worst receptor at farm receptor 15 using ADMS for benzo(a)pyrene is 2.04E-03 µg/kg-day.

Using the BMDL₁₀ of 520 µg/kg/day (lowest generated BMDL) an MoE ratio of 254,902 is calculated. This corresponds to an MoE band of 'unlikely to pose a risk'.

To demonstrate the contributions from the different pathways of exposure, Table 3-9 below presents the hazard quotient and cancer risk for the most affected resident and farmer receptors for each of the relevant pathways.

Table 3-9 Summary of Risk and Hazard to Highest Child Farmer and Resident Receptors- by Pathway

Receptor Name	Cancer Risk		Hazard Quotient	
	receptor 4 residential	receptor 15 farmer	receptor 4 residential	receptor 15 farmer
Inhalation	2.94E-06	1.32E-06	1.38E-02	6.19E-03
Ingestion of produce	7.99E-08	4.37E-07	7.84E-04	4.41E-03
Ingestion of beef	0.00E+00	1.53E-07	0.00E+00	9.93E-03

Receptor Name	Cancer Risk		Hazard Quotient	
	receptor 4 residential	receptor 15 farmer	receptor 4 residential	receptor 15 farmer
Ingestion of chicken	0.00E+00	5.54E-11	0.00E+00	3.88E-05
Ingestion of drinking water	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ingestion of eggs	0.00E+00	3.80E-11	0.00E+00	2.73E-05
Ingestion of milk	0.00E+00	9.73E-07	0.00E+00	7.25E-02
Ingestion of pork	0.00E+00	4.66E-09	0.00E+00	1.16E-03
Ingestion of soil	3.36E-09	2.67E-09	3.86E-03	3.06E-03
Total	3.02E-06	2.89E-06	1.85E-02	9.74E-02

It can be seen from the above that certain pathways such as the ingestion of milk contribute more significantly than other pathways of exposure to the total non-cancer in a farm land use scenario. The inhalation pathway was found to be the main risk driver for total cancer risk in the residential and farmer land use scenario. All risks from each and all pathways of exposure combined are lower than the target levels in spite of the extremely conservative assumption regarding the viability of all pathways of exposure. Therefore the level of risk is likely to be below the presented values.

Infant Exposure to Dioxins and Furans and Dioxin-like PCBs through Breast Milk

IRAP-h View calculates the exposure through breast milk by calculating infant exposures, and risks associated with such exposures for 2,3,7,8-TCDD TEQ.

There are no UK or USEPA target levels for acceptable infant exposure. However, one approach USEPA has taken to evaluate whether dioxins and furans are likely to cause significant health effects is to compare estimated TEQ exposures to national average background exposure levels (1pg TEQ/kg/day for adults and 60pg TEQ/kg/day for nursing infants). The average background level of dioxins and furans in breast milk is 25ppt of 2,3,7,8-TCDD TEQ. After normalisation for infant body weight, this breast milk concentration of 25ppt TEQ results in an average, background intake for the infant of 93 pg/kg-day of 2,3,7,8-TCDD TEQ. Accordingly, USEPA recommended that if exposures due to a facility's emissions during the exposure duration of concern are low compared to background exposures, then the emissions are not expected to cause an increase in the adverse health effects.

The Department for Environment, Food and Rural Affairs (DEFRA) and the EA R&D Science report SC050021/ TOX 12, reported a UK background adult's exposure of 0.7 pg WHO-TEQ/kg-day. The Former Ministry of Agriculture, Forestry and Fish eateries (MAFF) calculated dietary intake by breast-fed infants to be 170 pg WHO-TEQ/kg-day at two months, dropping to 39 pg WHO-TEQ/kg-day at 10 months in 1993-1994. A pilot

study of breast milk samples carried out in Yorkshire in 2001-2002 provided more recent data on the dietary intake of dioxins and PCBs by breast-fed infants, although the accuracy of this data is unclear according to the above referenced report. The upper bound mean daily intakes were estimated to be 72 pg WHO-TEQ /kg-day at 2-3 months and 19 pg WHO-TEQ /kg-day at 8-10 months, indicating that intakes of dioxins and PCBs by breast-fed infants may have dropped by over 50% since 1993-1994 survey. Despite the high intakes of dioxins experienced by nursing infants (about 100-fold those of an adult), the impact of breast-feeding on infant body burden of dioxin is markedly less dramatic due to the short period over which it occurs.

Table 3-10 below presents the infant ADD pg/kg-day for the most affected residential receptor 4 and farm receptor 15 in addition to the selected commercial receptors. All of the estimated values at all receptors are well below the USEPA background level of 60 pg/kg/day and the UK infant background exposures discussed above with the highest being 3.31E+00 in the location of receptor 15.

Table 3-10 Infant ADD pg/kg-day for Each Receptor

Receptor Name	ADD pg/kg/day
RCPTR_4	1.73E-01
RCPTR_5	1.91E-02
RCPTR_6	2.12E-02
RCPTR_7	8.18E-04
RCPTR_8	8.30E-03
RCPTR_15	3.31E+00

Based on the above presented data the proposed facility will not pose a significant risk via the ingestion of breast milk even at the most affected receptors.

Air concentration

Although potential risks from exposure to emissions from the facility through the inhalation pathway have been presented and discussed above, further comparisons between the predicted concentrations at sensitive receptors and acceptable air concentrations are presented in Table 3-11 and Table 3-12 below for residential and farmer receptors respectively.

Table 3-11 Air Concentration at Residential Receptor 4

COPC	Air Concentration ($\mu\text{g}/\text{m}^3$)	Relevant Environmental Criteria
Antimony	3.12E-05	5 $\mu\text{g}/\text{m}^3$ ^d
Benzo(a)pyrene	1.60E-05	0.25 ng/m^3 ^a
Chromium	7.85E-05	0.2 $\mu\text{g}/\text{m}^3$ ^c
Chromium, hexavalent	7.85E-05	0.2 $\mu\text{g}/\text{m}^3$ ^c
Lead	2.24E-04	0.25 $\mu\text{g}/\text{m}^3$ ^a
Arsenic	3.12E-05	3 ng/m^3 ^c
Cadmium	1.20E-05	5 ng/m^3 ^b
Mercury	4.80E-08	0.25 $\mu\text{g}/\text{m}^3$ ^d
Mercuric chloride	1.15E-05	0.25 $\mu\text{g}/\text{m}^3$ ^d
Nickel	1.59E-04	20 ng/m^3 ^{b/c}
Thallium	1.20E-05	1 $\mu\text{g}/\text{m}^3$ ^d

^a National air quality objective (The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007)

^b Target value (Air Quality Standards Regulations 2007)

^c Air quality guideline value (Expert Panel on Air Quality Standards, Metals and Metalloids 2009)

^d Long term EAL (Horizontal Guidance Note IPPC H1)

Table 3-12 Air Concentration at Farmer Receptor 15

COPC	Air Concentration ($\mu\text{g}/\text{m}^3$)	Relevant Environmental Criteria
Antimony	1.40E-05	5 $\mu\text{g}/\text{m}^3$ ^d
Benzo(a)pyrene	7.16E-06	0.25 ng/m^3 ^a
Chromium	3.51E-05	0.2 $\mu\text{g}/\text{m}^3$ ^c
Chromium, hexavalent	3.51E-05	0.2 $\mu\text{g}/\text{m}^3$ ^c
Lead	1.00E-04	0.25 $\mu\text{g}/\text{m}^3$ ^a
Arsenic	1.40E-05	3 ng/m^3 ^c
Cadmium	5.37E-06	5 ng/m^3 ^b
Mercury	2.15E-08	0.25 $\mu\text{g}/\text{m}^3$ ^d
Mercuric chloride	5.14E-06	0.25 $\mu\text{g}/\text{m}^3$ ^d
Nickel	7.12E-05	20 ng/m^3 ^{b/c}
Thallium	5.37E-06	1 $\mu\text{g}/\text{m}^3$ ^d

^a National air quality objective (The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007)

^b Target value (Air Quality Standards Regulations 2007)

^c Air quality guideline value (Expert Panel on Air Quality Standards, Metals and Metalloids 2009)

^d Long term EAL (Horizontal Guidance Note IPPC H1)

It can be seen from the above presented results that all the air concentrations are significantly below their target level at all receptors.

Cumulative Lead

Estimates of the potential health effects of exposure to lead are commonly assessed in relation to lead concentration in blood. DEFRA and the EA provided a soil guideline value of 450mg/kg of lead that is considered not to increase the blood concentration to greater than the acceptable level. The UK annual mean air quality objective for lead is currently 0.25µg/m³. Table 3-13 and Table 3-14 below present the model predicted maximum soil concentration and the air concentration of lead at different receptors.

Table 3-13 Lead Concentrations in Soil and Air at Resident Receptors

Receptor Name	Maximum Soil Concentration (mg/kg)	Air Concentration (µg/m ³)
RCPTR_10	3.15E-05	1.23E-04
RCPTR_11	2.72E-06	1.06E-05
RCPTR_12	6.13E-06	2.40E-05
RCPTR_13	6.13E-06	2.40E-05
RCPTR_22	1.68E-05	6.57E-05
RCPTR_23	1.89E-05	7.41E-05
RCPTR_3	5.65E-05	2.21E-04
RCPTR_4	5.74E-05	2.24E-04
RCPTR_40	9.29E-06	3.63E-05
RCPTR_41	1.52E-05	5.94E-05
RCPTR_9	3.42E-06	1.34E-05

Table 3-14 Lead Concentrations in Soil and Air at Farmer Receptors

Receptor Name	Maximum Soil Concentration (mg/kg)	Air Concentration (µg/m ³)
RCPTR_1	3.25E-06	1.27E-05
RCPTR_14	1.35E-05	5.27E-05
RCPTR_15	2.57E-05	1.00E-04
RCPTR_16	1.32E-05	5.16E-05
RCPTR_17	2.42E-05	9.46E-05
RCPTR_18	1.37E-05	5.35E-05
RCPTR_19	1.75E-05	6.87E-05
RCPTR_2	1.88E-05	7.36E-05
RCPTR_20	2.94E-06	1.15E-05
RCPTR_21	6.28E-06	2.46E-05
RCPTR_24	4.18E-06	1.64E-05
RCPTR_25	1.64E-05	6.41E-05
RCPTR_26	3.62E-06	1.42E-05

Receptor Name	Maximum Soil Concentration (mg/kg)	Air Concentration ($\mu\text{g}/\text{m}^3$)
RCPTR_27	4.00E-06	1.57E-05
RCPTR_28	1.91E-06	7.51E-06
RCPTR_29	2.46E-06	9.6E-06
RCPTR_30	2.36E-06	9.25E-06
RCPTR_31	2.43E-06	9.52E-06
RCPTR_32	2.91E-06	1.14E-05
RCPTR_33	4.06E-06	1.59E-05
RCPTR_34	2.58E-06	1.01E-05
RCPTR_35	2.76E-06	1.08E-05
RCPTR_36	1.31E-05	5.12E-05
RCPTR_37	2.16E-05	8.44E-05
RCPTR_38	1.13E-05	4.41E-05
RCPTR_39	1.21E-05	4.75E-05

It can be seen from the above presented results that both the soil and air concentrations are significantly below their target level at all receptors.

Soil Concentration

As discussed in Section 3.1.5.1 of this report, the background level of COPCs within the locality of the proposed facility is an unknown quantity and is not practically feasible to quantify at receptor's scale. Table 3-15 and

Table 3-16 below present the very low predicted concentrations of soil contamination caused by the identified sources in comparison to the soil concentrations considered to be acceptable (UK soil guideline values) and UK rural and urban soil concentration of the assessed contaminants as provided in "The UK Soil and Herbage pollutant Survey, EA 2007)". These values are based on the highest air data values as predicted by the dispersion modelling for the most affected receptors 5 and 15 for each land use scenario.

Table 3-15 Soil Concentration in the Location of Receptor 4

Determinand	Predicted Soil Level Mean (mg/kg)	Rural Soil Level Mean (mg/kg)	Urban Soil Level Mean (mg/kg)	SGV** (mg/kg)
Arsenic	8.35E-09	10.9	11.0	32
Cadmium	2.06E-07	0.39	0.44	10
Chromium (total)*	1.03E-02	34.4	34.3	130
Lead	5.73E-05	52.5	110	450

Determinand	Predicted Soil Level Mean (mg/kg)	Rural Soil Level Mean (mg/kg)	Urban Soil Level Mean (mg/kg)	SGV** (mg/kg)
Mercury	- 2.56E-04 1.27E-02	0.13	0.35	1-elmental 11-methyl 170-inorganic
Nickel	2.93E-06	21.1	28.19	130
Dioxins/furans & Dioxin-like PCBs	5.28E-01 (ng/kg) TEQ	4.70 (ng/kg) TEQ	9.19 (ng/kg) TEQ	8 µg/kg
Benzo(a)pyrene	8.93E-04	0.215	0.878	1.2-4.0

*Total Chromium: Chromium (5.17E-03), Chromium hexavalent (5.17E-03); ** for residential scenario.

Table 3-16 Soil Concentration in the Location of Receptor 15

Determinand	Predicted Soil Level Mean (mg/kg)	Rural Soil Level Mean (mg/kg)	Urban Soil Level Mean (mg/kg)	SGV** (mg/kg)
Arsenic	3.74E-09	10.9	11.0	32
Cadmium	9.23E-08	0.39	0.44	10
Chromium (total)*	4.63E-02	34.4	34.3	130
Lead	2.57E-05	52.5	110	450
Mercury (total)**	- 1.15E-04 5.68E-03	0.13	0.35	1-elmental 11-methyl 170-inorganic
Nickel	1.31E-06	21.1	28.19	130
Dioxins/furans	2.36E-01 (ng/kg) TEQ	4.70 (ng/kg) TEQ	9.19 (ng/kg) TEQ	8 µg/kg
Benzo(a)pyrene	4.00E-04	0.215	0.878	1.2-4.0

*Total Chromium: Chromium (2.32E-03), Chromium hexavalent (2.32E-03); ** for residential scenario.

Food Concentration

The maximum levels for certain contaminants in foodstuffs as reported in Commission Regulations (EC) No 1881/2006 are enforced by The Contaminants in Food (England) Regulations 2007. The draft Contaminants in Food (England) Regulations 2009 seeks to implement the enforcement of Commission Regulations (EC) Nos. 565/2008 & 629/2008 which amends (EC) No 1881/2006. These are presented in Table 3-17 in comparison to those predicted by the model at the most affected receptors.

Table 3-17 Food Concentration

	Maximum Level (mg/kg) wet weight	Model Predicted Maximum Level
Lead		
Cow milk	2.0E-02	7.11E-05
Meat/Poultry	1.0E-01	2.53E-05
Lowest acceptable for cereals, vegetables and fruits	1.0E-01	1.77E-03
Cadmium		
Meat/Poultry	5.0E-02	5.40E-07
Lowest acceptable for cereals, vegetables and fruits	5.0E-02	9.42E-05

As can be seen from Table 3-17, the predicted concentration in meat, poultry and produce produced in the area, are lower than the UK standard for all relevant COPCs. Values for other contaminants for the above presented food items are not available.

4 Summary and Conclusions

An assessment concerned with the evaluation of possible effects on the health of humans due to emissions from the proposed Sustainable Energy Plant at Lostock was undertaken. This was focused on Contaminants of Potential Concern (COPC) including metals, dioxins, benzo(a)pyrene and polychlorinated biphenyls for which any effects are likely to be chronic arising from prolonged exposure.

Potential secondary exposures, following the deposition of these COPC through the ingestion of affected soils, home-grown produce, beef, milk, pork, poultry and eggs at receptors within the vicinity of the site were also considered in the assessment.

In the absence of UK protocols for this type of assessment, the USEPA methodology "Human Health Risk Assessment Protocol 2005" was used utilising the commercial software IRAP-h View. The USEPA default exposure parameters and toxicological data were replaced by those recommended by DEFRA and the EA reports SC050021/SR3 and R&D Publication TOX reports where available.

The DEFRA common framework for risk assessment and management was used as the guidelines for the assessment and appraisal of potential impact on human health from the proposed facility.

A simplified conceptual model was built for the site identifying all viable sources, receptors and pathways of exposure relevant to each of the receptors. In the absence of specific information in relation to the nature of the local receptors, all default pathways of exposure were assumed to exist, for each receptor scenario, to screen receptors with potentially significant exposure and consequently greater risks.

Contaminants of potential concern (COPC) concentrations in the different receiving media were calculated from the particle phase and vapour phase air concentrations and deposition to the soil. The estimated concentrations were based on a number of conservative assumptions to ensure that worst-case scenarios were assessed.

To identify the level of potential risk from exposure to each COPC in all relevant pathways of exposure, the hazard quotients for each medium were calculated. Potential cancer risk was also estimated and compared with relevant acceptable risk levels.

The hazard quotients for all compounds in the residential and farm land uses for the most affected receptors are lower than target level of 1. The cancer risks for all

residential and farmer receptors are significantly lower than their relevant target levels. Therefore potential health impact on both residential and farmer receptors are not considered of potential significance.

It was, therefore, concluded that potential exposure to emissions from the proposed SEP with consideration to background exposure, where appropriate, will not pose unacceptable risk to the residential or farmer receptors identified in the vicinity of the proposed facility.

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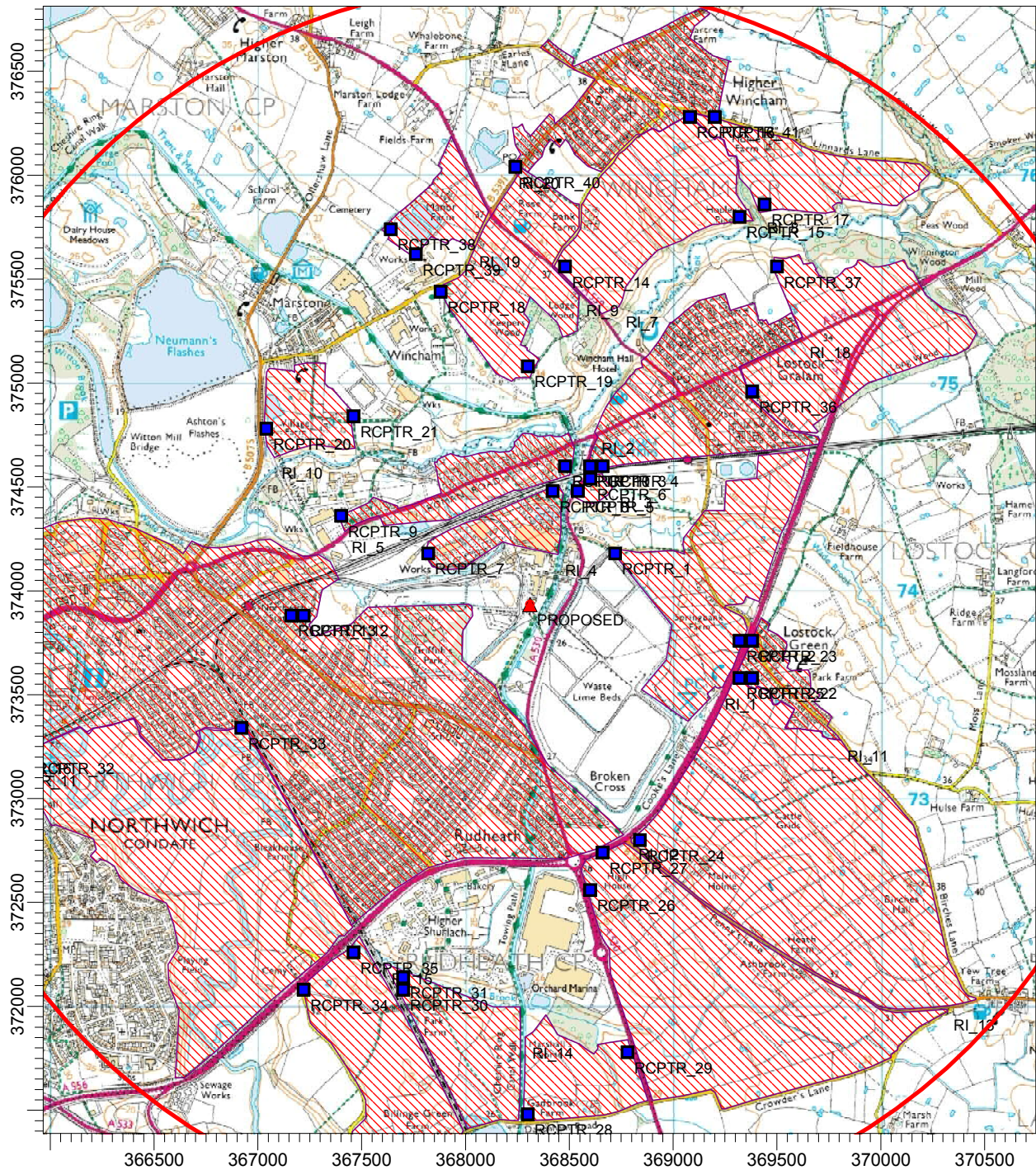
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Approach for Communicating the Risks of Exposure to Genotoxic Carcinogens. CC/07/08 2007.

Drawings

PROJECT TITLE:

Figure 1 - Receptors



COMMENTS:

Red Hatching = Selected Receptors
 Blue Boxes = Discrete Receptors (located at maxima concentrations identified by the model)
 Red Triangle = Source

COMPANY NAME:

RPS

MODELER:

E Williams

SCALE:

1:30,009

0

1 km

DATE:

07/01/2010

PROJECT NO.:

BES0388

Appendices

Annex A

RECEPTOR : RCPTR_1

UTM X: 368,720.00

UTM Y: 374,180.00

Based on Receptor I.D. : RI_1

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00575	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00575	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00575	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00575	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00497	dydp	s/m ² year
Dry deposition - particle bound	0.00497	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00497	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01441	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_10

UTM X: 368,480.00

UTM Y: 374,600.00

Based on Receptor I.D. : RI_5

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.05588	cyp	ug-s/g-m ³
Air concentration - particle bound	0.05588	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.05588	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.05588	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.04828	dydp	s/m ² year
Dry deposition - particle bound	0.04828	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.04828	dydv	s/m ² year
Dry deposition - vapor phase hg	0.14001	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_11 **UTM X: 365,720.00** **UTM Y: 373,160.00**

Based on Receptor I.D. : RI_6

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00482	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00482	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00482	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00482	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00416	dydp	s/m ² year
Dry deposition - particle bound	0.00416	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00416	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01208	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_12 **UTM X: 367,220.00** **UTM Y: 373,880.00**

Based on Receptor I.D. : RI_6

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.01086	cyp	ug-s/g-m ³
Air concentration - particle bound	0.01086	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.01086	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.01086	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00938	dydp	s/m ² year
Dry deposition - particle bound	0.00938	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00938	dydv	s/m ² year
Dry deposition - vapor phase hg	0.0272	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_13**UTM X: 367,160.00****UTM Y: 373,880.00**

Based on Receptor I.D. : RI_6

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.01085	cyp	ug-s/g-m ³
Air concentration - particle bound	0.01085	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.01085	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.01085	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00938	dydp	s/m ² year
Dry deposition - particle bound	0.00938	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00938	dydv	s/m ² year
Dry deposition - vapor phase hg	0.02719	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_14**UTM X: 368,480.00****UTM Y: 375,560.00**

Based on Receptor I.D. : RI_7

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.02388	cyp	ug-s/g-m ³
Air concentration - particle bound	0.02388	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.02388	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.02388	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.02063	dydp	s/m ² year
Dry deposition - particle bound	0.02063	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.02063	dydv	s/m ² year
Dry deposition - vapor phase hg	0.05983	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_17 **UTM X: 369,440.00** **UTM Y: 375,860.00**

Based on Receptor I.D. : RI_8

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.04286	cyp	ug-s/g-m ³
Air concentration - particle bound	0.04286	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.04286	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.04286	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.03703	dydp	s/m ² year
Dry deposition - particle bound	0.03703	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.03703	dydv	s/m ² year
Dry deposition - vapor phase hg	0.10739	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_18 **UTM X: 367,880.00** **UTM Y: 375,440.00**

Based on Receptor I.D. : RI_9

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.02424	cyp	ug-s/g-m ³
Air concentration - particle bound	0.02424	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.02424	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.02424	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.02094	dydp	s/m ² year
Dry deposition - particle bound	0.02094	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.02094	dydv	s/m ² year
Dry deposition - vapor phase hg	0.06074	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_20 **UTM X: 367,040.00** **UTM Y: 374,780.00**

Based on Receptor I.D. : RI_10

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00521	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00521	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00521	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00521	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.0045	dydp	s/m ² year
Dry deposition - particle bound	0.0045	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.0045	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01306	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_21 **UTM X: 367,460.00** **UTM Y: 374,840.00**

Based on Receptor I.D. : RI_10

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.01113	cyp	ug-s/g-m ³
Air concentration - particle bound	0.01113	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.01113	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.01113	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00961	dydp	s/m ² year
Dry deposition - particle bound	0.00961	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00961	dydv	s/m ² year
Dry deposition - vapor phase hg	0.02788	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_22 **UTM X: 369,380.00** **UTM Y: 373,580.00**

Based on Receptor I.D. : RI_11

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.02976	cyp	ug-s/g-m ³
Air concentration - particle bound	0.02976	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.02976	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.02976	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.02571	dydp	s/m ² year
Dry deposition - particle bound	0.02571	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.02571	dydv	s/m ² year
Dry deposition - vapor phase hg	0.07457	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_23 **UTM X: 369,380.00** **UTM Y: 373,760.00**

Based on Receptor I.D. : RI_11

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.03356	cyp	ug-s/g-m ³
Air concentration - particle bound	0.03356	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.03356	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.03356	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.029	dydp	s/m ² year
Dry deposition - particle bound	0.029	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.029	dydv	s/m ² year
Dry deposition - vapor phase hg	0.08409	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_24 **UTM X: 368,840.00** **UTM Y: 372,800.00**

Based on Receptor I.D. : RI_12

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00742	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00742	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00742	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00742	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.0064	dydp	s/m ² year
Dry deposition - particle bound	0.0064	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.0064	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01858	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_25 **UTM X: 369,320.00** **UTM Y: 373,580.00**

Based on Receptor I.D. : RI_12

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.02904	cyp	ug-s/g-m ³
Air concentration - particle bound	0.02904	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.02904	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.02904	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.02509	dydp	s/m ² year
Dry deposition - particle bound	0.02509	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.02509	dydv	s/m ² year
Dry deposition - vapor phase hg	0.07276	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_26 **UTM X: 368,600.00** **UTM Y: 372,560.00**

Based on Receptor I.D. : RI_13

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00641	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00641	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00641	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00641	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00554	dydp	s/m ² year
Dry deposition - particle bound	0.00554	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00554	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01606	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_27 **UTM X: 368,660.00** **UTM Y: 372,740.00**

Based on Receptor I.D. : RI_13

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00709	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00709	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00709	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00709	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00613	dydp	s/m ² year
Dry deposition - particle bound	0.00613	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00613	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01778	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_3 **UTM X: 368,600.00** **UTM Y: 374,600.00**

Based on Receptor I.D. : RI_2

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.1001	cyp	ug-s/g-m ³
Air concentration - particle bound	0.1001	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.1001	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.1001	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.08649	dydp	s/m ² year
Dry deposition - particle bound	0.08649	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.08649	dydv	s/m ² year
Dry deposition - vapor phase hg	0.25081	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_30 **UTM X: 367,700.00** **UTM Y: 372,080.00**

Based on Receptor I.D. : RI_15

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00419	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00419	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00419	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00419	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00362	dydp	s/m ² year
Dry deposition - particle bound	0.00362	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00362	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01051	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_31 **UTM X: 367,700.00** **UTM Y: 372,140.00**

Based on Receptor I.D. : RI_15

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00431	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00431	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00431	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00431	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00372	dydp	s/m ² year
Dry deposition - particle bound	0.00372	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00372	dydv	s/m ² year
Dry deposition - vapor phase hg	0.0108	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_32 **UTM X: 365,900.00** **UTM Y: 373,220.00**

Based on Receptor I.D. : RI_16

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00516	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00516	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00516	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00516	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00446	dydp	s/m ² year
Dry deposition - particle bound	0.00446	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00446	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01293	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_35**UTM X: 367,460.00****UTM Y: 372,260.00**

Based on Receptor I.D. : RI_17

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.0049	cyp	ug-s/g-m ³
Air concentration - particle bound	0.0049	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.0049	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.0049	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00423	dydp	s/m ² year
Dry deposition - particle bound	0.00423	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00423	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01227	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_36**UTM X: 369,380.00****UTM Y: 374,960.00**

Based on Receptor I.D. : RI_18

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.02318	cyp	ug-s/g-m ³
Air concentration - particle bound	0.02318	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.02318	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.02318	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.02003	dydp	s/m ² year
Dry deposition - particle bound	0.02003	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.02003	dydv	s/m ² year
Dry deposition - vapor phase hg	0.05808	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_37 **UTM X: 369,500.00** **UTM Y: 375,560.00**

Based on Receptor I.D. : RI_18

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.03822	cyp	ug-s/g-m ³
Air concentration - particle bound	0.03822	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.03822	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.03822	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.03302	dydp	s/m ² year
Dry deposition - particle bound	0.03302	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.03302	dydv	s/m ² year
Dry deposition - vapor phase hg	0.09576	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_38 **UTM X: 367,640.00** **UTM Y: 375,740.00**

Based on Receptor I.D. : RI_19

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.01996	cyp	ug-s/g-m ³
Air concentration - particle bound	0.01996	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.01996	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.01996	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.01725	dydp	s/m ² year
Dry deposition - particle bound	0.01725	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.01725	dydv	s/m ² year
Dry deposition - vapor phase hg	0.05001	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_39 **UTM X: 367,760.00** **UTM Y: 375,620.00**

Based on Receptor I.D. : RI_19

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.02152	cyp	ug-s/g-m ³
Air concentration - particle bound	0.02152	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.02152	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.02152	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.01859	dydp	s/m ² year
Dry deposition - particle bound	0.01859	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.01859	dydv	s/m ² year
Dry deposition - vapor phase hg	0.05392	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_4 **UTM X: 368,660.00** **UTM Y: 374,600.00**

Based on Receptor I.D. : RI_2

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.10166	cyp	ug-s/g-m ³
Air concentration - particle bound	0.10166	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.10166	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.10166	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.08783	dydp	s/m ² year
Dry deposition - particle bound	0.08783	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.08783	dydv	s/m ² year
Dry deposition - vapor phase hg	0.25472	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_40 **UTM X: 368,240.00** **UTM Y: 376,040.00**

Based on Receptor I.D. : RI_20

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.01646	cyp	ug-s/g-m ³
Air concentration - particle bound	0.01646	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.01646	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.01646	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.01422	dydp	s/m ² year
Dry deposition - particle bound	0.01422	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.01422	dydv	s/m ² year
Dry deposition - vapor phase hg	0.04124	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_41 **UTM X: 369,200.00** **UTM Y: 376,280.00**

Based on Receptor I.D. : RI_20

SOURCE: PROPOSED			
AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.0269	cyp	ug-s/g-m ³
Air concentration - particle bound	0.0269	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.0269	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.0269	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.02324	dydp	s/m ² year
Dry deposition - particle bound	0.02324	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.02324	dydv	s/m ² year
Dry deposition - vapor phase hg	0.0674	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

RECEPTOR : RCPTR_5 **UTM X: 368,540.00** **UTM Y: 374,480.00**

Based on Receptor I.D. : RI_3

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m^3
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m^3
Hourly air concentration - vapor phase	0	chv	ug-s/g-m^3
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m^3
Air concentration - particle phase	0.09062	cyp	ug-s/g-m^3
Air concentration - particle bound	0.09062	cyp_pb	ug-s/g-m^3
Air concentration - vapor phase	0.09062	cyv	ug-s/g-m^3
Air concentration - vapor phase hg	0.09062	cyv_hg	ug-s/g-m^3
Dry deposition - particle phase	0.0783	dydp	s/m^2 year
Dry deposition - particle bound	0.0783	dydp_pb	s/m^2 year
Dry deposition - vapor phase	0.0783	dydv	s/m^2 year
Dry deposition - vapor phase hg	0.22706	dydv_hg	s/m^2 year
Wet deposition - particle phase	0	dywp	s/m^2 year
Wet deposition - particle bound	0	dywp_pb	s/m^2 year
Wet deposition - vapor phase	0	dywv	s/m^2 year
Wet deposition - vapor phase hg	0	dywv_hg	s/m^2 year

RECEPTOR : RCPTR_6 **UTM X: 368,600.00** **UTM Y: 374,540.00**

Based on Receptor I.D. : RI_3

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m^3
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m^3
Hourly air concentration - vapor phase	0	chv	ug-s/g-m^3
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m^3
Air concentration - particle phase	0.10038	cyp	ug-s/g-m^3
Air concentration - particle bound	0.10038	cyp_pb	ug-s/g-m^3
Air concentration - vapor phase	0.10038	cyv	ug-s/g-m^3
Air concentration - vapor phase hg	0.10038	cyv_hg	ug-s/g-m^3
Dry deposition - particle phase	0.08673	dydp	s/m^2 year
Dry deposition - particle bound	0.08673	dydp_pb	s/m^2 year
Dry deposition - vapor phase	0.08673	dydv	s/m^2 year
Dry deposition - vapor phase hg	0.25151	dydv_hg	s/m^2 year
Wet deposition - particle phase	0	dywp	s/m^2 year
Wet deposition - particle bound	0	dywp_pb	s/m^2 year
Wet deposition - vapor phase	0	dywv	s/m^2 year
Wet deposition - vapor phase hg	0	dywv_hg	s/m^2 year

RECEPTOR : RCPTR_7 **UTM X:** 367,820.00 **UTM Y:** 374,180.00

Based on Receptor I.D. : RI_4

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m^3
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m^3
Hourly air concentration - vapor phase	0	chv	ug-s/g-m^3
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m^3
Air concentration - particle phase	0.00388	cyp	ug-s/g-m^3
Air concentration - particle bound	0.00388	cyp_pb	ug-s/g-m^3
Air concentration - vapor phase	0.00388	cyv	ug-s/g-m^3
Air concentration - vapor phase hg	0.00388	cyv_hg	ug-s/g-m^3
Dry deposition - particle phase	0.00335	dydp	s/m^2 year
Dry deposition - particle bound	0.00335	dydp_pb	s/m^2 year
Dry deposition - vapor phase	0.00335	dydv	s/m^2 year
Dry deposition - vapor phase hg	0.00973	dydv_hg	s/m^2 year
Wet deposition - particle phase	0	dywp	s/m^2 year
Wet deposition - particle bound	0	dywp_pb	s/m^2 year
Wet deposition - vapor phase	0	dywv	s/m^2 year
Wet deposition - vapor phase hg	0	dywv_hg	s/m^2 year

RECEPTOR : RCPTR_8 **UTM X:** 368,420.00 **UTM Y:** 374,480.00

Based on Receptor I.D. : RI_4

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m^3
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m^3
Hourly air concentration - vapor phase	0	chv	ug-s/g-m^3
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m^3
Air concentration - particle phase	0.0393	cyp	ug-s/g-m^3
Air concentration - particle bound	0.0393	cyp_pb	ug-s/g-m^3
Air concentration - vapor phase	0.0393	cyv	ug-s/g-m^3
Air concentration - vapor phase hg	0.0393	cyv_hg	ug-s/g-m^3
Dry deposition - particle phase	0.03396	dydp	s/m^2 year
Dry deposition - particle bound	0.03396	dydp_pb	s/m^2 year
Dry deposition - vapor phase	0.03396	dydv	s/m^2 year
Dry deposition - vapor phase hg	0.09847	dydv_hg	s/m^2 year
Wet deposition - particle phase	0	dywp	s/m^2 year
Wet deposition - particle bound	0	dywp_pb	s/m^2 year
Wet deposition - vapor phase	0	dywv	s/m^2 year
Wet deposition - vapor phase hg	0	dywv_hg	s/m^2 year

RECEPTOR : RCPTR_9

UTM X: 367,400.00

UTM Y: 374,360.00

Based on Receptor I.D. : RI_5

SOURCE: PROPOSED

AIR PARAMETER DESCRIPTION	VALUE	SYMBOL	UNITS
Hourly air concentration - particle phase	0	chp	ug-s/g-m ³
Hourly air concentration - particle bound	0	chp_pb	ug-s/g-m ³
Hourly air concentration - vapor phase	0	chv	ug-s/g-m ³
Hourly air concentration - vapor phase hg	0	chv_hg	ug-s/g-m ³
Air concentration - particle phase	0.00606	cyp	ug-s/g-m ³
Air concentration - particle bound	0.00606	cyp_pb	ug-s/g-m ³
Air concentration - vapor phase	0.00606	cyv	ug-s/g-m ³
Air concentration - vapor phase hg	0.00606	cyv_hg	ug-s/g-m ³
Dry deposition - particle phase	0.00523	dydp	s/m ² year
Dry deposition - particle bound	0.00523	dydp_pb	s/m ² year
Dry deposition - vapor phase	0.00523	dydv	s/m ² year
Dry deposition - vapor phase hg	0.01518	dydv_hg	s/m ² year
Wet deposition - particle phase	0	dywp	s/m ² year
Wet deposition - particle bound	0	dywp_pb	s/m ² year
Wet deposition - vapor phase	0	dywv	s/m ² year
Wet deposition - vapor phase hg	0	dywv_hg	s/m ² year

Annex B

SITE PARAMETER	VALUE	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/day
Qty of grain eaten by CATTLE each day	0.47	beef_qp_grain	kg DW/day
Qty of silage eaten by CATTLE each day	2.5	beef_qp_silage	kg DW/day
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/day
Average annual evapotranspiration	57.10	e_v	cm/yr
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-K
Average annual irrigation	0.0	i	cm/yr
Plant surface loss coefficient	18	kp	yr ⁻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/day
Qty of grain eaten by MILK CATTLE each day	3.0	milk_qp_grain	kg DW/day
Qty of silage eaten by MILK CATTLE each day	4.1	milk_qp_silage	kg DW/day

SITE PARAMETER	VALUE	SYMBOL	UNITS
Averaging time	1	milkfat_at	yr
Body weight of infant	9.4	milkfat_bw_infant	kg
Exposure duration of infant to breast milk	1	milkfat_ed	yr
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	days
Ingestion rate of breast milk	0.688	milkfat_ir_milk	kg/day
Viscosity of air corresponding to air temp.	1.81e-04	mu_a	g/cm-s
Average annual precipitation	80.10	p	cm/yr
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/day
Qty of silage eaten by PIGS each day	1.4	pork_qp_silage	kg DW/day
Qty of soil eaten by CATTLE	0.5	qs_beef	kg/day
Qty of soil eaten by CHICKEN	0.022	qs_chick	kg/day
Qty of soil eaten by DAIRY CATTLE	0.4	qs_milk	kg/day
Qty of soil eaten by PIGS	0.37	qs_pork	kg/day
Average annual runoff	11.51	r	cm/yr
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	Yr
Length of plant expos. to depos. - FORAGE	0.12	tp_forage	Yr
Length of plant expos. to depos. - SILAGE	0.16	tp_silage	Yr
Dry deposition velocity	0.5	vdv	cm/s

SITE PARAMETER	VALUE	SYMBOL	UNITS
Dry deposition velocity for mercury	2.9	v _{dv_hg}	cm/s
Wind velocity	3.9	w	m/s
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	z	cm
Soil mixing zone depth for produce	20	z_p	cm

	Resident Adult	Resident Child	Farmer Adult	Farmer Child	Units
Averaging time for carcinogens	30	6	40	6	yr
Averaging time for noncarcinogens	30	6	40	6	yr
Consumption rate of BEEF	0	0	0.00122	0.00075	kg/kg-day FW
Body weight	70	13.3	70	15	Kg
Consumption rate of POULTRY	0	0	0.00066	0.00045	kg/kg-day FW
Consumption rate of ABOVEGROUND PRODUCE	0.00032	0.0000926	0.00047	0.00113	kg/kg-day DW
Consumption rate of BELOWGROUND PRODUCE	0.00014	0.0000413	0.00017	0.00028	kg/kg-day DW
Consumption rate of DRINKING WATER	0.0	0.0	0.0	0.0	L/day
Consumption rate of PROTECTED ABOVEGROUND PRODUCE0	0.00061	0.0	0.00064	0.00157	kg/kg-day DW
Consumption rate of SOIL	0.0001	0.0001	0.0001	0.0002	kg/d
Exposure duration	30	6	40	6	yr
Exposure frequency	365	365	365	365	day/yr
Consumption rate of EGGS	0	0	0.00075	0.00054	kg/kg-day FW
Fraction of contaminated ABOVEGROUND PRODUCE	1	1	1	1	--
Fraction of contaminated DRINKING WATER	1	1	1	1	--
Fraction contaminated SOIL	1	1	1	1	--
Consumption rate of FISH	0	0	0	0	kg/kg-day FW
Fraction of contaminated FISH	1	1	1	1	--
Inhalation exposure duration	30	6	40	6	Yr
Inhalation exposure frequency	365	365	365	365	day/yr
Inhalation exposure time	24	24	24	24	hr/day
Fraction of contaminated BEEF	1	1	1	1	--
Fraction of contaminated POULTRY	1	1	1	1	--
Fraction of contaminated	1	1	1	1	--

	Resident Adult	Resident Child	Farmer Adult	Farmer Child	Units
EGGS					
Fraction of contaminated MILK	1	1	1	1	--
Fraction of contaminated PORK	1	1	1	1	--
Inhalation rate	0.83	0.49	0.83	0.49	m ³ /hr
Consumption rate of MILK	0	0	0.01367	0.02268	kg/kg-day FW
Consumption rate of PORK	0	0	0.00055	0.00042	kg/kg-day FW
Time period at the beginning of combustion	0	0	0	0	Yr
Length of exposure duration	30	6	40	6	Yr