PARC ADFER ENERGY RECOVERY FACILITY

Permit Variation to increase tonnage to 232ktpa

Atmospheric Dispersion Modelling – Air Emissions Risk Assessment

Prepared for: enfinium Parc Adfer Operations Limited

SLR Ref: 410.V11035.00011
Version No: Rev2
August 2022

BASIS OF REPORT

EXECUTIVE SUMMARY

enfinium Parc Adfer Operations Limited ('PAOL') operate the existing Parc Adfer Energy Recovery Facility (ERF), which is Regulated under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) by Natural Resources Wales (NRW). The existing facility is Permitted to accept and thermally treat 200,000 tonnes per annum (200ktpa) of municipal, industrial and commercial waste, with emissions and associated emission limit values (ELV) Regulated under Annex VI of the Industrial Emissions Directive (IED).

This Air Emissions Risk Assessment (AERA) supports the Environmental Permit Variation application, for which PAOL are seeking an increase in capacity of 32,000 tonnes per annum to a total annual tonnage of 232ktpa. Aligned with this, NRW has issued PAOL with a Regulation 61 notice regarding the publication of the revised Best Available Techniques (BAT) Reference Document (BREF) as contained within Implementing Decision 2019/2020, and associated BAT Conclusions for Waste Incineration, which were published in December 2019 in the Official Journal of the European Union. Implementing Decision 2019/2020 references new BAT-Associated Emission Limits (BAT-AELs).

This AERA quantifies impacts on air quality arising from BAT-AEL emissions to air associated with the proposed increase to 232ktpa scenario. Impacts are assessed against the relevant Air Quality Standards / Environmental Assessment Levels (EAL) for the protection of human health and the relevant Critical Levels and Critical Loads (for nutrient nitrogen and acid deposition) for the protection of designated ecological receptors.

Three scenarios are modelled and presented within this AERA, as follows:

- As originally Permitted scenario (200ktpa) (termed the 'Originally Permitted Scenario' herein);
- Existing operation, minor Permit variation scenario representing the as built boiler with Permit ELVs (200kpta) (termed the 'Existing Operational Scenario' herein); and
- Permit variation scenario representing the as built boiler with BAT-AELs (232ktpa) (termed the 'Permit Variation Scenario' herein).

The 'Existing Operational Scenario' reflects the current operational impact on air quality associated with the Site and, therefore, represents a baseline scenario to assess deviation against as associated with the Permit Variation Scenario.

The conclusions to this AERA are as follows:

- maximum ground level short-term Process Contributions (PC) arising from the Permit Variation Scenario are <10% of the applied EAL for all considered pollutants / short-term averaging periods and, therefore, 'insignificant' in accordance with the AERA guidance. There are no predicted exceedences of any short-term standard. In comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs;
- maximum ground level long-term PCs arising from the Permit Variation Scenario of nitrogen dioxide (NO_2), particulate matter (PM) (assessed as particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) and less than 2.5µm ($PM_{2.5}$), hydrogen fluoride (HF), total organic carbon (TOC) (assessed as benzene (C_6H_6)), cadmium (Cd), mercury (Hg), antimony (Sb), chromium (Cr), hexavalent Cr (Cr (VI)), copper (Cu), lead (Pb), manganese (Mn), vanadium (V) and ammonia (NH_3) are <1% of the applied EAL and, therefore, 'insignificant' in accordance with the AERA guidance. Annual mean PCs of arsenic (As) and nickel (Ni) are >1% of the applied EAL. However, in comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs;
- maximum ground-level PCs arising from the Permit Variation Scenario to the oxides of nitrogen (NOx) Critical Levels (CLe) at ecological receptors ER2 – ER4 and ER7 result in '*no likely significant effects (alone and in-combination)*' (at Special Area of Conservation (SAC) / Special Protection Area (SPA) designations) and '*no likely damage*' (at Site of Special Scientific Interest (SSSI) designations). Maximum ground-level

PCs arising from the Permit Variation Scenario to the NOx CLe are >1% of the NOx CLe at ecological receptors ER1, ER5 and ER6.

- result in 'no adverse effect' (at SAC / SPA) designations and 'no significant pollution' (at SSSI designations). However, in comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs;
- maximum ground-level PCs arising from the Permit Variation Scenario to the 24-hour mean NOx, annual mean NH_3, annual mean SO_2 and 24-hour mean HF CLes result in '*no likely significant effects (alone and in-combination)'* (at SAC / SPA designations) and '*no likely damage*' (at SSSI designations);
- maximum ground-level PCs arising from the Permit Variation Scenario to the nutrient nitrogen CLo are >1% of the applied '*Coastal stable dune grasslands - acid type*' APIS relevant critical load (CLo) class at ER1 and ER5. However, impacts for the existing operational site (200ktpa) are above 1% and were previously concluded by NRW to result in no significant effect. At all other ecological designations, the maximum ground-level PCs to the nutrient nitrogen CLo are <1% of the applied CLo and result in '*no likely significant effects (alone and in-combination)'* (at SAC / SPA designations) and '*no likely damage*' (at SSSI designations). Further, in comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs; and
- maximum ground-level PCs arising from the Permit Variation Scenario to the acid CLo result in '*no likely significant effects (alone and in-combination)'* (at SAC / SPA designations) and '*no likely damage*' (at SSSI designations). Further, in comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs.

CONTENTS

APPENDICIES

DOCUMENT REFERENCES

TABLES

FIGURES

1.0 INTRODUCTION

SLR Consulting Ltd has been commissioned by enfinium Parc Adfer Operations Limited ('PAOL') to undertake Atmospheric Dispersion Modelling (ADM) to support their Environmental Permit Variation application for the existing Energy Recovery Facility (ERF) at Weighbridge Road, Deeside Industrial Park, Deeside, Flintshire, CH5 2LL ('the Site').

The existing Site is Regulated under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) by Natural Resources Wales (NRW) as a Section 5.1 A1 (b) and Section 5.4 A1 (b) (iii) activity of the Regulations activity (Permit reference: EPR/AB3092CV). The existing Site is Permitted to accept and thermally treat 200,000 tonnes per annum (200ktpa) of municipal, industrial and commercial waste for incineration in a combined heat and power (CHP) enabled incinerator. Emissions from the incinerator are presently regulated under Annex VI of the Industrial Emissions Directive (IED).

1.1 Scope and Objective

PAOL are seeking an increase in capacity of 32,000 tonnes per annum to a total annual tonnage of 232ktpa.

Aligned with this, NRW has issued PAOL with a Regulation 61 notice regarding the publication of the revised Best Available Techniques (BAT)[1] Reference Document (BREF) as contained within Implementing Decision 2019/2020, and associated BAT Conclusions for Waste Incineration, which were published in December 2019 in the Official Journal of the European Union[2]. Implementing Decision 2019/2020 references new BAT-Associated Emission Limits (BAT-AELs), which have been applied as part of this ADM.

Pre-application discussion to the Permit variation was undertaken with NRW. This response and updated assessment addresses those air quality comments made by NRW to the pre-application enquiry.

The scope of the assessment provides a full update to the ADM completed for the existing Permitted operational capacity of the Site (200ktpa), and assess the impact on air quality arising from emissions to air associated with the proposed increase to 232ktpa scenario.

Therefore, the objective of the study is to assess the impact of BAT-AEL emissions from the 232ktpa operation of the Site against the relevant Air Quality Standards / Environmental Assessment Levels for the protection of human health and the relevant Critical Levels and Critical Loads (for nutrient nitrogen and acid deposition) for the protection of designated ecological receptors.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D2010&from=EN.
[2] Best Available Techniques (BAT) Reference Document for Waste Incineration (europa.eu).

2.0 ASSESSMENT METHODOLOGY

In accordance with the Environment Agency's (EA) '*Air Emissions Risk Assessment for your Environmental Permit*' (the 'AERA' guidance[3]), as additionally applied by NRW, and the additional guidance provided by the Air Quality Modelling and Risk Assessment Team (AQMaRAT) of NRW, a detailed dispersion modelling assessment has been undertaken to assess the impact of process emissions from the Site. An atmospheric dispersion model has been used to model ground levels concentration for comparison against Air Quality Assessment Levels (AQAL) / Environmental Assessment Levels (EAL), and Critical Loads and Critical Levels.

2.1 Model Scenarios

2.1.1 Process Conditions

The process conditions / emission parameters applied in the modelling are provided in Table 2-1 below. The emission parameters were provided by PAOL. Three scenarios are modelled, as follows:

- As originally Permitted scenario (200ktpa) (termed the 'Originally Permitted Scenario' herein)[4];
- Existing operation, minor Permit variation scenario representing the as built boiler with Permit emission limit values (ELV) (200kpta) (termed the 'Existing Operational Scenario' herein)[5]; and
- Permit variation scenario representing the as built boiler with BAT-AELs (232ktpa) (termed the 'Permit Variation Scenario' herein).

The 'Existing Operational Scenario' reflects the current operational impact on air quality associated with the Site and, therefore, represents a baseline scenario to assess deviation against as associated with the Permit Variation Scenario.

For reference and comparison, the process conditions / emission parameters for each of the three scenarios listed above are presented in Table 2-1.

Table 2-1
Emission Parameters – Process Flow

Parameter / Source	Original Permitted Scenario (200ktpa)	Existing Operational Scenario (200ktpa)	Permit Variation Scenario (232ktpa)
Stack Location (NGR x,y) (m)	x331093.4, y371418.0		
Stack Height (m)	85		
Stack internal diameter (m)	2.3	1.9	1.9
Volume Flow (Nm^3/s) (273K, 11%, dry)	37.6	48.7	48.7
Emission Temperature (ºC)	140	140	140
Oxygen Content (% O_2 in dry gas)	10.1	7.21	7.21
Moisture content (% H_2O)	18.14	17.33	17.33

[3] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit.
[4] The 'As Originally Permitted Scenario (200kpta)' mirrors the process conditions referenced and represented within Appendix H1_1 of the Environmental Permit Application, Atmospheric Dispersion Modelling, SLR report reference: 416.04097.00007/DAQM dated August 2014.
[5] The 'existing operation, minor Permit variation scenario' reflects a change in boiler technology from that considered within the original Permit application: the change in boiler technology is associated with an increased exhaust gas flow rate.

Parameter / Source	Original Permitted Scenario (200ktpa)	Existing Operational Scenario (200ktpa)	Permit Variation Scenario (232ktpa)
Actual Flow Rate (Am^3/s)	63.8	64.6	64.6
Emission velocity (m/s)	15.35	22.79	22.79

2.1.2 Emission Concentrations

Emissions from the Site are currently regulated under Annex VI of the IED, with corresponding emission limit values as stated within *Table S3.1 Point source emissions to air – emission limits and monitoring requirements* of the existing Permit[6].

As part of the Permit Variation Scenario, emissions will be regulated under the Implementing Decision 2019/2020[7] '*Establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration*'. Implementing Decision 2019/2020 references BAT-AELs as contained within the BREF for Waste Incineration[8]. Corresponding BAT-AELs have been selected for 'existing plant' and agreed in writing with NRW[9].

Reference should be made to Table 2-2 for presentation of existing ELVs (Annex VI of the IED) and Permit variation BAT-AELs (waste incineration BREF) relevant to the Site and as applied within this Atmospheric Dispersion Modelling. Corresponding 'daily average values' have been presented and considered.

Table 2-2
Existing ELVs and Permit Variation BAT-AELs

Parameter / Source	Original Permitted Scenario / Existing Operational Scenario (200ktpa) mg/Nm^3 (A)	Permit Variation Scenario (232ktpa) mg/Nm^3 (A)
Oxides of nitrogen (NOx)	200	180
Particulate matter (PM)	10	5
Sulphur dioxide (SO_2)	50	40
Carbon monoxide (CO)	50	50
Hydrogen chloride (HCl)	10	8
Hydrogen fluoride (HF)	1	1
Total Organic Carbon (TOC)	10	10
Metals (Formerly termed Group 1) (B)	0.05	0.02
Metals (Formerly termed Group 2) (C)	0.05	0.02
Metals (Formerly termed Group 3) (D)	0.5	0.3
Ammonia (NH_3)	10	10
Dioxins and Furans	0.0000001	0.0000001

[6] Permit number EPR/AB3092CV.
[7] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D2010&from=EN.
[8] Best Available Techniques (BAT) Reference Document for Waste Incineration (europa.eu).
[9] Email correspondence between SLR Consulting Ltd and NRW, dated 30/05/2022.

Parameter / Source	Original Permitted Scenario / Existing Operational Scenario (200ktpa) mg/Nm^3 (A)	Permit Variation Scenario (232ktpa) mg/Nm^3 (A)

Note:
(A) Concentrations referenced to temperature 273 K, pressure 101.3 kPa, 11% oxygen, dry gas. Reference conditions remain consistent between Annex VI of the IED and the waste incineration BREF.
(B) Includes the following metal species: Cadmium (Cd) and thallium (Tl).
(C) Includes the following metal species: Mercury (Hg).
(D) Includes the following metal species: Antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt, copper (Cu), manganese (Mn), nickel (Ni) and vanadium (V).

2.1.3 Applied Emission Rates

The applied emission rates are presented in Table 2-3 and have been calculated from the process conditions detailed in Table 2-1, the ELVs for the existing operation of the Site and Permit variation BAT-AELs relevant to the Site as presented in Table 2-2.

Table 2-3
Pollutant Emission Rates

Parameter / Source	Original Permitted Scenario (200ktpa)	Existing Operational Scenario (200ktpa)	Permit Variation Scenario (232ktpa)
NOx	7.53	9.74	8.77
PM	0.38	0.49	0.24
SO_2	1.88	2.43	1.95
CO	1.88	2.43	2.43
HCl	0.38	0.49	0.39
HF	0.038	0.049	0.049
TOC	0.38	0.49	0.49
Metals (Group 1, per metal species)	0.0009	0.0012	0.0005
Metals (Group 2)	0.0019	0.0024	0.0010
Metals (Group 3)	0.0188	0.0243	0.0146
Cr(VI)	0.0049	0.0063	0.0063
NH_3	0.38	0.49	0.49
Dioxins and Furans	3.76×10^{-9}	4.87×10^{-9}	4.87×10^{-9}

2.2 Model Treatments / Pollutant Specific Issues

2.2.1 Modelled Pollutants and Averaging Periods

The scenarios considered within this ADM are detailed in Table 2-4.

Table 2-4
Atmospheric Dispersion Modelling Scenarios

Pollutant	Modelled As	
	Short-term	Long-term
Nitrogen dioxide (NO_2)	99.79 percentile of 1-hour means	Annual mean
Sulphur dioxide (SO_2)	99.9 percentile of 15-minute means 99.73 percentile of 1-hour means 99.18 percentile of 24-hour means	Annual mean
Particulate matter (PM)	90.41 percentile of 24-hour means	Annual mean
Total Organic Carbon (TOC)	24-hour mean (1st high)	Annual mean
Carbon monoxide (CO)	8-hour mean (1st high)	-
NOx	24-hour mean (1st high)	Annual mean
Hydrogen chloride (HCl)	-	Annual mean
Hydrogen fluoride (HF)	1-hour mean (1st high)	Annual mean
Metals (Formerly termed Group 1, per metal species)	1-hour mean (1st high)	Annual mean
Metals (Formerly termed Group 2 metals)	1-hour mean (1st high)	Annual mean
Metals (Formerly termed Group 3 metals, Excluding Chromium (Cr) (VI) (Cr VI)	1-hour mean (1st high)	Annual mean
Cr (VI)	-	Annual mean
Ammonia (NH_3)	1-hour mean (1st high)	Annual mean
Oxides of nitrogen (NOx)	24-hour mean (1st high)	Annual mean

2.2.2 Total Organic Carbon

The ELV for TOC presented within Annex VI of the IED and as stated as an ELV within the current Permit, and the BAT-AEL presented within the waste incineration BREF, relates to '*gaseous and vaporous organic substances, expressed as TOC*'. Environment Agency (EA) 'Air Emissions Risk Assessment for your Environmental Permit' (the 'AERA' guidance) states:

> *"If you release volatile organic compounds into the air and do not know what all the substances in them are, treat them all as 100% benzene in your risk assessment."*

Therefore, as a precautionary approach and following AERA guidance, the TOC emission has been assessed against the C_6H_6 AQAL / EAL allowing the maximum ground level impacts with respect to the AQAL / EAL to be considered.

Further, it is noted in the interim since the Atmospheric Dispersion Modelling was completed in support of the Original Permitted Scenario / Existing Operational Scenario (200ktpa), the EA has issued an updated short-tern EAL for C_6H_6 as part of the AERA guidance. The new 24-hour mean C_6H_6 EAL of 30µg/m^3 replaces the previous short-term 1-hour mean C_6H_6 EAL of 195µg/m^3.

2.2.3 Particulate Matter

The ELV for PM presented within Annex VI of the IED and as stated as an ELV within the current Permit, and the BAT-AEL presented within the waste incineration BREF, relates to 'total dust'. However, as a precautionary approach in this assessment it is assumed that the entire PM emission consists of both and only PM_{10} and $PM_{2.5}$, allowing the maximum ground level impacts with respect to the AQALs to be considered.

2.2.4 Metals – 'Group 1'

Cadmium (Cd) and thallium (Cd), formerly termed the 'Group 1 metals', have been modelled assuming that each metal species is at 50% of the IED emission limit for Cd and Tl. This approach is consistent with that adopted as part of the Atmospheric Dispersion Modelling completed in support of the Original Permitted Scenario / Existing Operational Scenario (200ktpa).

2.2.5 Metals – 'Group 3'

Sb, As, Pb, Co, Cu, Mn, Ni and V, formerly termed the 'Group 3 metals', have been modelled following the approach outlined within EA '*guidance on assessing group 3 metal stack emissions from incinerators*'[10]. It is noted that this differs from the approach adopted as part of the Atmospheric Dispersion Modelling[4] completed in support of the Original Permitted Scenario (200ktpa) which assumed each 'group 3' metal species is at 11.1% of the WID emission limit for the group, except for As which was assumed as 1% for the total 'group 3' emissions.

Reference should be made to Table 2-5 for Group 3 metal species composition percentages applied as part of the assessment. It is noted the 'maximum' emission concentrations / percentages referenced within the EA '*guidance on assessing group 3 metal stack emissions from incinerators*' have been applied.

Table 2-5
'Group 3' Metal Species – Monitoring Data

Pollutant	Measured Concentration (mg/Nm^3) – Maximum	Percentage of the IED Group 3 ELV (%)
Sb	0.0115	2.3
As	0.025	5
Total Cr	0.092	18.4
Cr (VI)	1.3×10^{-4}	0.03
Co	0.0056	1.1
Cu	0.029	5.8

[10] Releases from waste incinerators, Guidance on assessing group 3 metal stack emissions from incinerators, version 4. Environment Agency.

Pollutant	Measured Concentration (mg/Nm^3) – Maximum	Percentage of the IED Group 3 ELV (%)
Pb	0.0503	10.1
Mn	0.06	12
Ni	0.22	44
V	0.006	1.2

2.2.6 Treatment of Model Output – NOx to NO_2 Conversion

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

A worse-case scenario has been applied in that 35% of NOx is presented as NO_2 in relation to short-term impacts and 70% of NOx is present as NO_2 in relation to long term impacts in accordance with the EA's AQMAU standard guidance[11] approach on the conversion ratio for NOx and NO_2.

2.2.7 Treatment of Model Output – SO_2 15-minute Mean Averaging Period

As dispersion models utilise hourly average meteorological data, calculation of 15-minute averages, such as required for SO_2, requires the application of conversion factors. For the purposes of detailed modelling of SO_2, a conversion factor of 1.34 is applied to hourly average data as detailed in EA AERA guidance.

2.3 Meteorological Data and Preparation

The Atmospheric Dispersion Modelling[4] completed in support of the Original Permitted Scenario (200ktpa) considered and applied 5-years' hourly sequential Global Forecasting System (GFS) resolution Numerical weather prediction (NWP) meteorological data, centred on the site coordinates, covering the period 2009 – 2013. To assess the impact associated with the Permit Variation Scenario (232ktpa), an update to this NWP data has been considered covering the period 2016 – 2020.

Wind roses for each considered meteorological year are presented in Figure 2-1 to Figure 2-5.

[11] Environment Agency, Air Quality Modelling and Assessment Unit, 'Conversion Ratios for NOx and NO_2' (no date).

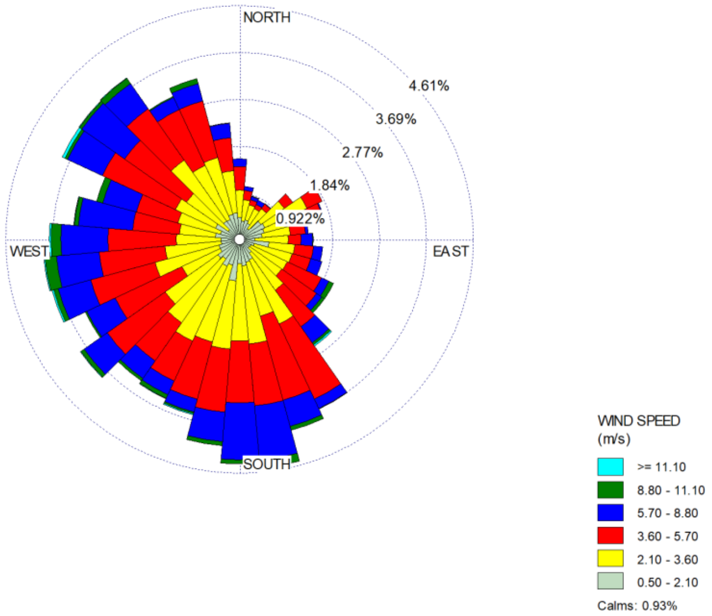


Figure 2-1
NWP Meteorological Data Wind Rose 2016

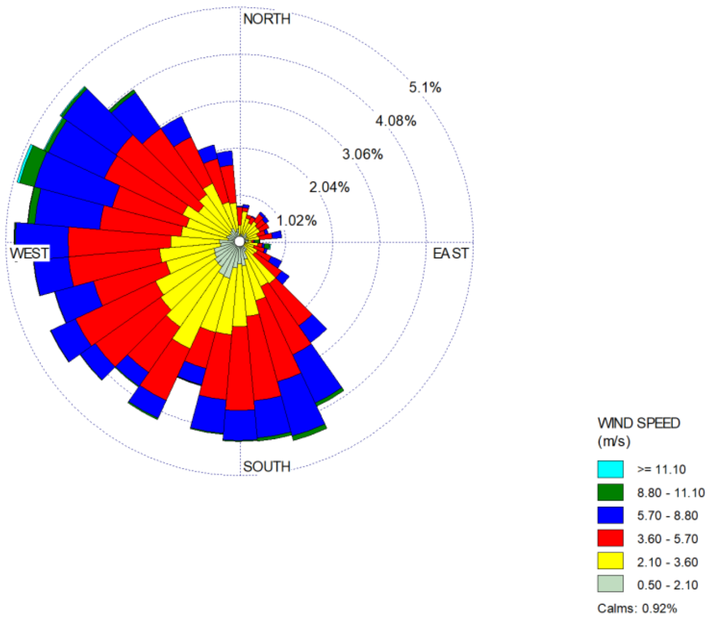


Figure 2-2
NWP Meteorological Data Wind Rose 2017

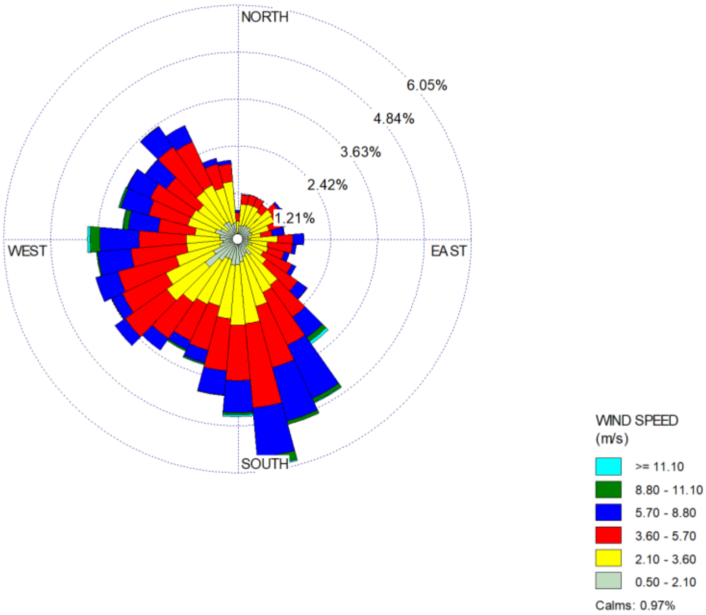


Figure 2-3
NWP Meteorological Data Wind Rose 2018

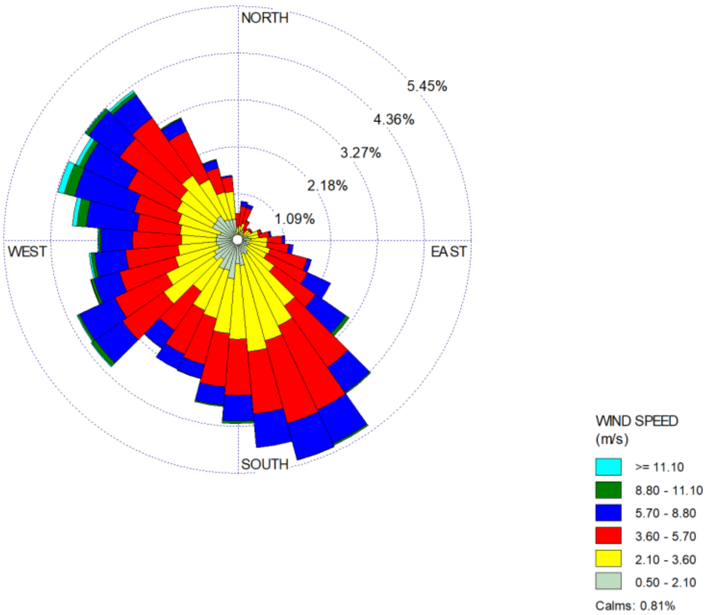


Figure 2-4
NWP Meteorological Data Wind Rose 2019

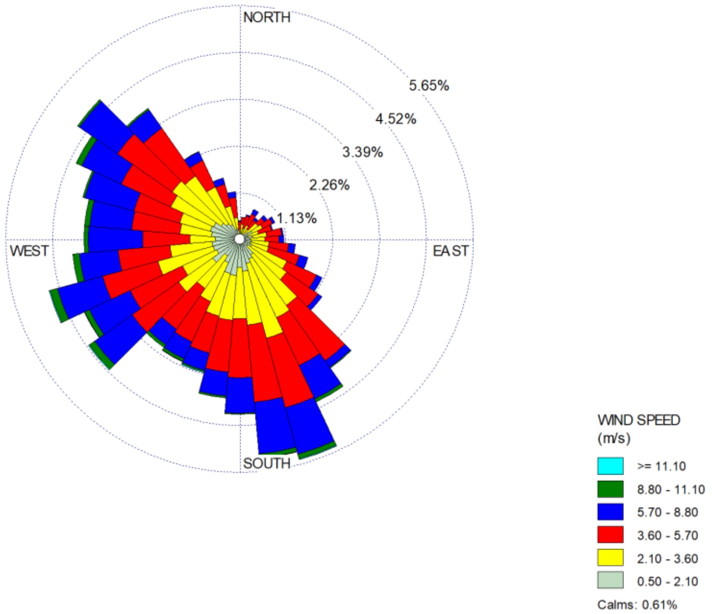


Figure 2-5
NWP Meteorological Data Wind Rose 2020

The meteorological data (5-year hourly sequential data for 2015 – 2019, inclusive) was obtained in .met format from the data supplier and converted to the required surface and profile formats for use in AERMOD using AERMET View meteorological pre-processor. Details specific to the site location were used to define surface roughness, albedo and bowen ratio in the conversion (see Table 2-6).

Table 2-6
Applied Surface Characteristics

Zone (Start)	Zone (End)	Albedo	Bowen Ratio	Surface Roughness (m)
0	45	0.14	0.45	0.1625
45	120	0.2075	1.625	1
120	270	0.2075	1.625	1
270	0	0.14	0.45	0.1625

Table 2-6 presents statistics on the meteorological dataset illustrating the percentage of calm hours and the percentage of missing hours recorded within the 5-year period. Data capture, in terms of the percentage of calm hours and missing hours recorded are less than 10% and therefore, within acceptable limits.

Table 2-7
NWP: Meteorological Data Statistics

Year	Calm Hours (%)	Missing Hours (%)
2016	1.09	1.15
2017	0.92	1.05
2018	0.97	1.14

Year	Calm Hours (%)	Missing Hours (%)
2019	0.81	1.00
2020	0.61	1.25

2.4 Dispersion Model Setup

For this assessment the AERMOD model[12] has been applied; this model is widely used and accepted by the NRW for undertaking such assessments and its predictions have been validated against real-time monitoring data by the United States (US) Environmental Protection Agency (EPA). It is therefore considered a suitable model for this assessment.

2.5 Dispersion Coefficient

Given the coastal / estuary setting of the Application Site, the 'rural dispersion' coefficient was selected in accordance with AERMOD guidance on land-use classifications. This remains consistent with that applied within the Atmospheric Dispersion Modelling[4] completed in support of the Original Permitted Scenario (200ktpa).

2.6 Terrain Data

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

AERMOD utilises digital elevation data to determine the impact of topography on dispersion from a source. Topography was incorporated within the modelling using 30m resolution Shuttle Radar Topography Mission (SRTM) terrain data files. Data was processed by the AERMAP function within AERMOD to calculate terrain heights.

The topography in the immediacy surrounding the site is relatively flat and consistent from a base above ordnance datum (AOD) height of approximately 4m (covering the site itself) to a maximum height of approximately 300m west of the site within a distance of 9.5km. As such topography has been incorporated into the model

Data was processed by the AERMAP function within AERMOD to calculate terrain heights as illustrated in Figure 2-6.

[12] Software used: Lakes AERMOD View, (Executable Aermod_18081).

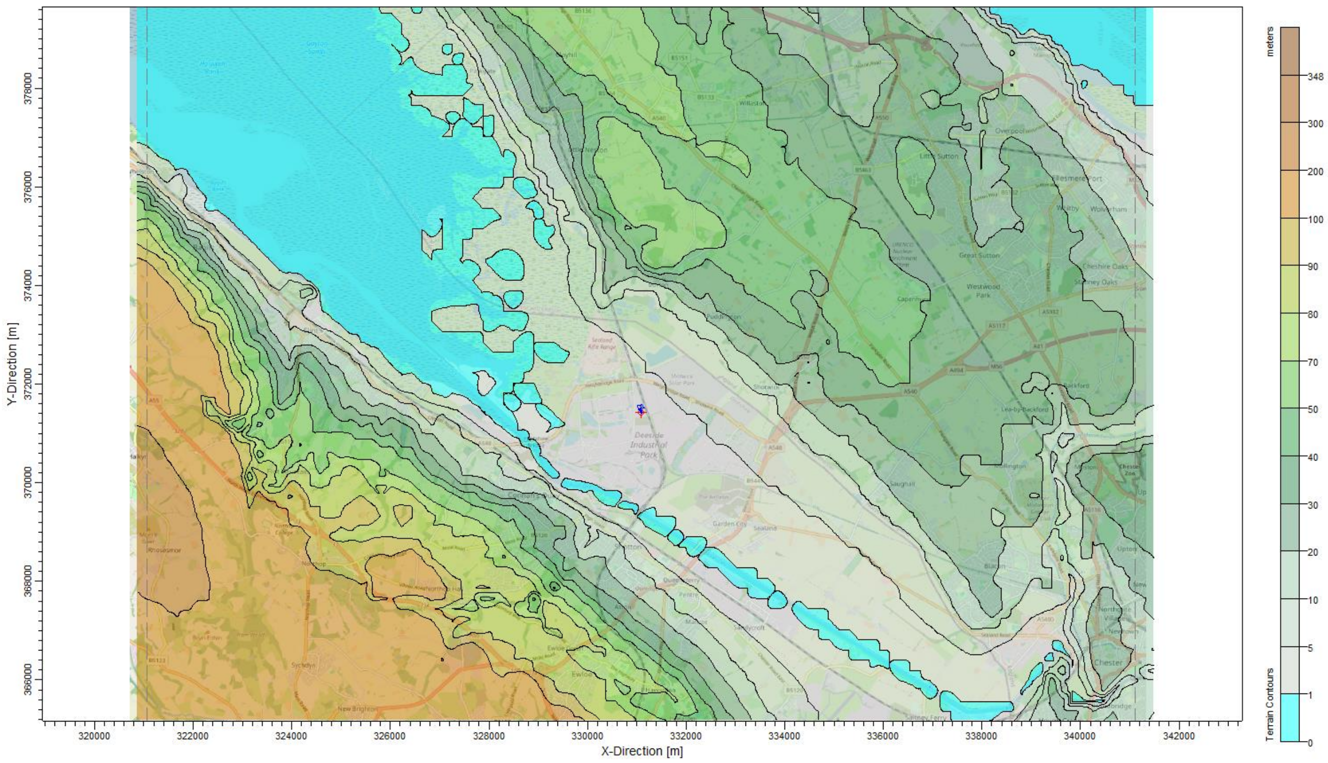


Figure 2-6
Surrounding Topography – Parc Adfer ERF Site

2.7 Assessment Area

The modelling has been undertaken using a receptor grid across an Ordnance Survey map of the study area. Pollutant exposure isopleths are generated by interpolation between receptor points and superimposed onto the map. This method allows the maximum ground level concentration outside the site boundary to be assessed.

The potential air quality impact of the site arising from the three considered scenarios outlined within Section 2.1 (i.e. the Originally Permitted Scenario (200ktpa), the Existing Operation Scenario (200ktpa), and the Permit Variation Scenario (232ktpa)) was assessed over an area of 10km radius from the site. The receptor grid spacing used was: 100m across a 5km radius circular grid and 200m across the 5km – 10km radius (13696 data points). The location of maximum ground level concentration and the results isopleths show that this resolution and area is sufficient for purposes of this assessment.

In relation to the assessment of impacts at ecological sites, the AQTAG guidance has been followed and impacts at European sites up to 10km from the stack have been assessed.

2.7.1 Ecological Receptors

The AERA Guidance Note requires that designated ecological sites should be screened against relevant standards if they are located within the following set distances from the facility:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10km of the installation; and
- Sites of Special Scientific Interest (SSSIs) and local nature sites (ancient woods, local wildlife sites and national and local nature reserves) within 2km of the installation.

Details of the sites within these screening distances are presented in Table 2-8. It is noted that the considered ecological designations remain consistent with those applied and assessed within the Atmospheric Dispersion Modelling[4] completed in support of the Site as part of the Originally Permitted Scenario (200ktpa).

Table 2-8
Designated Ecological Sites

Receptor	Site	Designation
ER1	Dee Estuary / Aber Dyfrdwy (England) (UK0030131)	SAC / SPA
ER2	River Dee and Bala Lake (UK0030252)	SAC / SPA
ER3	Deeside and Buckley Newt sites (UK0030132)	SAC / SPA
ER4	Halkyn Mountain / Mynydd Helygain (UK0030163)	SAC / SPA
ER5	The Dees Estuary	SPA
ER6	Inner Marsh Farm	SSSI
ER7	Shotton Lagoons and Reedbeds	SSSI

2.8 Building Downwash

Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations. Building downwash should always be considered for buildings that have a maximum height equivalent to at least 40% of the emission height (in the case of the Parc Adfer ERF 34m based on an 85m stack height), and which within a distance defined as five times the lesser of the height or maximum projected width of the building.

The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics.

Applied building / structure height parameters remain consistent with those applied within the Atmospheric Dispersion Modelling[4] completed in support of the Original Permitted Scenario (200ktpa).

Buildings and structures input to the model are represented in Figure 2-7.

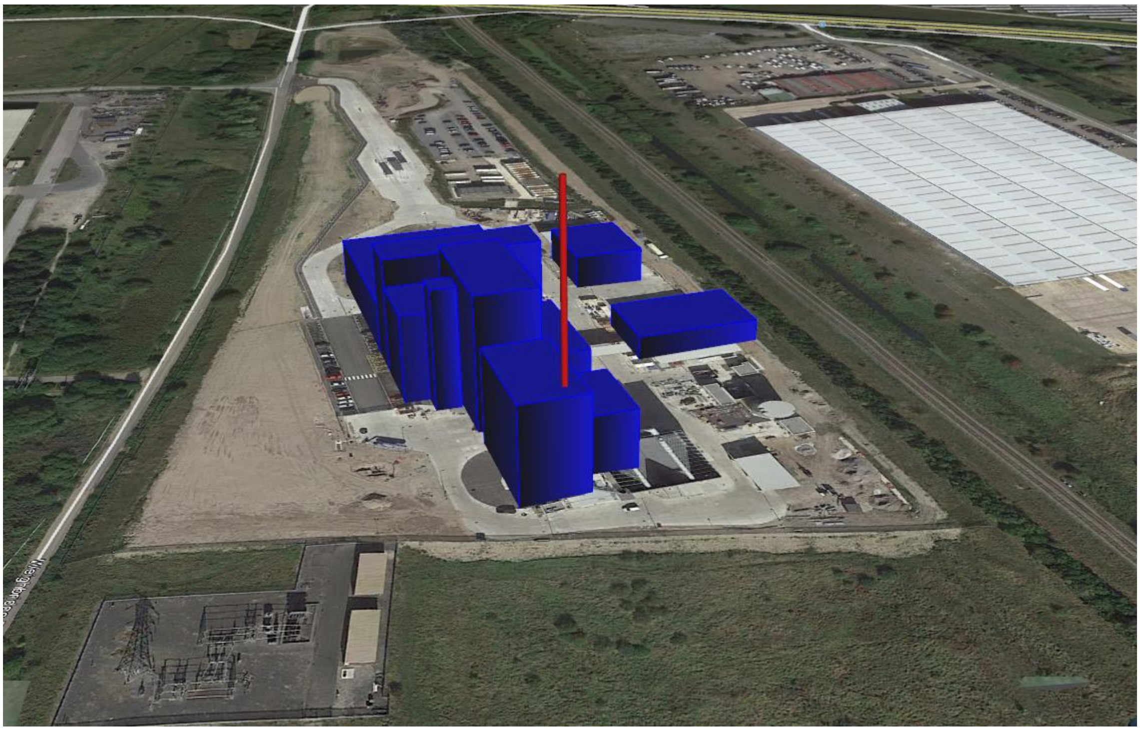


Figure 2-7
Modelled Buildings and Structures – Parc Adfer ERF

3.0 PREDICTION OF IMPACTS: PROCESS CONTRIBUTIONS

3.1 Human Receptors

3.1.1 Short-term Impacts

A summary of the maximum predicted short-term process contributions (PC) from the Permit Variation Scenario (232ktpa) is presented in Table 3-1. These predicted short-term impacts relate to the highest predicted level of impact at any location on the receptor grid and impacts at all other locations, and at all other times, will be lower.

For reference / comparison, maximum predicted PCs are additionally presented for the Original Permitted Scenario (200tkpa) and the Existing Operational Scenario (200ktpa) to provide narrative and context to the Permit Variation Scenario (232ktpa) maximum predicted short-term PCs.

For additional comparison, reference should be made to Appendix A for presentation of the maximum predicted short-term PCs presented within the original Atmospheric Dispersion Modelling[4] submitted in support of the original Permit application, as based upon the application of 2009 – 2013 meteorological data.

Table 3-1
Maximum Predicted Short-term Process Contributions

Pollutant	Applied Standard (µg/m³)	Averaging Period	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
			PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max Change (µg/m³) (A)	PC Max Change as a % of the EAL
NO_2	200	1-hour 99.79%ile	2.93	1.46	3.72	1.86	3.35	1.67	-0.37	-0.19
PM (B)	50	24-hour 90.41%ile	0.08	0.16	0.10	0.21	0.05	0.10	-0.05	-0.10
SO_2	266	15-minute 99.9%ile	3.02	1.14	3.83	1.44	3.06	1.15	-0.77	-0.29
	350	1-hour 99.73%ile	2.04	0.58	2.59	0.74	2.07	0.59	-0.52	-0.15
	125	24-hour 99.18%ile	0.91	0.73	1.15	0.92	0.92	0.73	-0.23	-0.18
CO	10,000	8-hour Rolling Mean	1.93	0.02	2.46	0.02	2.46	0.02	0.00	0.00
HCl	750	1-hour Mean	1.39	0.19	1.77	0.24	1.42	0.19	-0.35	-0.05
HF	160	1-hour Mean	0.14	0.09	0.18	0.11	0.18	0.11	0.00	0.00
TOC (C)	30	24-hour Mean	0.23	0.76	0.28	0.95	0.28	0.95	0.00	0.00
Hg	7.5	1-hour Mean	0.007	0.09	0.009	0.12	0.004	0.05	-0.01	-0.07
Sb	150	1-hour Mean	0.002	0.00	0.002	0.00	0.001	0.00	0.00	0.00
Cr	150	1-hour Mean	0.013	0.01	0.016	0.01	0.010	0.01	-0.01	0.00

Pollutant	Applied Standard (µg/m³)	Averaging Period	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
			PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max Change (µg/m³) (A)	PC Max Change as a % of the EAL
Co	200	1-hour Mean	0.004	0.00	0.005	0.00	0.003	0.00	0.00	0.00
Mn	1500	1-hour Mean	0.008	0.00	0.011	0.00	0.006	0.00	0.00	0.00
V	1	1-hour Mean	0.001	0.08	0.001	0.11	0.001	0.06	0.00	-0.04
NH_3	2500	1-hour Mean	1.389	0.06	1.770	0.07	1.770	0.07	0.00	0.00

Notes:

(A) Presented PC is based upon an average of the modelled 5-year dataset.
(B) Assessed as particulate matter with an aerodyanamic diameter of less than 10µm (PM_{10}).
(C) Assessed as C_6H_6.

Table 3-1 indicates that the maximum ground-level PCs are <10% of the applied EAL for all considered pollutants / short-term averaging periods arising from the operation of the Permit Variation Scenario (232ktpa). Short-term maximum ground-level PCs are considered 'insignificant' in accordance with the AERA guidance. Therefore, consideration of the resultant Predicted Environmental Concentration (PEC) as a percentage of the applied limit value is not required (i.e. the impact of that pollutant is screened out irrespective of existing background levels).

As presented in Table 3-1, the Permit Variation Scenario (232ktpa) results in either the same or a reduction in the maximum ground-level PCs in comparison to the Existing Operational Scenario (200ktpa). This is irrespective of the increase in tonnage, and as a result in the reduction in emission rate(s) for the suite of pollutants based upon the adherence of BAT-AELs in comparison to existing ELVs.

Table 3-2 presents the NGR location of the maximum short-term GLC for each considered pollutant / averaging period, based upon those predicted maximum PCs presented in Table 3-1.

Table 3-2
Predicted Short-term Process Contributions: Analysis of Location of Max GLCs

Pollutant	Averaging Period	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
NO_2	1-hour 99.79%ile	x330800; y371800	x330800; y371800	x330800; y371800
PM	24-hour 90.41%ile	x330800; y372100	x330800; y372100	x330800; y372100
SO_2	15-minute 99.9%ile	x330900; y371800	x330900; y371800	x330900; y371800
	1-hour 99.73%ile	x330800; y371800	x330800; y371800	x330800; y371800
	24-hour 99.18%ile	x330700; y372300	x330700; y372300	x330700; y372300
CO	8-hour Rolling Mean	x330900; y371900	x330900; y371900	x330900; y371900
HCl	1-hour Mean	x322300; y369200	x322300; y369200	x322300; y369200
HF	1-hour Mean	x322300; y369200	x322300; y369200	x322300; y369200
TOC	24-hour Mean	x330600; y372200	x330600; y372200	x330600; y372200
Hg	1-hour Mean	x322300;	x322300;	x322300;

Pollutant	Averaging Period	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
		y369200	y369200	y369200
Sb	1-hour Mean	x322300; y369200	x322300; y369200	x322300; y369200
Cr	1-hour Mean	x322300; y369200	x322300; y369200	x322300; y369200
Co	1-hour Mean	x322300; y369200	x322300; y369200	x322300; y369200
Mn	1-hour Mean	x322300; y369200	x322300; y369200	x322300; y369200
V	1-hour Mean	x322300; y369200	x322300; y369200	x322300; y369200
NH_3	1-hour Mean	x322300; y369200	x322300; y369200	x322300; y369200

As indicated in Table 3-2, the NGR location of the maximum GLC remains consistent and identical between the relevant pollutant suite / averaging period for each of the considered Original Permitted Scenario, Existing Operational Scenario and the Permit Variation Scenario.

3.1.2 Long-term Impacts

A summary of the maximum predicted long-term PCs from the Permit Variation Scenario (232ktpa) are presented in Table 3-3. These predicted long-term impacts relate to the highest predicted level of impact at any location on the receptor grid and impacts at all other locations, and at all other times, will be lower.

For reference / comparison, maximum predicted PCs are additionally presented for the Original Permitted Scenario (200tkpa) and the Existing Operational Scenario (200ktpa) to provide narrative and context to the Permit Variation Scenario (232ktpa) maximum predicted short-term PCs.

For additional comparison, reference should be made to Appendix A for presentation of the maximum predicted short-term PCs presented within the original Atmospheric Dispersion Modelling[4] submitted in support of the original Permit application, as based upon the application of 2009 – 2013 meteorological data.

Table 3-3
Maximum Predicted Long-term Process Contributions

Pollutant	Applied Standard ($\mu g/m^3$)	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
		PC Max ($\mu g/m^3$) (A)	PC Max as a % of the EAL	PC Max ($\mu g/m^3$) (A)	PC Max as a % of the EAL	PC Max ($\mu g/m^3$) (A)	PC Max as a % of the EAL	PC Max Change ($\mu g/m^3$) (A)	PC Max Change as a % of the EAL
NO_2	40	0.32	0.79	0.40	1.00	0.36	0.90	-0.04	-0.10
PM (B)	40	0.02	0.06	0.03	0.07	0.01	0.04	-0.01	-0.04
PM (C)	25	0.02	0.09	0.03	0.11	0.01	0.06	-0.01	-0.06
HF	16	0.00	0.01	0.00	0.02	0.00	0.02	0.00	0.00
TOC (D)	5.0	0.02	0.45	0.03	0.57	0.03	0.57	0.00	0.00
Cd	0.005	5.67×10^{-5}	1.13	7.16×10^{-5}	1.43	2.86×10^{-5}	0.57	<0.01	-0.86
Hg	0.3	1.13×10^{-4}	0.04	1.43×10^{-4}	0.05	5.73×10^{-5}	0.02	<0.01	-0.03
As	0.003	5.67×10^{-5}	1.89	7.16×10^{-5}	2.39	4.30×10^{-5}	1.43	<0.01	-0.95
Sb	5	2.61×10^{-5}	<0.01	3.29×10^{-5}	<0.01	1.98×10^{-5}	<0.01	<0.01	<0.01
Cr	5	2.09×10^{-4}	<0.01	2.63×10^{-4}	0.01	1.58×10^{-4}	<0.01	<0.01	<0.01
Cr (VI)	0.0002	2.95×10^{-7}	0.15	3.72×10^{-7}	0.19	3.72×10^{-7}	0.19	0.00	0.00
Cu	10	6.58×10^{-5}	0.00	8.30×10^{-5}	0.00	4.98×10^{-5}	0.00	<0.01	<0.01
Pb	0.3	1.15×10^{-4}	0.04	1.45×10^{-4}	0.05	8.68×10^{-5}	0.03	<0.01	-0.02

Pollutant	Applied Standard (µg/m³)	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
		PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max (µg/m³) (A)	PC Max as a % of the EAL	PC Max Change (µg/m³) (A)	PC Max Change as a % of the EAL
Mn	0.2	1.36×10^{-4}	0.07	1.72×10^{-4}	0.09	1.03×10^{-4}	0.05	<0.01	-0.03
Ni	0.02	4.99×10^{-4}	2.50	6.30×10^{-4}	3.15	3.78×10^{-4}	1.89	<0.01	-1.26
V	5	1.36×10^{-5}	<0.01	1.72×10^{-5}	<0.01	1.03×10^{-5}	0.00	<0.01	<0.01
NH_3	180	0.02	0.01	0.03	0.02	0.03	0.02	<0.01	<0.01
PCDDs / PCDFs	-	2.27×10^{-10}		2.86×10^{-10}	-	2.86×10^{-10}	-	0.00	-

Note:

(A) Presented PC is based upon an average of the modelled 5-year dataset.
(B) Assessed as PM_{10}.
(C) Assessed as $PM_{2.5}$
(D) Assessed as C_6H_6

Table 3-3 indicates that the maximum ground-level PCs arising from the operation of the Permit Variation Scenario (232ktpa) are <1% of the applied EAL for annual mean concentrations of NO_2, PM (assessed as both PM_{10} and $PM_{2.5}$), HF, TOC (assessed as C_6H_6), Cd, Hg, Sb, Cr, Cr (VI), Cu, Pb, Mn, V and NH_3. Therefore, long-term maximum ground-level PCs for these pollutants are 'insignificant' in accordance with the AERA guidance.

Table 3-3 further indicates that the maximum ground-level PCs arising from the operation of the Permit Variation Scenario (232ktpa) are >1% of the applied EAL for annual mean As and Ni and, therefore, not insignificant in accordance with the AERA guidance. **However**, Table 3-3 indicates the Permit Variation Scenario (232ktpa) results in a reduction in the maximum ground-level annual mean As and Ni PCs in comparison to the Existing Operational Scenario (200ktpa). This is irrespective of the increase in tonnage, and as a result in the reduction in emission rate(s) for the suite of pollutants based upon the adherence to BAT-AELs in comparison to existing ELVs. Therefore, the Permit Variation Scenario (232ktpa) results in betterment across the suite of pollutants, including maximum ground-level annual mean As and Ni PCs in comparison to the Existing Operational Scenario (200ktpa) and, therefore, no assessment of PECs is undertaken.

Reference should be made to Appendix B for isopleth contour plots for both the Existing Operational Scenario (200kpta) and Permit Variation Scenario (232kpta) illustrating the extent where:

- the annual mean As PC is >0.00003µg/m^3 (i.e. 1% of the applied EAL of 0.003µg/m^3) (Figure B-1); and
- the annual mean Ni PC is >0.0002µg/m^3 (i.e. 1% of the applied EAL of 0.02µg/m^3) (Figure B-2).

The NGR location of the maximum long-term GLC for each considered pollutant, based upon those predicted maximum PCs presented in Table 3-3, is as follows:

- As originally Permitted scenario (200ktpa);
    - x330800, y372200;
- Existing operation, minor Permit variation scenario (200kpta); and
    - x330800, y372300;
- Permit variation scenario (232ktpa).
    - x330800, y372300.

As indicated above, the NGR location of the maximum GLC remains consistent and identical between the relevant pollutant suite for each of the considered Existing Operational Scenario (200ktpa) and the Permit Variation Scenario (232ktpa).

3.2 Ecological Receptors

The assessment of impacts associated with the Permit Variation Scenario (232ktpa) at considered ecological designations is presented in the following subsections. It is noted that the assessment of impacts at all ecological receptors is based upon the maximum predicted ground-level concentration / PC at any location across the considered designations.

For reference / comparison, maximum predicted impacts on the CLe are presented for both the Permit variation scenario (232ktpa) and existing operational site (200ktpa).

For reference / comparison, maximum predicted PCs are additionally presented for the Original Permitted Scenario (200tkpa) and the Existing Operational Scenario (200ktpa) to provide narrative and context to the Permit Variation Scenario (232ktpa) maximum predicted short-term PCs.

For additional comparison, reference should be made to Appendix A for presentation of the maximum predicted short-term PCs to the applied CLe and CLo as presented within the original Atmospheric Dispersion Modelling[4] submitted in support of the original Permit application, as based upon the application of 2009 – 2013 meteorological data.

3.2.1 Critical Levels (CLe) – Annual Mean NOx

The results of the assessment of impacts on the annual mean NOx CLe are presented in Table 3-4 below.

Table 3-4
Impact on NOx Critical Levels – Annual Mean

Receptor	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe
ER1	0.45	1.51	0.57	1.91	0.52	1.72	-0.06	-0.19
ER2	0.08	0.25	0.10	0.32	0.09	0.29	-0.01	-0.03
ER3	0.03	0.10	0.04	0.13	0.03	0.12	0.00	-0.01
ER4	0.02	0.06	0.03	0.08	0.02	0.08	0.00	-0.01
ER5	0.32	1.06	0.41	1.36	0.37	1.22	-0.04	-0.14
ER6	0.32	1.06	0.41	1.36	0.37	1.22	-0.04	-0.14
ER7	0.11	0.37	0.14	0.47	0.13	0.42	-0.01	-0.05

Note:
(A) Presented PC is based upon an average of the modelled 5-year dataset.
(B) Assessing against an annual mean NOx CLe of 30µg/m³.

Table 3-4 illustrates that the maximum annual mean NOx PC arising from the operation of the Permit Variation Scenario (232ktpa) does not exceed 1% of the annual NOx CLe at ecological receptors ER2 – ER4 and ER7.

Following the stated 'EA's Operational Instruction 66_12'[13], impacts on the annual mean NOx CLe are considered to result in:

- '*no likely significant effects (alone and in-combination)*' at ecological receptors ER3 and ER4 (SAC / SPA designation); and
- '*no likely damage*' at ecological receptor ER7 (SSSI designation).

Table 3-4 further illustrates that the maximum annual mean NOx PC is >1% of the annual NOx CLe at ecological receptors ER1, ER5 and ER6. **However**, Table 3-4 indicates the Permit Variation Scenario (232ktpa) results in a reduction in the maximum ground-level annual mean NO_x PC in comparison to the Existing Operational Scenario (200ktpa). This is irrespective of the increase in tonnage, and as a result in the reduction in NOx emission rate based upon the adherence of BAT-AEL in comparison to existing ELV. Therefore, the Permit Variation Scenario (232ktpa) results in betterment across predicted maximum annual mean NOx PC in comparison to the Existing Operational Scenario (200ktpa) and, therefore, no assessment of PECs is undertaken.

[13] EA Operational Instruction 66_12 - Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation. Issued 08/05/2012.

Reference should be made to Appendix B for an isopleth contour plot illustrating the extent where the annual mean NOx PC is >0.3µg/m^3 (i.e. 1% of the applied CLe of 30µg/m^3) for both the Existing Operational Scenario (200kpta) and Permit Variation Scenario (232kpta) (Figure B-3).

Table 3-5 presents the NGR location of the maximum annual mean NOx GLC based upon those predicted maximum PCs presented in Table 3-4.

Table 3-5
Annual Mean NOx Critical Level – Analysis of Location of Max GLCs

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER1	x330833.8; y372241.6	x330833.8; y372241.6	x330833.8; y372241.6
ER2	x332340.7; y368746.7	x332340.7; y368746.7	x332340.7; y368746.7
ER3	x329713.1; y368403.3	x329713.1; y368403.3	x329713.1; y368403.3
ER4	x321579.4; y369899.2	x321579.4; y369899.2	x321579.4; y369899.2
ER5	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER6	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER7	x330166.9; y371014.5	x330166.9; y371014.5	x330166.9; y371014.5

As indicated in Table 3-5, the NGR location of the maximum GLC remains consistent and identical for the annual mean NOx PC between the considered Existing Operational Scenario (200ktpa) and the Permit Variation Scenario (232ktpa).

3.2.2 Critical Levels – 24-hour Mean NOx

The results of the assessment of impacts on the 24-hour mean NOx CLe are presented in Table 3-6 below.

Table 3-6
Impact on NOx Critical Levels – 24-hour Mean

Receptor	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
	PC Max (µg/m^3) (A)	PC Max as a % of the CLe	PC Max (µg/m^3) (A)	PC Max as a % of the CLe	PC Max (µg/m^3) (A)	PC Max as a % of the CLe	PC Max (µg/m^3) (A)	PC Max as a % of the CLe
ER1	4.53	6.04	5.69	7.59	5.12	6.83	-0.57	-0.76
ER2	1.96	2.61	2.52	3.36	2.27	3.02	-0.25	-0.34
ER3	1.39	1.85	1.78	2.37	1.60	2.13	-0.18	-0.24
ER4	0.84	1.12	1.09	1.46	0.98	1.31	-0.11	-0.15
ER5	2.87	3.83	3.69	4.92	3.32	4.43	-0.37	-0.49

Receptor	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe
ER6	2.87	3.83	3.69	4.92	3.32	4.43	-0.37	-0.49
ER7	2.35	3.14	3.00	4.00	2.70	3.60	-0.30	-0.40

Note:
(A) Presented PC is based upon an average of the modelled 5-year dataset.
(B) Assessing against a 24-hour mean NOx CLe of 75µg/m³.

Table 3-6 illustrates that the maximum 24-hour mean NOx PC arising from the operation of the Permit Variation Scenario (232ktpa) does not exceed 10% of the 24-hour mean NOx CLe at any considered ecological designation.

Following the stated 'EA's Operational Instruction 66_12'[13], impacts on the 24-hour mean NOx CLe are considered to result in:

- '*no likely significant effects (alone and in-combination)*' at ecological receptors ER1 – ER5 (SAC / SPA designation); and
- '*no likely damage*' at ecological receptors ER6 and ER7 (SSSI designation).

Table 3-6 further indicates the Permit Variation Scenario (232ktpa) results in a reduction in the maximum ground-level 24-hour mean NO_x PC in comparison to the Existing Operational Scenario (200ktpa). This is irrespective of the increase in tonnage, and as a result in the reduction in NOx emission rate based upon the adherence of BAT-AEL in comparison to existing ELV.

Table 3-7 presents the NGR location of the maximum 24-hour mean NOx GLC based upon those predicted maximum PCs presented in Table 3-6

Table 3-7
24-hour Mean NOx Critical Level – Analysis of Location of Max GLCs

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER1	x330663.8; y372156.6	x330578.8; y372241.6	x330578.8; y372241.6
ER2	x330725.7; y369766.7	x330725.7; y369766.7	x330725.7; y369766.7
ER3	x328599.5; y364778.2	x328599.5; y364778.2	x328599.5; y364778.2
ER4	x321579.4; y369899.2	x321579.4; y369899.2	x321579.4; y369899.2
ER5	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER6	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER7	x330166.9; y371014.5	x330166.9; y371014.5	x330166.9; y371014.5

As indicated in Table 3-7, the NGR location of the maximum GLC remains consistent and identical for the 24-hour mean NOx PC between the considered Existing Operational Scenario (200ktpa) and the Permit Variation Scenario (232ktpa).

3.2.3 Critical Levels – Annual Mean NH_3

The results of the assessment of impacts on the annual mean NH_3 CLe are presented in Table 3-8 below.

Table 3-8
Impact on NH_3 Critical Levels – Annual Mean

Receptor	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe
ER1	0.02	0.76	0.03	0.95	0.03	0.95	0.00	0.00
ER2	<0.01	0.13	<0.01	0.16	<0.01	0.16	0.00	0.00
ER3	<0.01	0.05	<0.01	0.06	<0.01	0.06	0.00	0.00
ER4	<0.01	0.03	<0.01	0.04	<0.01	0.04	0.00	0.00
ER5	0.02	0.53	0.02	0.68	0.02	0.68	0.00	0.00
ER6	0.02	0.53	0.02	0.68	0.02	0.68	0.00	0.00
ER7	0.01	0.18	0.01	0.23	0.01	0.23	0.00	0.00

Note:
(A) Presented PC is based upon an average of the modelled 5-year dataset.
(B) Assessing against an annual mean NH_3 CLe of 1µg/m³, as a precautionary approach.

Table 3-8 illustrates that the maximum annual mean NH_3 PC arising from the operation of the Permit Variation Scenario (232ktpa) does not exceed 1% of the annual mean NH_3 CLe at any considered ecological designation.

Following the stated 'EA's Operational Instruction 66_12'[13], impacts on the annual mean NH_3 CLe are considered to result in:

- '*no likely significant effects (alone and in-combination)*' at ecological receptors ER1 – ER5 (SAC / SPA designation); and
- '*no likely damage*' at ecological receptors ER6 and ER7 (SSSI designation).

Table 3-8 further indicates the Permit Variation Scenario (232ktpa) results in the same reduction in the maximum ground-level annual mean NH_3 PC in comparison to the Existing Operational Scenario (200ktpa). This is a function of the identical NH_3 emission rate based upon the adherence of BAT-AEL in comparison to the existing ELV.

Table 3-9 presents the NGR location of the maximum 24-hour mean NOx GLC based upon those predicted maximum PCs presented in Table 3-8.

Table 3-9
Annual Mean NH_3 Critical Level – Analysis of Location of Max GLCs

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER1	x330833.8; y372241.6	x330833.8; y372241.6	x330833.8; y372241.6
ER2	x332340.7; y368746.7	x332340.7; y368746.7	x332340.7; y368746.7
ER3	x329713.1; y368403.3	x329713.1; y368403.3	x329713.1; y368403.3
ER4	x321579.4; y369899.2	x321579.4; y369899.2	x321579.4; y369899.2
ER5	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER6	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER7	x330166.9; y371014.5	x330166.9; y371014.5	x330166.9; y371014.5

As indicated in Table 3-9, the NGR location of the maximum GLC remains consistent and identical for the 24-hour mean NOx PC between the considered Existing Operational Scenario (200ktpa) and the Permit Variation Scenario (232ktpa).

3.2.4 Critical Levels – Annual Mean SO_2

The results of the assessment of impacts on the annual mean SO_2 CLe are presented in Table 3-10 below.

Table 3-10
Impact on SO_2 Critical Levels – Annual Mean

Receptor	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
	PC Max (µg/m^3) (A)	PC Max as a % of the CLe	PC Max (µg/m^3) (A)	PC Max as a % of the CLe	PC Max (µg/m^3) (A)	PC Max as a % of the CLe	PC Max (µg/m^3) (A)	PC Max as a % of the CLe
ER1	0.11	0.57	0.14	0.72	0.11	0.57	-0.03	-0.14
ER2	0.02	0.09	0.02	0.12	0.02	0.10	<0.01	-0.02
ER3	0.01	0.04	0.01	0.05	0.01	0.04	<0.01	-0.01
ER4	0.00	0.02	0.01	0.03	0.01	0.03	<0.01	-0.01
ER5	0.08	0.40	0.10	0.51	0.08	0.41	-0.02	-0.10
ER6	0.08	0.40	0.10	0.51	0.08	0.41	-0.02	-0.10
ER7	0.03	0.14	0.04	0.18	0.03	0.14	-0.01	-0.04

Note:
(A) Presented PC is based upon an average of the modelled 5-year dataset.
(B) Assessing against an annual mean NH_3 CLe of 20µg/m^3.

Table 3-10 illustrates that the maximum annual mean SO_2 PC arising from the operation of the Permit Variation Scenario (232ktpa) does not exceed 1% of the annual mean SO_2 CLe at any considered ecological designation.

Following the stated 'EA's Operational Instruction 66_12'[13], impacts on the annual mean SO_2 CLe are considered to result in:

- '*no likely significant effects (alone and in-combination)*' at ecological receptors ER1 – ER5 (SAC / SPA designation); and
- '*no likely damage*' at ecological receptors ER6 and ER7 (SSSI designation).

Table 3-10 further indicates the Permit Variation Scenario (232ktpa) results in a reduction in the maximum ground-level annual mean SO_2 PC in comparison to the Existing Operational Scenario (200ktpa). This is irrespective of the increase in tonnage, and as a result in the reduction in SO_2 emission rate based upon the adherence of BAT-AEL in comparison to existing ELV.

Table 3-11 presents the NGR location of the maximum 24-hour mean NOx GLC based upon those predicted maximum PCs presented in Table 3-8.

Table 3-11
Annual Mean SO_2 Critical Level – Analysis of Location of Max GLCs

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER1	x330833.8; y372241.6	x330833.8; y372241.6	x330833.8; y372241.6
ER2	x332340.7; y368746.7	x332340.7; y368746.7	x332340.7; y368746.7
ER3	x329713.1; y368403.3	x329713.1; y368403.3	x329713.1; y368403.3
ER4	x321579.4; y369899.2	x321579.4; y369899.2	x321579.4; y369899.2
ER5	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER6	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER7	x330166.9; y371014.5	x330166.9; y371014.5	x330166.9; y371014.5

As indicated in Table 3-11, the NGR location of the maximum GLC remains consistent and identical for the annual mean SO_2 PC between the considered Existing Operational Scenario (200ktpa) and the Permit Variation Scenario (232ktpa).

3.2.5 Critical Levels – 24-hour Mean HF

The results of the assessment of impacts on the 24-hour mean HF CLe are presented in Table 3-12 below.

Table 3-12
Impact on HF Critical Levels – 24-hour Mean

Receptor	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe	PC Max (µg/m³) (A)	PC Max as a % of the CLe
ER1	0.02	4.53	0.03	5.69	0.03	5.69	0.00	0.00
ER2	0.01	1.96	0.01	2.52	0.01	2.52	0.00	0.00
ER3	0.01	1.39	0.01	1.78	0.01	1.78	0.00	0.00
ER4	0.00	0.84	0.01	1.09	0.01	1.09	0.00	0.00
ER5	0.01	2.87	0.02	3.69	0.02	3.69	0.00	0.00
ER6	0.01	2.87	0.02	3.69	0.02	3.69	0.00	0.00
ER7	0.01	2.35	0.02	3.00	0.02	3.00	0.00	0.00

Note:
(A) Presented PC is based upon an average of the modelled 5-year dataset.
(B) Assessing against an annual mean NH_3 CLe of 20µg/m³.

Table 3-12 illustrates that the maximum 24-hour mean HF PC arising from the operation of the Permit Variation Scenario (232ktpa) does not exceed 10% of the 24-hour mean HF CLe at any considered ecological designation.

Following the stated 'EA's Operational Instruction 66_12'[13], impacts on the 24-hour mean HF CLe are considered to result in:

- '*no likely significant effects (alone and in-combination)*' at ecological receptors ER1 – ER5 (SAC / SPA designation); and
- '*no likely damage*' at ecological receptors ER6 and ER7 (SSSI designation).

Table 3-12 further indicates the Permit Variation Scenario (232ktpa) results in the same reduction in the maximum ground-level 24-hour mean HF PC in comparison to the Existing Operational Scenario (200ktpa). This is a function of the identical HF emission rate based upon the adherence of BAT-AEL in comparison to the existing ELV.

Table 3-13 presents the NGR location of the maximum 24-hour mean HF GLC based upon those predicted maximum PCs presented in Table 3-12.

Table 3-13
24-hour Mean HF Critical Level – Analysis of Location of Max GLCs

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER1	x330663.8; y372156.6	x330578.8; y372241.6	x330578.8; y372241.6
ER2	x330725.7; y369766.7	x330725.7; y369766.7	x330725.7; y369766.7

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER3	x328599.5; y364778.2	x328599.5; y364778.2	x328599.5; y364778.2
ER4	x321579.4; y369899.2	x321579.4; y369899.2	x321579.4; y369899.2
ER5	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER6	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER7	x330166.9; y371014.5	x330166.9; y371014.5	x330166.9; y371014.5

As indicated in Table 3-13, the NGR location of the maximum GLC remains consistent and identical for the 24-hour mean HF PC between the considered Existing Operational Scenario (200ktpa) and the Permit Variation Scenario (232ktpa).

3.2.6 Impacts on Critical Loads – Nutrient Nitrogen

The results of the assessment of impacts on the nutrient nitrogen CLo are presented in Table 3-14.

Table 3-14
Impact on Nutrient Nitrogen Critical Load

Site	Applied C_{Lo} (kg N/ha/yr)	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
		PC Max (kg N/ha/yr) (A)	PC Max as a % of CLo	PC Max (kg N/ha/yr) (A)	PC Max as a % of CLo	PC Max (kg N/ha/yr) (A)	PC Max as a % of CLo	PC Max (kg N/ha/yr) (A)	PC Max as a % of CLo
ER1	8	0.16	2.05	0.21	2.58	0.20	2.51	-0.01	-0.07
ER2	10	0.03	0.27	0.03	0.35	0.03	0.34	-<0.01	-0.01
ER3	10	0.01	0.11	0.01	0.14	0.01	0.14	-<0.01	-<0.01
ER4	10	0.01	0.07	0.01	0.09	0.01	0.09	-<0.01	-<0.01
ER5	8	0.11	1.44	0.15	1.84	0.14	1.79	-<0.01	-0.05
ER6	20	0.11	0.57	0.15	0.74	0.14	0.72	-<0.01	-0.02
ER7	10	0.04	0.40	0.05	0.51	0.05	0.49	-<0.01	-0.01

Note:
(A) Total PC includes contributions from NH_3 and NOx.

Table 3-14 illustrates that the PC to nutrient nitrogen arising from the operation of the Permit Variation Scenario (232ktpa) exceeds 1% of the applied nutrient nitrogen CLo at ecological receptors ER1 and ER5 (SAC / SPA) based upon the application of a CLo of 8kg N/ha/yr comparable to the 'Fixed coastal dunes with herbaceous vegetation ("grey dunes") (H2130)' site interest feature / 'Coastal stable dune grasslands - acid type' APIS relevant critical load class.

It is noted that the PC to nutrient nitrogen deposition exceeded 1% of the applied CLo at the ER1 receptor (Dee Estuary / Aber Dyfrdwy (England) (UK0030131) SPA / SAC) within the Atmospheric Dispersion Modelling completed in support of the Original Permitted Scenario (200ktpa) (see Appendix A). Therefore, impacts in excess of 1% of the applied nutrient nitrogen CLo have already been accepted. The Decision Document for the Parc Adfer ERF[14] states the following:

> *"The Applicant's Habitats assessment was reviewed by Natural Resources Wales technical specialists for air quality modelling and the conservation body in Wales, who agreed with the assessment's conclusions, that there would be no likely significant effect on the interest features of the protected sites.*
>
> *For all designated sites the impacts have screened out as being environmentally insignificant. In fact emissions are so low that they could be deemed as in-consequential."*

At all other ecological designations, the PC to nutrient nitrogen does not exceeds 1% of the applied nutrient nitrogen CLo. Therefore, following the stated 'EA's Operational Instruction 66_12'[13], impacts on the nutrient nitrogen CLo are considered to result in:

- '*no likely significant effects (alone and in-combination)*' at ecological receptors ER2 – ER5 (SAC / SPA designation); and
- '*no likely damage*' at ecological receptors ER6 and ER7 (SSSI designation).

Table 3-14 further indicates the Permit Variation Scenario (232ktpa) results in a reduction in the maximum ground-level annual mean PC to nutrient nitrogen in comparison to the Existing Operational Scenario (200ktpa). This is irrespective of the increase in tonnage, and as a result in the reduction in NOx emission rate based upon the adherence of BAT-AEL in comparison to existing ELV (the NH_3 emission rate remains the same). Therefore, the Permit Variation Scenario (232ktpa) results in betterment across predicted maximum annual mean PC to nutrient nitrogen in comparison to the Existing Operational Scenario (200ktpa) and, therefore, no assessment of PECs is undertaken.

Reference should be made to Appendix B for an isopleth contour plot illustrating the extent where the annual mean PC to nutrient nitrogen load is ≥0.08kg N/ha/yr (i.e. 1% of the worst-case applied CLo of 8kg N/ha/yr) for both the Existing Operational Scenario (200kpta) and Permit Variation Scenario (232kpta) (Figure B-4).

Table 3-15 presents the NGR location of the maximum annual mean PC to nutrient nitrogen load based upon those predicted maximum PCs presented in Table 3-14.

Table 3-15
Process Contribution to Nutrient Nitrogen Critical Load – Analysis of Location of Max GLCs

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER1	x330833.8; y372241.6	x330833.8; y372241.6	x330833.8; y372241.6
ER2	x332340.7; y368746.7	x332340.7; y368746.7	x332340.7; y368746.7

[14] Decision Document to Permit Reference: EPR/PP3733WW.

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER3	x329713.1; y368403.3	x329713.1; y368403.3	x329713.1; y368403.3
ER4	x321579.4; y369899.2	x321579.4; y369899.2	x321579.4; y369899.2
ER5	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER6	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER7	x330166.9; y371014.5	x330166.9; y371014.5	x330166.9; y371014.5

As indicated in Table 3-15, the NGR location of the maximum annual mean PC to nutrient nitrogen load remains consistent and identical between the considered Existing Operational Scenario (200ktpa) and the Permit Variation Scenario (232ktpa).

3.2.7 Impacts on Critical Loads – Acidification

The results of the assessment of impacts on the acid CLo are presented in Table 3-16.

The total current N load is greater than the CLminN at all considered ecological receptors. Therefore, the assessment of PC to acid deposition has been undertaken against the CLmaxN CLo.

Table 3-16
Impact on Acid Critical Load

Site	Applied C_{Lo} (kg $_{eq}$/ha/yr)	Original Permitted Scenario (200ktpa)		Existing Operational Scenario (200ktpa)		Permit Variation Scenario (232ktpa)		Permit Variation Scenario Change from Existing Operational Scenario	
		PC Max (kg $_{eq}$/ha/yr) (A)	PC Max as a % of CLo	PC Max (kg $_{eq}$/ha/yr) (A)	PC Max as a % of CLo	PC Max (kg $_{eq}$/ha/yr) (A)	PC Max as a % of CLo	PC Max (kg $_{eq}$/ha/yr) (A)	PC Max as a % of CLo
ER1	4.558	0.03	0.66	0.04	0.83	0.03	0.72	-0.01	-0.11
ER2	Sensitive to acidity but no Critical Load set	<0.01	-	0.01	-	0.01	-	<0.01	-
ER3	2.999	<0.01	0.07	<0.01	0.08	<0.01	0.07	<0.01	-0.01
ER4	4.323	<0.01	0.03	<0.01	0.04	<0.01	0.03	<0.01	-0.01
ER5	4.558	0.02	0.46	0.03	0.59	0.02	0.51	<0.01	-0.08
ER6	4.538	0.02	0.46	0.03	0.59	0.02	0.51	<0.01	-0.08
ER7	4.548	0.01	0.16	0.01	0.20	0.01	0.18	<0.01	-0.03

Note:
(A) Total PC includes contributions from NH_3, NOx, HCL and SO_2.

Table 3-16 illustrates that the PC to acidification arising from the operation of the Permit Variation Scenario (232ktpa) does not exceed 1% of the applied acid CLo at any considered ecological designation.

Following the stated 'EA's Operational Instruction 66_12'[13], impacts on the acid CLo are considered to result in:

- '*no likely significant effects (alone and in-combination)*' at ecological receptors ER1 – ER5 (SAC / SPA designation); and
- '*no likely damage*' at ecological receptors ER6 and ER7 (SSSI designation).

Table 3-16 further indicates the Permit Variation Scenario (232ktpa) results in a reduction in the maximum ground-level annual mean PC to acidification in comparison to the Existing Operational Scenario (200ktpa). This is irrespective of the increase in tonnage, and as a result in the reduction in NOx, HCl and SO_2 emission rates based upon the adherence of BAT-AEL in comparison to existing ELV (the NH_3 emission rate remains the same). Therefore, the Permit Variation Scenario (232ktpa) results in betterment across predicted maximum annual mean PC to acidification in comparison to the Existing Operational Scenario (200ktpa) and, therefore, no assessment of PECs is undertaken.

Table 3-17 presents the NGR location of the maximum annual mean PC to nutrient nitrogen load based upon those predicted maximum PCs presented in Table 3-15.

Table 3-17
Process Contribution to Acid Critical Load – Analysis of Location of Max GLCs

Receptor	Original Permitted Scenario (200ktpa) NGR (m)	Existing Operational Scenario (200ktpa) NGR (m)	Permit Variation Scenario (232ktpa) NGR (m)
ER1	x330833.8; y372241.6	x330833.8; y372241.6	x330833.8; y372241.6
ER2	x332340.7; y368746.7	x332340.7; y368746.7	x332340.7; y368746.7
ER3	x329713.1; y368403.3	x329713.1; y368403.3	x329713.1; y368403.3
ER4	x321579.4; y369899.2	x321579.4; y369899.2	x321579.4; y369899.2
ER5	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER6	x330751.3; y373063.4	x330751.3; y373063.4	x330751.3; y373063.4
ER7	x330166.9; y371014.5	x330166.9; y371014.5	x330166.9; y371014.5

As indicated in Table 3-17 the NGR location of the maximum annual mean PC to the acid load remains consistent and identical between the considered Existing Operational Scenario (200ktpa) and the Permit Variation Scenario (232ktpa).

4.0 SUMMARY AND CONCLUSIONS

This Atmospheric Dispersion Modelling / AERA has quantified and assessed the potential air quality impacts associated with combustion emissions from the Installation operating at the Permit Variation Scenario (232ktpa) and based upon the application of BAT-AELs prescribed within Implementing Decision 2019/2020[7] to the Waste Incineration BREF[8], using NRW approved techniques against published standards for the protection of human health and designated ecological sites.

The conclusions of the Atmospheric Dispersion Modelling / AERA are as follows:

- maximum ground level short-term PCs arising from the Permit Variation Scenario are <10% of the applied EAL for all considered pollutants / short-term averaging periods and, therefore, 'insignificant' in accordance with the AERA guidance. There are no predicted exceedences of any short-term standard. In comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs;
- maximum ground level long-term PCs arising from the Permit Variation Scenario of PM (assessed as PM_{10} and $PM_{2.5}$), HF, TOC (assessed as C_6H_6), Cd, Hg, Sb, Cr, Cr (VI), Cu, Pb, Mn, V and NH_3 are <1% of the applied EAL and, therefore, 'insignificant' in accordance with the AERA guidance. Annual mean PCs of NO_2, As and Ni are >1% of the applied EAL. However, in comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs;
- maximum ground-level PCs arising from the Permit Variation Scenario to the NOx CLe at ecological receptors ER2 – ER4 and ER7 result in '*no likely significant effects (alone and in-combination)'* (at SAC / SPA designations) and '*no likely damage*' (at SSSI designations). Maximum ground-level PCs arising from the Permit Variation Scenario to the NOx CLe are >1% of the NOx CLe at ecological receptors ER1, ER5 and ER6.
- result in 'no adverse effect' (at SAC / SPA) designations and 'no significant pollution' (at SSSI designations). However, in comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs;
- maximum ground-level PCs arising from the Permit Variation Scenario to the 24-hour mean NOx, annual mean NH_3, annual mean SO_2 and 24-hour mean HF CLes result in '*no likely significant effects (alone and in-combination)'* (at SAC / SPA designations) and '*no likely damage*' (at SSSI designations);
- maximum ground-level PCs arising from the Permit Variation Scenario to the nutrient nitrogen CLo are >1% of the applied 'Coastal stable dune grasslands - acid type' APIS relevant critical load class at ER1 and ER5. However, impacts for the existing operational site (200ktpa) are above 1% and were previously concluded by NRW to result in no significant effect. At all other ecological designations, the maximum ground-level PCs to the nutrient nitrogen CLo are <1% of the applied CLo and result in '*no likely significant effects (alone and in-combination)'* (at SAC / SPA designations) and '*no likely damage*' (at SSSI designations). Further, in comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs; and
- maximum ground-level PCs arising from the Permit Variation Scenario to the acid CLo result in '*no likely significant effects (alone and in-combination)'* (at SAC / SPA designations) and '*no likely damage*' (at SSSI designations). Further, in comparison to the Existing Operational Scenario, the Permit Variation Scenario results in a reduction in maximum PCs.

APPENDIX A

Extracts from 2014 Environmental Permit Application, Atmospheric Dispersion Modelling

Section 6: Prediction of Impacts

APPENDIX B

Isopleth Contour Plots

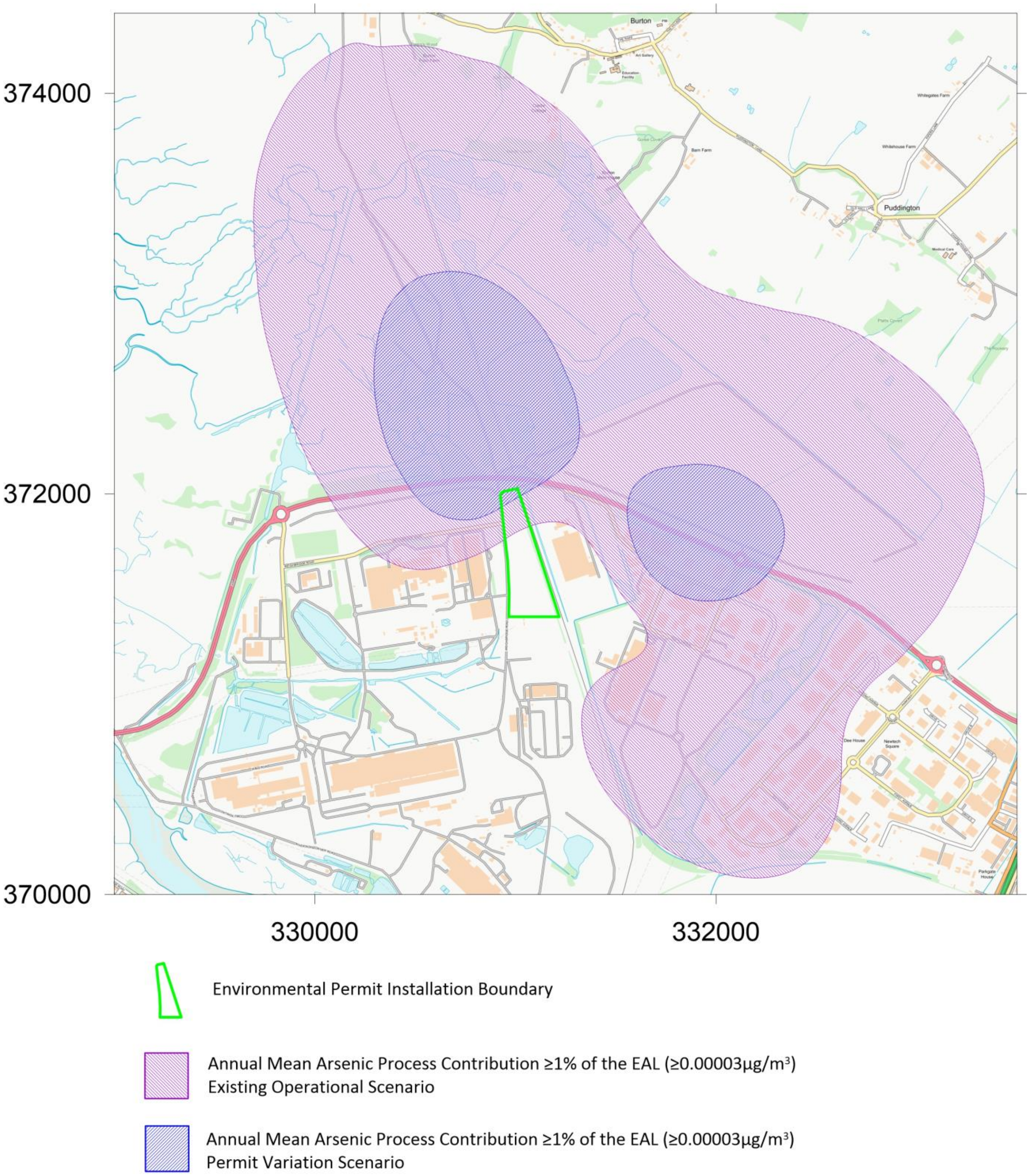
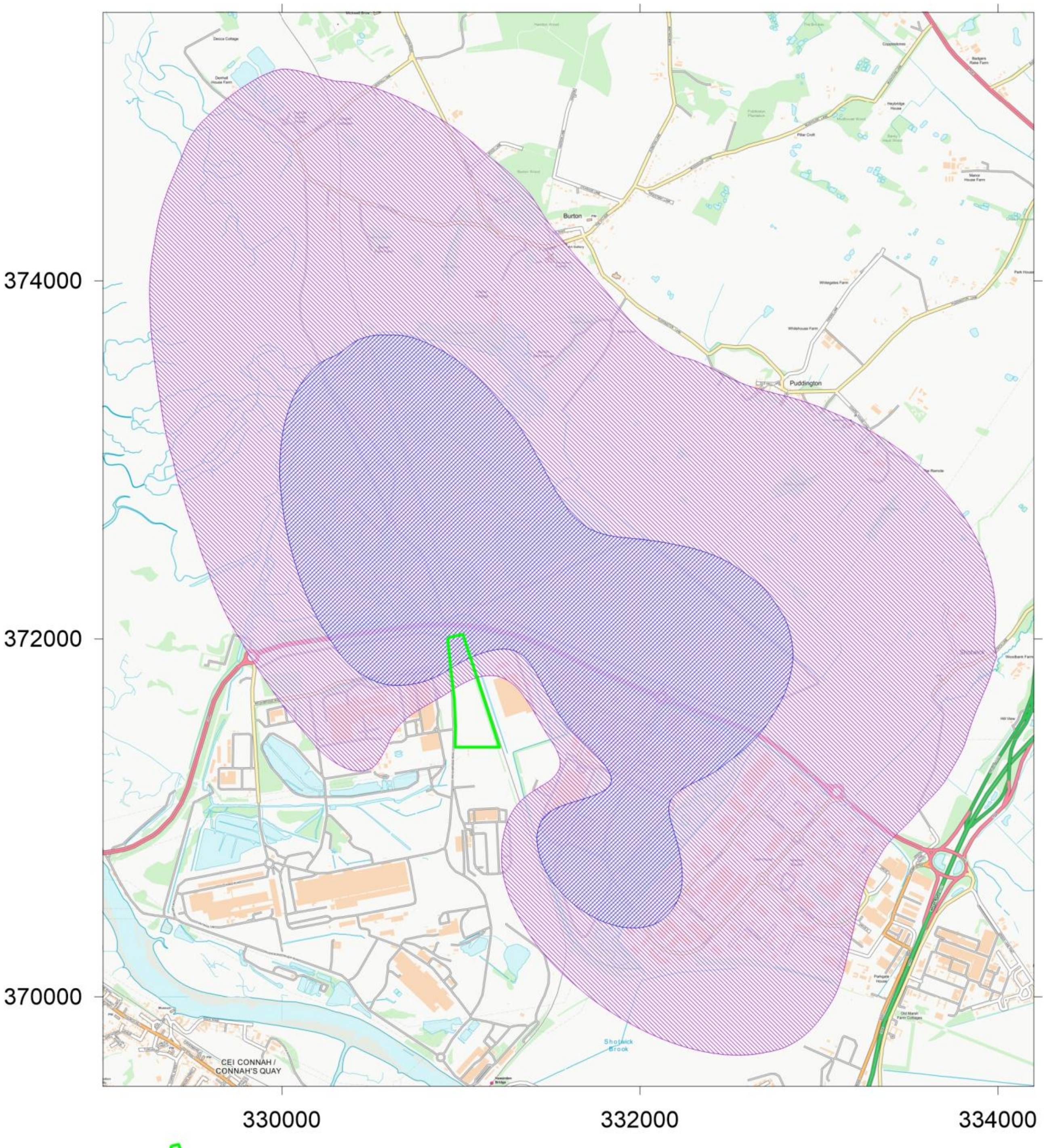


Figure B-1
Annual Mean As PC >1% of the EAL – Existing Operational Scenario Compared to Permit Variation Scenario



Environmental Permit Installation Boundary

Annual Mean Nickel Process Contribution ≥1% of the EAL (≥0.0002μg/m³)
Existing Operational Scenario

Annual Mean Nickel Process Contribution ≥1% of the EAL (≥0.0002μg/m³)
Permit Variation Scenario

Figure B-2
Annual Mean Ni PC >1% of the EAL – Existing Operational Scenario Compared to Permit Variation Scenario

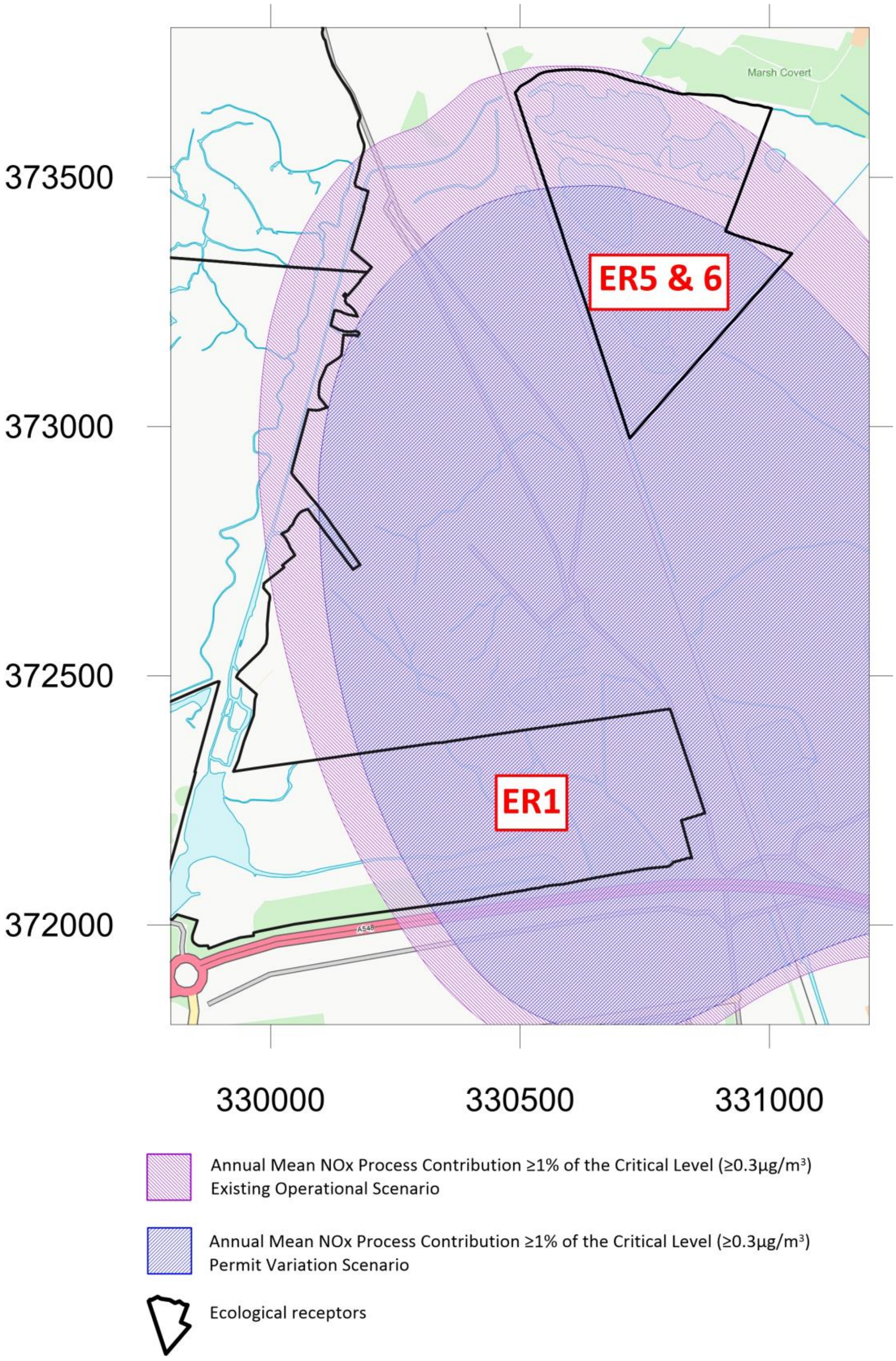


Figure B-3
Annual Mean NOx PC >1% of the CLe – Existing Operational Scenario Compared to Permit Variation Scenario

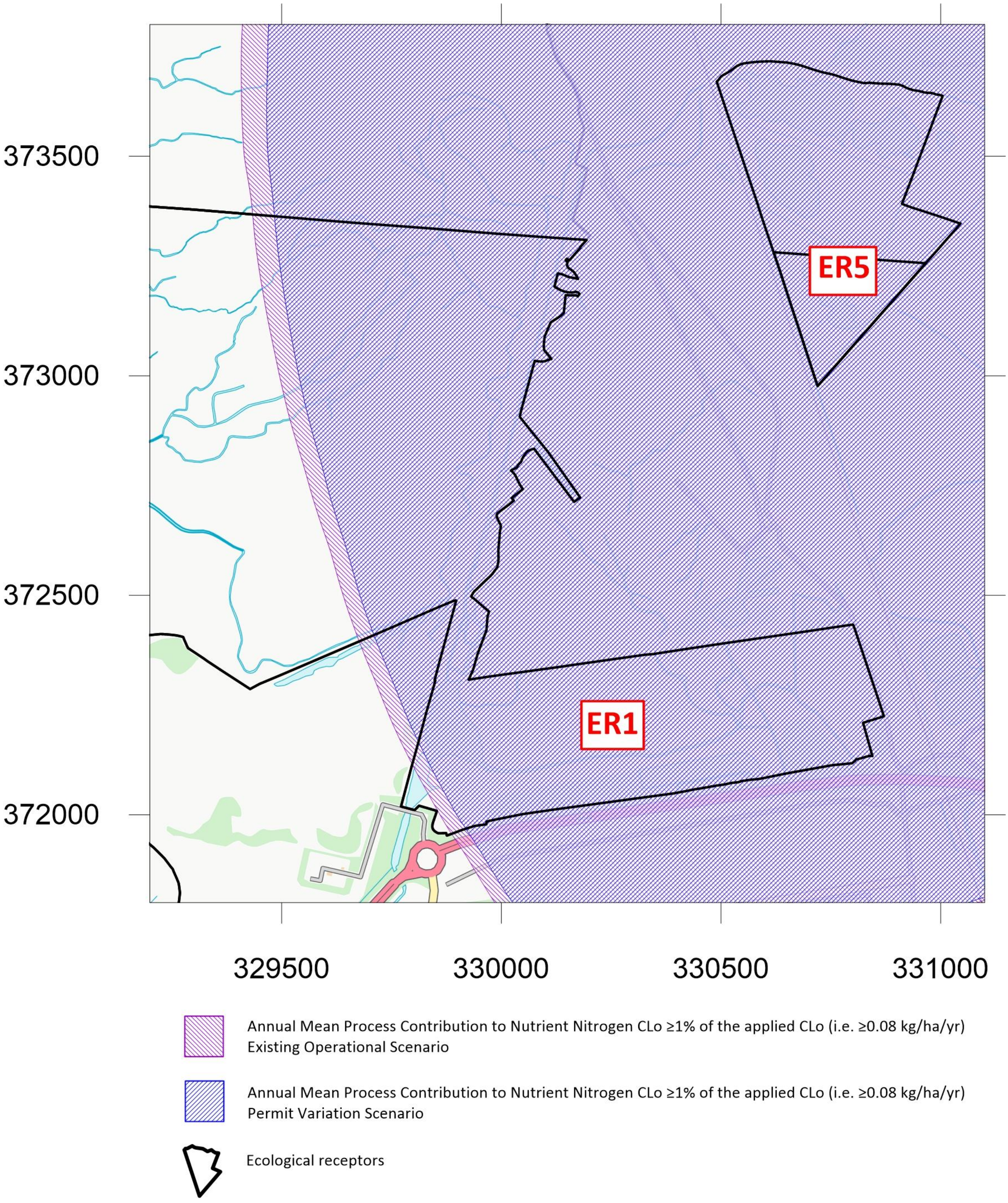


Figure B-4
Nutrient Nitrogen PC >1% of the Applied CLo – Existing Operational Scenario Compared to Permit Variation Scenario

APPENDIX C

Model files (electronic only)

EUROPEAN OFFICES

United Kingdom

AYLESBURY
T: +44 (0)1844 337380

BELFAST
T: +44 (0)28 9073 2493

BRADFORD-ON-AVON
T: +44 (0)1225 309400

BRISTOL
T: +44 (0)117 906 4280

CAMBRIDGE
T: + 44 (0)1223 813805

CARDIFF
T: +44 (0)29 2049 1010

CHELMSFORD
T: +44 (0)1245 392170

EDINBURGH
T: +44 (0)131 335 6830

EXETER
T: + 44 (0)1392 490152

GLASGOW
T: +44 (0)141 353 5037

GUILDFORD
T: +44 (0)1483 889800

LEEDS
T: +44 (0)113 258 0650

LONDON
T: +44 (0)203 691 5810

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE
T: +44 (0)191 261 1966

NOTTINGHAM
T: +44 (0)115 964 7280

SHEFFIELD
T: +44 (0)114 245 5153

SHREWSBURY
T: +44 (0)1743 23 9250

STAFFORD
T: +44 (0)1785 241755

STIRLING
T: +44 (0)1786 239900

WORCESTER
T: +44 (0)1905 751310

Ireland

DUBLIN
T: + 353 (0)1 296 4667

France

GRENOBLE
T: +33 (0)4 76 70 93 41