Permit ref: PAN-0055141/V002

Operator: Newbridge Energy Limited

Site Address: Blazers Fuels, Brick Lane, Denbigh Road, Ruthin, LL15 2TN

Environmental Permit Variation Application: Response to Request for Further Information

An application to vary the above Environmental Permit was submitted to NRW on 26.01.21 by Smith Grant LLP on behalf of Newbridge Energy Ltd.

A note was subsequently prepared by SGP[1] and submitted to NRW in response to an initial request for additional information / clarification received from NRW on 12.05.21.

Following a request for further information / clarification from NRW on 03.08.21[2] a further note was submitted by SGP[3]. At the time additional air quality assessment that had been requested was outstanding. This following note and supporting documentation now includes the additional information requested by NRW.

For clarification the points raised by NRW are summarised below and detail provided as to where responses can be found in the attached Supplementary Air Quality Assessment (AQA) report[4].

NRW Comments	Response
Provide us with requested emission limit values for the new plant and ensure the air emissions risk assessment is completed at requested emission limit values	Provided in the earlier response[3] and in the attached Supplementary AQA
Provide us with the modelling files for the detailed air dispersion modelling	To be provided separately in zipped folder
Present your modelling results as cumulative predicted impact results (scenarios B1 and B2) from the modelling rather than the difference between existing and proposed scenarios (B1–A1 and B2–A2)	Model has been re-run for both the original scenario (existing stacks) and the proposed revised scenario (existing and proposed stacks). However, all results are presented and discussed in the attached AQA in the context of the revised scenario alone (i.e. the combined emissions from the existing and proposed CHP biomass boiler plants stacks and the Stela dryer stacks) rather than changes that would come about from the proposed development.
If you continue to use the OEM NO_x emissions data as input for the model provide us with the O2 % the OEM NO_x emissions value of 350 mg/m^3 is stated at	Not applicable. Emissions data for the CHP boiler stacks based on the existing and proposed ELVs.
Provide us with a risk assessment of carbon monoxide (CO) and Total Volatile Organic Carbon (TVOC) emissions in line with the following guidance: Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk). This can be done either through H1 tool or if required detailed air dispersion modelling.	Detailed assessment of CO and TVOC included in attached AQA. ELVs have been based on the required ELVs for the existing biomass boiler stack.

[1] Smith Grant LLP, Permit ref: PAN-0055141/V002, Environmental Permit Variation Application, R2298E-N01-v3, 2nd July 2021
[2] Natural Resources Wales, Application ref: PAN-00514/V002, dated 03 August 2021
[3] Smith Grant LLP, Permit ref: PAN-0055141/V002, Environmental Permit Variation Application, R2298E-N02-v2, 16th August 2021
[4] Smith Grant LLP, Blazer Fuels, Ruthin, Supplementary Air Quality Assessment, R2298D-R07-v2, 15th September 2022

NRW Comments	Response
Please complete a comparison of pollutant concentrations for particulates PM2.5 against the correct Ambient Air Directive (AAD) Limit Value of 20 µg/m^3 as per the following guidance: Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk);	Included in the attached AQA.
Provide us with a National Grid Reference (NGR) for all stack locations included within the modelling	Full details included in the attached AQA.
Provide us with an assessment of impact of air emissions on local nature sites (ancient woods, local wildlife sites, national and local nature reserves) and sites of special scientific interest (SSSIs) within 2 km of the site	Full details included in the attached AQA.
For the two Special Areas of Conservation (SACs) within 10 km of your site (Llwyn SAC UK0030184 and Alyn Valley Woods SAC UK0030078), provide us with an in-combination assessment of the combined impact of all permissions, plans or project that affect each respective habitat site;	Full details included in the attached AQA.
Provide us with an assessment of acid deposition impact on Llwyn SAC. We have been advised the Llwyn SAC is sensitive to acidification and to use the following acid deposition critical load values in your assessment:	Full details included in the attached AQA.

Minimum acid critical load function (keq/ha/yr)	Maximum acid critical load function (keq/ha/yr)
MinCLminN: 0.142	MaxCLminN: 0.357
MinCLmaxN: 1.877	MaxCLmaxN: 3.723
MinCLmaxS: 1.729	MaxCLMaxS: 2.715

We trust this meets the requirements and provide the required additional information.

Prepared on behalf of Smith Grant LLP by:

Name:	**Signature:**	**Date:**
K. Hawkins, Partner		
BSc MSc MIAQM MEnvSci CEnv		15.09.21

APPENDIX A

Supplementary Air Quality Assessment

Contaminated Land
Air Quality
Environmental Audit

SMITH GRANT Environmental Consultancy LLP

Partnership No: OC 00776

ADDITIONAL CHP PLANT, BLAZER'S FUELS, BRICKFIELD LANE, RUTHIN

SUPPLEMENTARY AIR QUALITY ASSESSMENT

Environmental Permit Ref: PAN-005141

for: Newbridge Energy Ltd

September 2021

R2298D-R07-v2

Smith Grant LLP, Station House, Station Road, Ruabon, Wrexham, LL14 6DL
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Members: K E Hawkins (Chairman), A F Smith, D Wayland

DOCUMENT CONTROL SHEET

Report Title:	Additional CHP Plant, Blazer's Fuels, Ruthin, Denbighshire Supplementary Air Quality Assessment
Client:	Newbridge Energy Ltd
Report Reference Number:	R2298D-R07
Report Status:	Final
Version:	v2
Report Date:	September 2021

for: Smith Grant LLP

	Name	Position	Signature	Date
Drafted by	K Hawkins BSc MSc MIAQM CEnv	Partner		15.09.21
Checked	K Hawkins BSc MSc MIAQM CEnv	Partner		15.09.21

Document Revision Record:

Version	Report Status	Date	Details of Revision
v1	Draft	02.09.21	draft for client review
v2	Final	16.09.21	final for issue; minor typographical edits to draft

ADDITIONAL CHP PLANT, BLAZER'S FUELS, RUTHIN

SUPPLEMENTARY AIR QUALITY ASSESSMENT

For: Newbridge Energy Ltd

Contents

Appendices

1 Introduction

1.1 General

1.1.1 Newbridge Energy Limited (NEL) holds an Environmental Permit (PAN-005141) issued by Natural Resources Wales (NRW) under the Environmental Permitting (England and Wales) Regulations 2016, as amended ('EPR')[1]. The Permit allows the Operator, NEL, to operate *'one or more small waste incinerator plant that is also a Tranche B Specified Generator aggregated to <50MW$_{th}$'* at a site at Brickfield Lane, Ruthin, Denbighshire.

1.1.2 An application has been submitted by Smith Grant LLP to NRW, on behalf of NEL, to vary the Environmental Permit to operate a second Tranche B Generator / Medium Combustion Plant at the site[2]. The variation application was supported by a Supporting Information Document[3] which included a detailed Air Quality Assessment (AQA)[4] and an associated addendum[5] that had been prepared by SGP in relation to the proposed additional facility.

1.1.3 The AQA (and Addendum) incorporated atmospheric dispersion modelling of the existing and proposed new CHP plant stack emissions and incorporated consideration of potential impacts at human health and ecological receptors in the area.

1.1.4 A Request for Further Information was received from NRW in relation to the submitted application[6]. This following report has been prepared by SGP in response to the request for further information specifically in relation to the submitted AQA (and Addendum) and dispersion modelling. It supplements an earlier provided response prepared by SGP providing other information requested by NRW[7].

1.2 Scope and Objectives of the Report

1.2.1 The following report specifically deals with the points raised by NRW in relation to Detailed Dispersion Modelling as follows:

- *provide us with requested emission limit values for the new plant and ensure the air emissions risk assessment is completed at requested emission limit values;*
- *provide us with the modelling files for the detailed air dispersion modelling;*
- *present your modelling results as cumulative predicted impact results (scenarios B1 and B2) from the modelling rather than the difference between existing and proposed scenarios (B1–A1 and B2–A2);*

[1] Natural Resources Wales, Environmental Permit, ref: PAN-005141, granted 17th December 2019
[2] Application submitted to Natural Resources Wales on 25.01.21
[3] Smith Grant LLP, CHP Plant, Blazer's Fuels, Ruthin: Environmental Permit Variation Application Supporting Information Document, R2298E-R03-v1, January 2021
[4] Smith Grant LLP, Additional Wood Drying and Associated CHP Plant, Blazer's Fuels, Ruthin, Air Quality Assessment, R2298D-R02-v4, July 2018
[5] Smith Grant LLP, Additional Wood Drying and Associated CHP Plant, Blazer's Fuels, Ruthin, Air Quality Assessment: Addendum, R2298D-R06-v1, February 2020 *(supercedes previous submitted addendums collating all information for the variation application)*
[6] Natural Resources Wales, Application ref: PAN-00514/V002, dated 03 August 2021
[7] Smith Grant LLP, Application ref: PAN-00514/V002, ref: R2298E-N02-v2, dated 16.08.21

- *If you continue to use the OEM NO_x emissions data as input for the model provide us with the O2 % the OEM NO_x emissions value of 350 mg/m^3 is stated at;*
- *provide us with a risk assessment of carbon monoxide (CO) and Total Volatile Organic Carbon (TVOC) emissions in line with the following guidance: Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk). This can be done either through H1 tool or if required detailed air dispersion modelling.*
- *please complete a comparison of pollutant concentrations for particulates PM2.5 against the correct Ambient Air Directive (AAD) Limit Value of 20 µg/m^3 as per the following guidance: Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk);*
- *provide us with a National Grid Reference (NGR) for all stack locations included within the modelling;*
- *provide us with an assessment of impact of air emissions on local nature sites (ancient woods, local wildlife sites, national and local nature reserves) and sites of special scientific interest (SSSIs) within 2 km of the site;*
- *for the two Special Areas of Conservation (SACs) within 10 km of your site (Llwyn SAC UK0030184 and Alyn Valley Woods SAC UK0030078), provide us with an in-combination assessment of the combined impact of all permissions, plans or project that affect each respective habitat site;*
- *provide us with an assessment of acid deposition impact on Llwyn SAC. We have been advised the Llwyn SAC is sensitive to acidification and to use the following acid deposition critical load values in your assessment:*

Minimum acid critical load function (keq/ha/yr)	***Maximum acid critical load function (keq/ha/yr)***
MinCLminN: 0.142	*MaxCLminN: 0.357*
MinCLmaxN: 1.877	*MaxCLmaxN: 3.723*
MinCLmaxS: 1.729	*MaxCLMaxS: 2.715*

1.2.2 The original AQA (referred to in this following report as the '2018 AQA') was based on predicted stack emission concentrations and rates based on the manufacturers data (OEM data) and stack monitoring results. As requested by NRW this following report presents a comprehensive supplementary air quality assessment based on the proposed emission limit values for the stacks.

1.2.3 The methodology follows the framework described in Defra / Environment Agency (EA) Air Emissions Environmental Risk Assessment Guidance for environmental permitting facilities[8].

1.2.4 The report describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect impacts of the development

[8]Defra / Environment Agency, https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit, issued 1st February 2016, last updated 7th October 2020

arising from aerial emissions, and the mitigation measures required to prevent, reduce or offset the impacts.

1.2.5 SGP is an environmental consultancy specialising in air quality assessments, particularly in association with emissions from industrial facilities. The report reviewer, Katrina Hawkins, Partner, is a Member of the Institute of Air Quality Management (IAQM).

2 Air Quality Standards

2.1 Ambient air quality standards in the UK have been established in the UK through the combination of transposition of European legislation and additional UK legislation and requirements. A series of Limit and Target Values have been established through the European legislation on the UK as a whole (referred to as AAD values) and responsibility for meeting these is devolved to the national administrations; the Department for Environment, Food and Rural Affairs (Defra) co-ordinates assessment and air quality plans for the UK as a whole.

2.2 The Air Quality Strategy 2007 includes targets and objectives (referred to as AQOs) for the UK for specified pollutants deemed to pose a risk for human health or other receptors and to ensure that international commitments are met. The objectives are a statement of policy intentions or targets. There is no legal requirement to meet these objectives except in so far as these mirror equivalent legally binding limit values in EU legislation. Standards are also imposed on the UK through the Air Quality (Standards) Regulations 2010 which implement the 2008 EU ambient air quality objective. AQOs are included for PM_{10}, NO_x, NO_2, SO_2 and the VOCs benzene and 1,3-butadiene. Following the departure of the UK from the EU the air pollution limits established under EU requirements remain in place having been enshrined in UK law.

2.3 In addition, Part IV of the Environment Act 1995 imposes a duty on local authorities in the UK to review existing and projected air quality in their area. Any location likely to exceed established UK Air Quality Objectives (AQOs) must be declared an Air Quality Management Area (AQMA) and an Action Plan prepared and implemented, with the aim of achieving the objectives. This process is referred to as Local Air Quality Management (LAQM). The LAQM process is supported by national statutory policy[9], which is published by each country within the UK separately, and technical guidance[10] provided by Defra at a UK level.

2.4 The applicable EU limit and target values and UK AQOs relevant to the site and proposed development with regards to protection of human health, referred to in this report as Environmental Quality Standards (EALs), are summarised in Table 2.1. below.

[9] Defra, Local Air Quality Management, Policy Guidance (PG(W)17), June 2017
[10] Defra, Local Air Quality Management, Technical Guidance (TG16), April 2021

Table 2.1: Relevant Air Quality Assessment Levels (AQALs)[1]

Pollutant	AQAL	Averaging Period	Source
Nitrogen dioxide (NO_2)	40 µg/m^3	annual mean	AAD Limit Value / AQO
	200 µg/m^3	hourly mean, not to be exceeded more than 18 times per annum	AAD Limit Value / AQO
Particulates (PM_{10})	40 µg/m^3	annual mean	AAD Limit Value / AQO
	50 µg/m^3	24 hour mean, not to be exceeded more than 35 times per annum	AAD Limit Value / AQO
Particulates ($PM_{2.5}$)	25 µg/m^3	annual mean	AAD Limit Value / AQO
	20 µg/m^3 (AEI)	3 year average	AAD Limit Value
Caron monoxide (CO)	10 mg/m^3	maximum daily running 8-hour mean	AAD Limit value / AQO
Benzene	5 µg/m^3	annual mean	AAD Limit Value / AQO
1,3-butadiene	2.25 µg/m3	running annual mean	AQO

1: as detailed in EA guidance https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions

1.3 For the purposes of the EALs ambient air refers to the outdoor air and excludes workplaces where members of the pubic do not have regular access. Advice is given in Defra guidance[5] as to where the UK AQOs should apply as summarised below; slightly different compliance requirements are provided for EU limit and target values:

Table 2.2: Summary of where the AQOs should apply

averaging period	objective should apply at
annual mean	all locations where members of the public might be regularly exposed; including facades of residential properties, schools, hospitals, care homes etc
24-hour mean and 8-hr mean	all locations where the annual mean objectives apply together with hotels and gardens of residential properties
1-hr mean	all locations where the annual mean, 24-hour and 8-hour means apply; also kerbside sites, parts of car parks, bus stations and railway stations which are not fully enclosed and any outdoor locations where members of the public might reasonably be expected to spend 1 hour or longer.
15-min mean	all locations where members of the public may be reasonably exposed for a period of 15 minutes

Note: the AQOs do not apply at building facades or other places of work where members of the public do not have regular access

1.4 Additional statutory and non-statutory ambient air quality standards (termed Critical Levels) are also provided by the UK Air Quality Strategy and NRW / EA guidance for the protection of vegetation and ecosystems to be applied at nature conservation sites. Applicable standards for this assessment are detailed below:

Table 2.3: Additional Non-Statutory Critical Levels for Protection of Vegetation and Ecosystems

Pollutant	Concentration (µg/m^3)	Measured as
nitrogen oxides (as NO_2)	30	annual mean
	75 / 200[1]	daily mean

1: The Critical Level is generally considered to be 75 µg/m^3, but this only applies where there are high concentrations of SO_2 and this is not generally the situation in the UK.

1.5 Additional standards, termed Critical Loads, are also established in relation to nitrogen and acid deposition. These are habitat specific and discussed further in Section 8 where relevant.

3 Assessment Methodology

3.1 Methodology

3.1.1 In undertaking the air quality assessment SGP has carried out the following activities:

- review of development proposals, including current and proposed operations;
- review of baseline air quality, DCC air quality reports and monitoring data;
- review of appropriate meteorological data including local wind speed and direction statistics;
- review of technical information relating to existing and proposed process emissions, specifically NO_x / NO_2, PM_{10} / $PM_{2.5}$, Total VOCs and CO;
- modelling of stack emissions, specifically NO_x / NO_2, PM_{10} / $PM_{2.5}$, Total VOCs and CO using the ADMS atmospheric dispersion model;
- qualitative assessment of stack emission impacts on human health and ecological receptors;
- provision of recommendations for mitigation where necessary.

3.1.2 The baseline data has mainly been gathered through a desk top study and site visit to the area. No additional survey or field work has been undertaken as part of this assessment. In undertaking the assessment reference has been made to the following principal sources of information:

Table 3.1: Information Sources

Reference and Data	Author and Source	Purpose and Information Content
background and topographical information		
Promap	Ordnance Survey (OS) and aerial photography	general mapping information including topography, ground features, rights of way, communications etc
Google Earth (imagery date 2016)	aerial photography	site setting
www.magic.gov.uk	multi-agency	web-based interactive map containing information on nature conservation areas
air quality information		
North Wales Authorities Collaborative Project, 2020 Air Quality Progress Report, November 2020 *(and earlier reports)*	Wood.	update of local authority air quality monitoring and assessment across North Wales up to the end of 2019
www.uk-air.defra.gov.uk/aqma	Defra	details and maps of AQMAs throughout UK

Reference and Data	Author and Source	Purpose and Information Content
www.laqm.defra.gov.uk	Defra	Local Authority air quality management support; background pollutant mapping

All websites accessed in July and August 2021

3.1.3 In addition, reference has been made to the current and proposed layout plans and existing emissions monitoring data (provided in Appendix A) for the existing CHP and dryer stacks.

3.1.4 A site visit was undertaken by K. Hawkins, Partner and D. Lloyd, Associate on 9th June 2018 to obtain overview information on the current site operations to inform the original 2018 AQA. Subsequent visits to the Site were undertaken by K Hawkins in 2019.

3.2 Stack Emissions Assessment

3.2.1 The potential impacts of emissions from the stacks associated with the CHP plant on nearby receptors have been assessed using atmospheric dispersion modelling. The modelling has been undertaken using ADMS 5 supplied by Cambridge Environmental Research Consultants (CERC). The derivation of emission rates and modelling methodology are detailed in Section 6.

3.2.2 The model outputs have been compared to the relevant EALs as described in Section 2. Detailed assessment has been undertaken in accordance with the EA guidance[2] in relation to environmental permitting and air quality.

3.2.3 Technical details of the processes and combustion emissions were provided by NEL and the technology providers, Uniconfort and Stela, and have been incorporated as necessary in the description of the proposed development.

3.3 Identification of Receptors

3.3.1 The assessment has predicted air quality impacts upon a range of representative receptors. In identifying potential receptors to be considered in the assessment reference has been made to NRW / EA guidance. Potential receptors have been considered on the followed basis:

Table 3.2: Receptor Selection Principles

Human Health Receptors	
Houses / groups of houses Schools, hospitals, shops, factories Public rights of way, recreational areas Allotments	identified based on distance from site boundaries, operational areas and haulage distances, sensitivity and likely duration of exposure
Conservation sites	
SPAs, SACs and RAMSAR sites	within 10km of site boundaries
SSSIs	within 2km of site boundaries
National Nature Reserves and Local Nature Reserves	

3.4 Significance Evaluation Methodology

3.4.1 The severity of impacts and significance of potential air quality effects on human health receptors have been assessed through reference to the EA guidance[2] with regards to air quality and environmental permitting. The EA guidance advises that a process contribution (PC) can be seen as *insignificant* where:

- the long-term PC is less than 1% of the long-term EAL;
- the short-term PC is less than 10% of the short-term EAL.

3.4.2 If both these criteria are met for a substance no further assessment of that substance is required.

3.4.3 Where these screening criteria are exceeded then further assessment is required involving calculation of the resulting Predicted Environmental Concentration (PEC) taking into account the background concentrations. For short term concentrations it is assumed the short-term background concentration is twice the long-term background concentrations

3.4.4 The EA guidance provides an intermediary step to ascertain whether detailed modelling is required. Where the following are met no further assessment is required:

- Short-term PC is less than 20% of the short-term EAL minus twice the long-term background concentration;
- Long-term PEC is less than 70% of the long-term EAL.

3.4.5 Where detailed modelling is caried out this step is effectively not required.

3.4.6 Where detailed modelling is carried out, no further action is required if the resulting PECs do not exceed the EALs.

3.5 Significance Evaluation Methodology – Ecological Receptors

3.5.1 The impact assessment terminology varies depending on the protection status of the nature conservation sites.

3.5.2 For European sites an assessment is made as to whether the proposed development is '*likely to have a significant effect*', and whether this could lead to an '*adverse effect on site integrity'*. For SSSIs the assessment needs to determine whether the proposed development is '*likely to damage'* the site. For all other nature conservation sites the assessment needs to determine whether the proposed developed would result in '*significant pollution'*.

3.5.3 The guidance provides the following screening ('de minimis') thresholds with regards to nature conservation sites and pollutant contributions to indicate whether impacts may have likely significant effects and the need for further detailed assessment:

Table 3.3: Screening ('Simple') Assessment Criteria for Nature Conservation Receptors

European Sites and SSSIs
$PC_{long\text{-}term}$ is *insignificant* where less than 1% of relevant Critical Level / Load
$PC_{short\text{-}term}$ is *insignificant* where less than 10% of relevant Critical Level / Load
$PEC_{long\text{-}term}$ will result in *no likely significant effect* (European sites) / *no likely damage* (SSSIs) where less than 70% of relevant Critical Level / Load
Local Nature Sites (NNRs, LNRs, LWSs and Ancient Woodland)
$PC_{long\text{-}term}$ is *insignificant* where less than 100% of relevant Critical Level / Load / will result in *no potential pollution*
$PC_{short\text{-}term}$ is *insignificant* where less than 100% of relevant Critical Level / Load / will result in *no potential pollution*

PC = Process Contribution; PEC = Predicted Environmental Concentration

3.5.4 Where the $PC_{long\text{-}term}$ and $PC_{short\text{-}term}$ are less than the screening thresholds, they are considered *insignificant* and no further assessment is necessary as detailed in internal EA guidance[11, 12]. For European sites and SSSIs where necessary further assessment is undertaken considering background concentrations. Where the resulting $PEC_{long\text{-}term}$ is less than 70% of the relevant Critical Level / Load then it can be concluded there is *no likely significant effect* / *no likely damage*. This is intended to be a trigger threshold for requiring atmospheric dispersion modelling and it is not intended to be a damage threshold.

3.5.5 Exceedance of 70% of the Critical Level / Load does not therefore infer that a significant effect / damage is likely, but that further detailed assessment, including modelling, may be necessary[13, 14]. This internal guidance is primarily aimed at undertaking 'appropriate assessments' as required under the Habitats Directive, but the principals are also applied to other designated nature conservation sites under the Environmental Permitting regime.

3.5.6 Current guidance[1] is that the screening thresholds above apply both 'alone' and 'in-combination' (also termed 'cumulative') in relation to assessments of potential impacts on European sites, where 'in-combination' refers to other plans and projects that many be undergoing development or planned in the area. Hence, it may be that although a project considered 'alone' may result in PCs less than the relevant screening threshold, in-combination with other projects the resulting combined PCs may be more than the screening threshold and further assessment is required. At present there are no agreed lower thresholds, such as levels that would result in *no appreciable effect*, that can be used to rule out the need for an in-combination assessment.

[11] Environment Agency: 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 08/05/12*
[12] AQTAG 21, Environment Agency, 'Likely significant effect' use of 1% and 4% long-term thresholds and 10% short-term threshold
[13] AQTAQ 06, Environment Agency, Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air, 20/04/10, version 10
[14] Environment Agency: Operational Instruction 67_12 '*Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation', issued 01/03/12*

3.5.7 It is also noted that previous EA advice[15] has been *'Experience of permitting allows us to be confident that it is unlikely that a substantial number of plans or projects will occur in the same area at the same time, such that their in-combination impact would give rise to concern at the appropriate assessment stage. If such a situation was to arise then the assessment could be determined on a case by case basis.'*

[15] EA, AQTAG21, 'Likely significant effect' – use of 1% and 4% long-term thresholds ad 10% short-term threshold, draft 27.03.15

4 Site Location, Current and Proposed Development

4.1 Site Details

4.1.1 The Site is located in a mixed-use area on the north-western outskirts of Ruthin as shown below in Figure 4.1. Access to the facility is gained via Lon Cae Brics / Brickfields Lane to the north off the A525 Lon Gwernydd 260m to the west.

4.1.2 Summary site details are:

Table 4.1: Site Details

Address	Blazer's Fuels
National Grid Reference	311600, 359000
Local Authority	Denbighshire County Council (DCC)
Nature of Current Site	Manufacture of wood pellets and fuel
Proposed Development	Installation of additional CHP plant and drying plant

Figure 4.1: Site Location

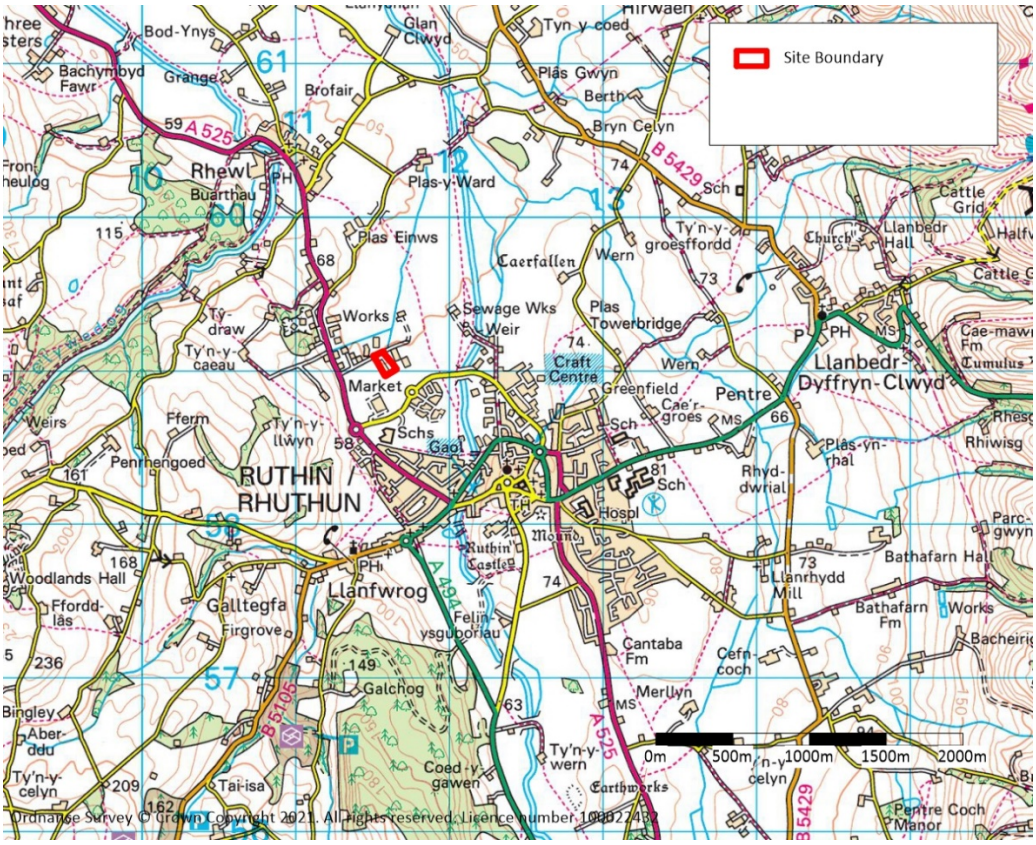
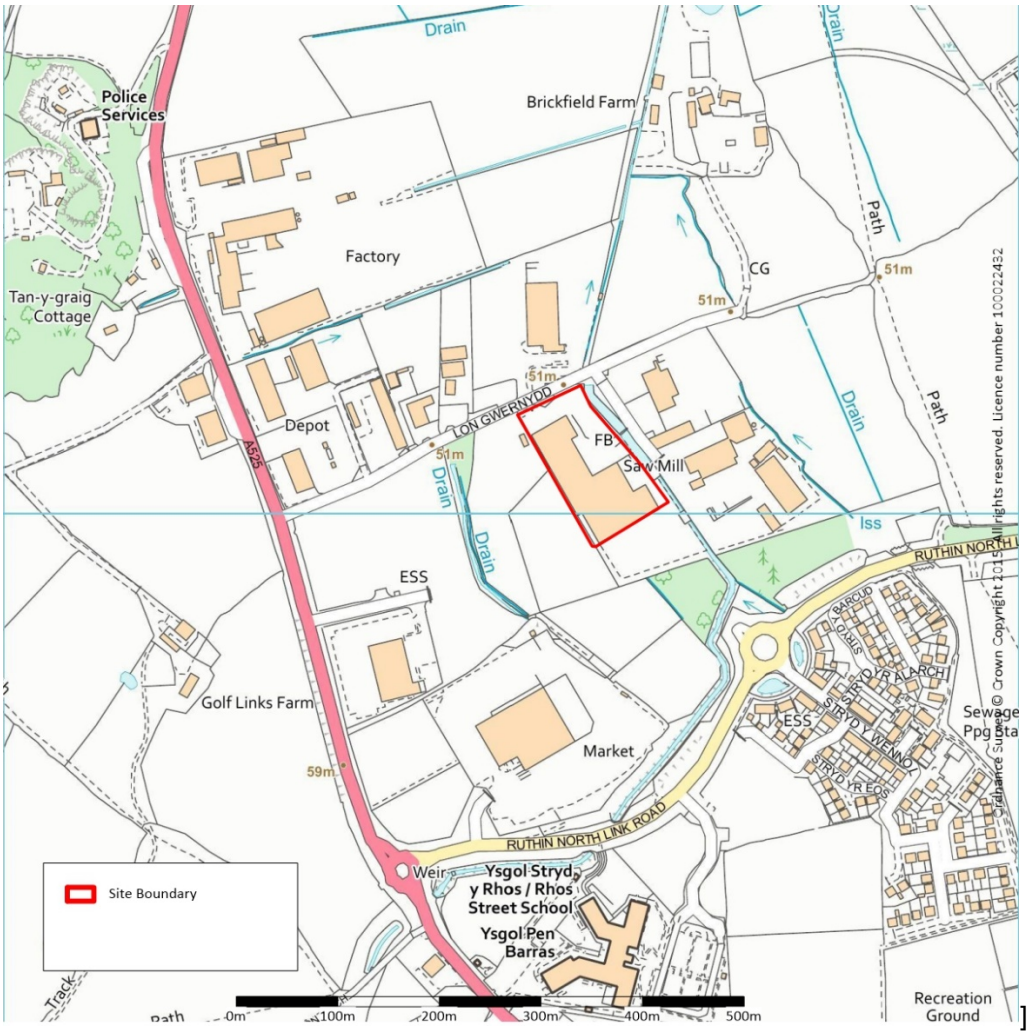


Figure 4.2: Site Location



4.2 Existing Development

4.2.1 The existing facility on site includes a solid biomass CHP plant (a Uniconfort Boiler) and a woodchip dryer (Stela Dryer). The CHP plant is utilised to provide heat to dry woodchip to a desired moisture content in the Stela belt dryer prior to processing into wood pellets or briquettes. The CHP plant was installed in 2017 and replaced a previous boiler used on site. The CHP plant is served by a single main stack of 20m, which replaced the previous boiler stack.

4.2.2 The CHP plant was originally served by a Stela dryer that was located externally to the main building and provided with 2 stacks of 8m. The dryer and stacks have since been relocated to within the southwest corner of the building and the stacks raised to 12m above ground level (relocated under planning permission 02/2015/1095/PF).

4.2.3 The buildings are also served by a number of other small emergency vent chimneys as marked on the As Existing Site Plan (R. Arwel Davies, 2018/02/AE1/e, 18th March 2018).

4.3 Proposed Development

4.3.1 The proposals are for the installation of additional wood drying equipment and CHP plant to augment the existing operations. The details of relevance to this Supplementary AQA are as follows:

- installation of a new (second) Stela dryer in the southwest corner of the existing building; to include two new stacks to a height of 12m above ground level;
- installation of additional CHP plant with one main stack to a height of 20m above ground level and two emergency stacks.

4.3.2 The additional facility would be the same as the CHP plant and Stela dryers installed in 2017. The additions would have a thermal input capacity of 5.2MW_{th} and electrical output of 1 MW_e; all the thermal energy will be utilised within the manufacturing process along with ~300KW of electrical energy. The remainder will be available for export to the grid. The total thermal input capacity of the plant would therefore be 10.4MW_{th} and electrical output of 2MW_e.

4.3.3 The additional CHP plant, Stela dryer and associated infrastructure have all now been installed.

4.4 Environmental Permit

4.4.1 The existing plant utilises a combination of virgin woodchip and some clean untreated wood waste from an aboricultural source. Due to the use of clean untreated wood waste within an individual unit input capacity of ≥1 MW_{th} but less than 3 tonnes per hour (~13.33 MW_{th} input) the plant forms a SWIP under Schedule 1, Part 2, Chapter 5, Section 5.1 Part B(a)(v). The plant is used for the purposes of generation of electricity and heat and is also a Specified Generator under Schedule 25B of the EPR and a Medium Combustion Plant (MCP) as defined in Schedule 25(A). 1.2.5 As the plant was an existing MCP on the basis it was operational before 20th December 2018 it has been permitted as a Tranche B Specified Generator. The operation was granted an Environmental Permit (PAN-005141) on 17th December 2019[1.]. The Permit allows the Operator, NEL, to operate *'one or more small waste incinerator plant that is also a Tranche B Specified Generator aggregated to <50MW_{th}'* at a site at Brickfield Lane, Ruthin, Denbighshire.

4.4.2 The proposed second Uniconfort Boiler unit at the site will have the same input capacity of 5.2MW_{th} and electrical output of MW_e as the existing plant and be served by a single 20m exhaust stack. The total combined rated thermal input capacity at the site would therefore be 10.4MW_{th} with a combined electrical output of 2MWe. The plant will utilise the same virgin wood chip as the existing plant. It is not proposed to use the clean untreated waste wood in this second plant; this material will continue to be used in the current installed plant. It would remain that no more than 125 tonnes of waste wood would be stored on site at any one time.

4.4.3 As detailed in the application supporting documentation[3] the variation application therefore relates to the proposed operation of a second Generator as defined in Schedule 25B of the EPR

and a Medium Combustion Plant (MCP) as defined in Schedule 25A of the EPR. The total combined rated thermal input capacity of the resulting Specified Generator would remain less than 50 megawatts.

5 Site Setting and Baseline Conditions

5.1.1 The site is located in a mixed-use area on the north-western outskirts of Ruthin. The adjacent commercial premises to the east are used by Clifford Jones Timber Ltd. Further commercial / industrial premises are located on land to the north and northeast whilst the immediate surrounds to the west and south consist of undeveloped land.

5.1.2 Site boundaries and immediate environs are:

Table 5.1: Site Boundaries and Environs

Direction	Boundary	Neighbouring Land
north	fencing	Brickfields Lane
east	fencing / trees	Clifford Jones Timber Ltd
south	Fencing	timber storage
west	fencing / hedgerow	field

5.1.3 The premises of the Ruthin Livestock Market are located 110m to the southwest. The closest residential development is located about 175m to the southeast beyond the Ruthin North Link Road. The buildings of a relatively recently constructed school (Ysgol Stryd y Rhos and Ysgol Pen Barras) extend to about 350m to the south.

5.1.4 No public footpaths are shown on OS mapping in the immediate vicinity of the Site, the closest being about 270m to the east.

5.1.5 The site setting effectively remains as assessed in the original 2018 AQA. At the time of the AQA the school to the south had been constructed, and was considered in the assessment, but was not shown on OS mapping.

5.2 Nature Conservation Sites

5.2.1 EA guidance for environmental permitting requires consideration of any international statutory designated sites (such as SPAs, SACs and Ramsar sites) within 10km of an installation and national or local statutory designated sites (such as SSSIs and local nature sites (ancient woods, local wildlife sites, and national and local nature reserves)) within 2km.

5.2.2 The following nature conservation sites have been identified within the appropriate screening radii:

Table 5.2: Nature Conservation Sites

Name	Designation[1]	Distance and Orientation from Site Boundary[2]
International Sites within 10km[3]		
Llwyn	SAC	8.8km NW

Name	Designation[1]	Distance and Orientation from Site Boundary[2]
Alyn Valley Wood	SAC	7.5km NE
National or Local Sites within 2km[3]		
SSSIs		
none		
Other National / Local Sites		
Coed Orllwyn (Lady Bagot's Woods)	LWS	1.1km NW
unnamed	Ancient Woodlands	*several identified by NRW within 2km of site; locations not provided by NRW; possible locations derived from Forestry Commission and NRW (http://lle.gov.uk) information; closest lies 400m to NW*

1: SAC – Special Area of Conservation; LWS – Local Wildlife Site

2: Distance & orientation of nearest point of nature conservation site to Site boundary

3: Based on information obtained from MAGIC (www.magic.defra.gov.uk) and provided by NRW

5.2.3 The site location in relation to these nature conservation sites are shown below in Figures 5.1 and 5.2.

Figure 5.1: International Designated Nature Conservation Sites within 10km

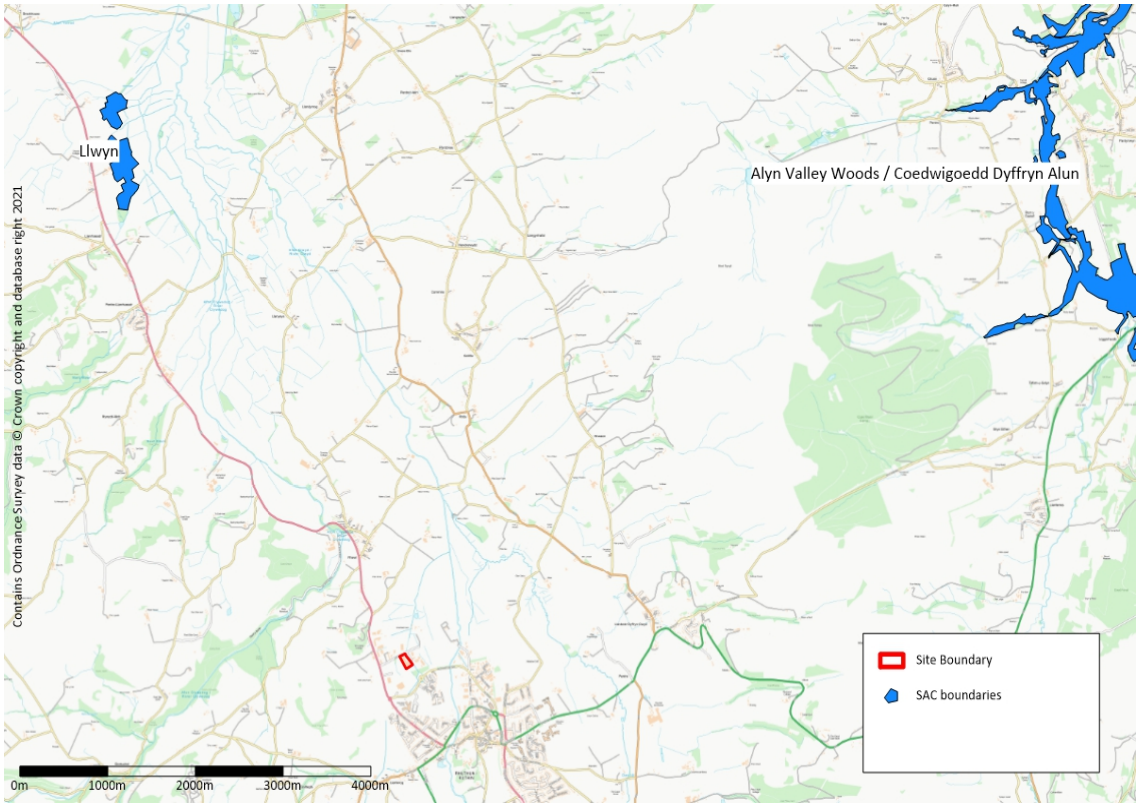
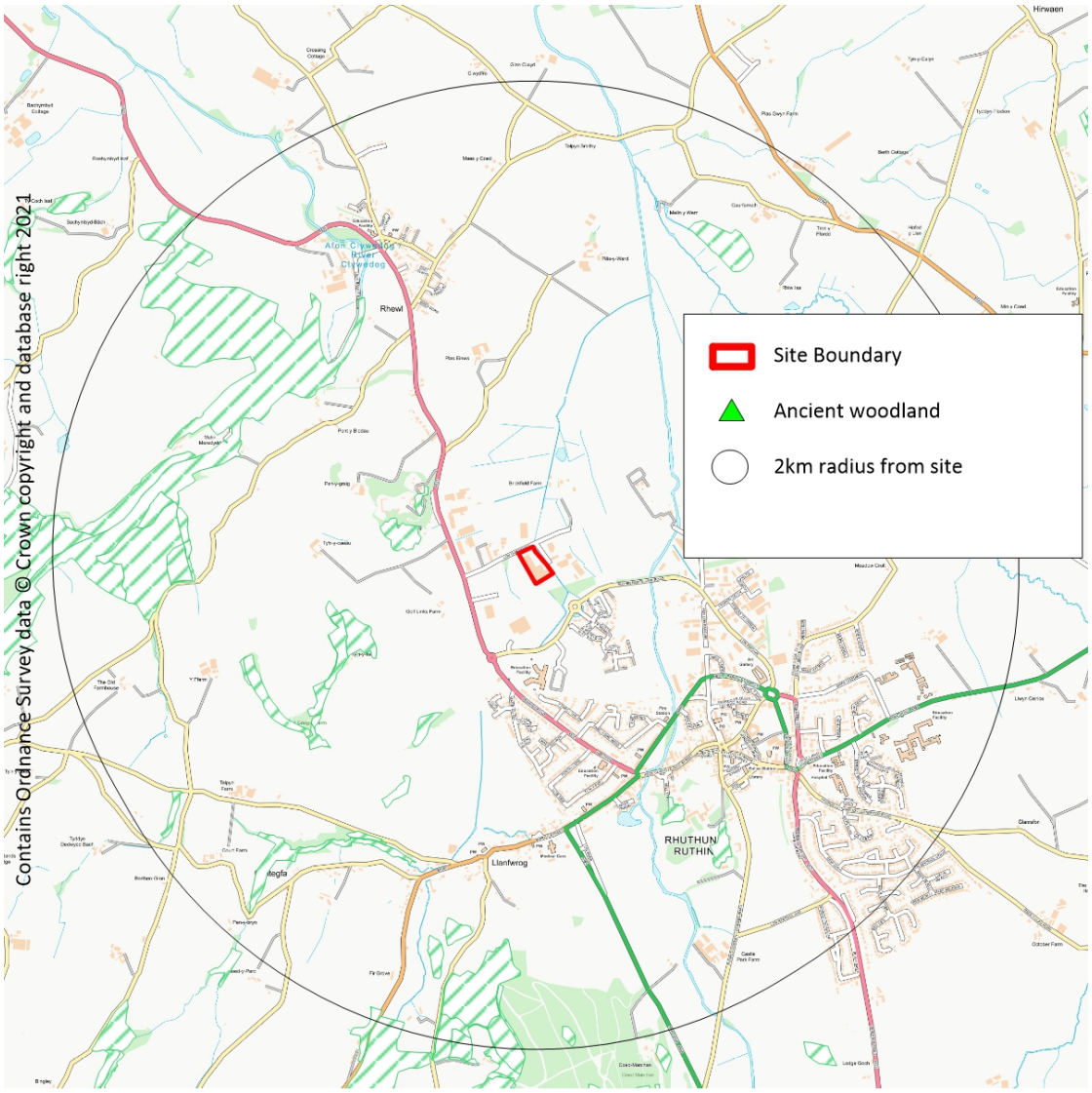


Figure 5.2: National and Local Designated Nature Conservation Sites within 2km



5.2.4 Applicable information on these nature conservation sites of relevance to this AQA is detailed below in Section 8.

5.3 Topography

5.3.1 The site is mapped at approximately 50m AOD on OS mapping located within the broad base of the north-south trending valley of the Afon Clwyd. Immediate surrounding land is at a similar elevation. Ground rises steeply on the valley side to the west beyond the A525 285m distant. The valley side to the east beyond the river is initially less steep before rising to the Clwydian Range.

5.4 Air Quality Review

5.4.1 DCC is one of the six local authorities in the North Wales region. Reference has been made to the 2020 Annual Progress Report (APR), November 2020, prepared by Wood for the North Wales Authorities in fulfilment of the LAQM reporting requirements.

5.4.2 DCC has not declared any Air Quality Management Areas (AQMAs) within its' administrative area.

5.5 Background Airborne Pollutant Concentrations

5.5.1 Predicted background air quality data for NO_2, NO_x, PM_{10} and $PM_{2.5}$ were obtained from the Defra UK-AIR website for the 1km x 1km grid square in which the Site and nearby receptors are located.

5.5.2 The predicted data is based on 2018 ambient monitoring and meteorological data and incorporate revised information on the age and distribution of vehicles and emission factors. Predicted data is provided by Defra for each year from 2018 to 2030.

5.5.3 Predicted background concentrations for the current year (2021) are summarised in the following table. Full data for surrounding grid squares of relevant to receptors considered further in the assessment are provided in Appendix B.

Table 5.3: Predicted Background Air Quality Data – 2021

Grid Square	Location	Annual Mean Concentrations (µg/m^3)			
		NO_2	NO_x	PM_{10}	$PM_{2.5}$
311500, 359500	Site	5.98	7.58	10.92	7.49
311500, 358500	Site, receptors to south	4.83	6.05	9.49	6.35
	EAL (annual mean)	**40**	**30 (v)**	**40**	**20**

data downloaded from Defra website on 24.08.21; issued by Defra August 2020
v – EAL established for the protection of ecosystems

5.5.4 The average background annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations for the grid squares in which the Site and receptors are located are predicted to be substantially below the relevant EALs AQS objectives, at 15%, 19% and 37% respectively.

5.5.5 It should be noted that the data are effectively an average concentration across each 1 km square. The pollutant concentrations will therefore be higher close to any significant source, such as main roads, junctions and concentrated habitation, such as within the Ruthin town centre.

5.5.6 Background data has also been obtained from the Defra UK-AIR website for the grid square in which the site and nearby receptors are located for CO, benzene and 1,3-butadiene as detailed

below. Data for CO, benzene and 1,3-butadiene has been extrapolated to 2021 in accordance with the Defra guidance[16].

Table 5.4: Predicted Background Air Quality Data - 2021

Grid Square	Location	Concentrations		
		CO	benzene	1,3-butadiene
		mg/m^3	µg/m^3	
311500, 359500	Site	0.08	0.10	0.03
311500, 358500	Site, receptors to south	0.08	0.10	0.03
	EAL (annual mean)	**10**	**5**	**2.25**

data downloaded from Defra website on 24.08.21; data issued by Defra August 2020
v – EAL established for the protection of ecosystems

5.5.7 The average background annual mean CO, benzene and 1,3-butadiene concentrations for the grid squares in which the Site is located are predicted to be substantially below the relevant EALs in 2021.

5.6 Local Authority Monitored Air Quality

Continuous Monitoring

5.6.1 DCC does not operate any automatic monitoring stations within its' area.

Diffusion Tube Monitoring

5.6.2 DCC operates a network of diffusion tubes for monitoring NO_2 concentrations across the Council area which in 2019 incorporated 26 locations. Of these 3 of the monitored locations were within Ruthin as detailed in the table below and shown in Figure 5.1. A 4th location was described as being monitored in the 2018 and previous ASRs but is not referred to in the subsequent 2019 and 2020 ASRs.

Table 5.5: Non-automatic Monitoring Sites

Site ID	Location	Type[1]	Grid reference	Distance and Orientation from Site
DBR20	25 Park Road, Ruthin.	Roadside	312106, 358306	840m SE
DBR37	Haul Fryn Depot, Ruthin	Roadside	312789, 358231	1.37km SE
DBR38	adj 62 Rhos Street, Ruthin	Roadside	312913, 358273	1.45km SE
DBR54[2]	adj. 2 Market Street, Ruthin	Suburban	312502, 358376	1.05km SE

1: Type as defined in Defra LAQM.TG(16)[10]

2: Not referred to in 2019 and 2020 ASRs; referred to in previous ASRs

[16] Defra: Air Pollution Background Concentration Maps, A User Guide for Local Authorities, August 2020

5.6.3 These locations are as per considered in the 2018 AQA. None of these locations are within the immediate vicinity of the site, but they do provide data on local air quality within the Ruthin town centre. Recorded concentrations of NO_2 from these diffusion tubes for the period 2015-2019 are as follows:

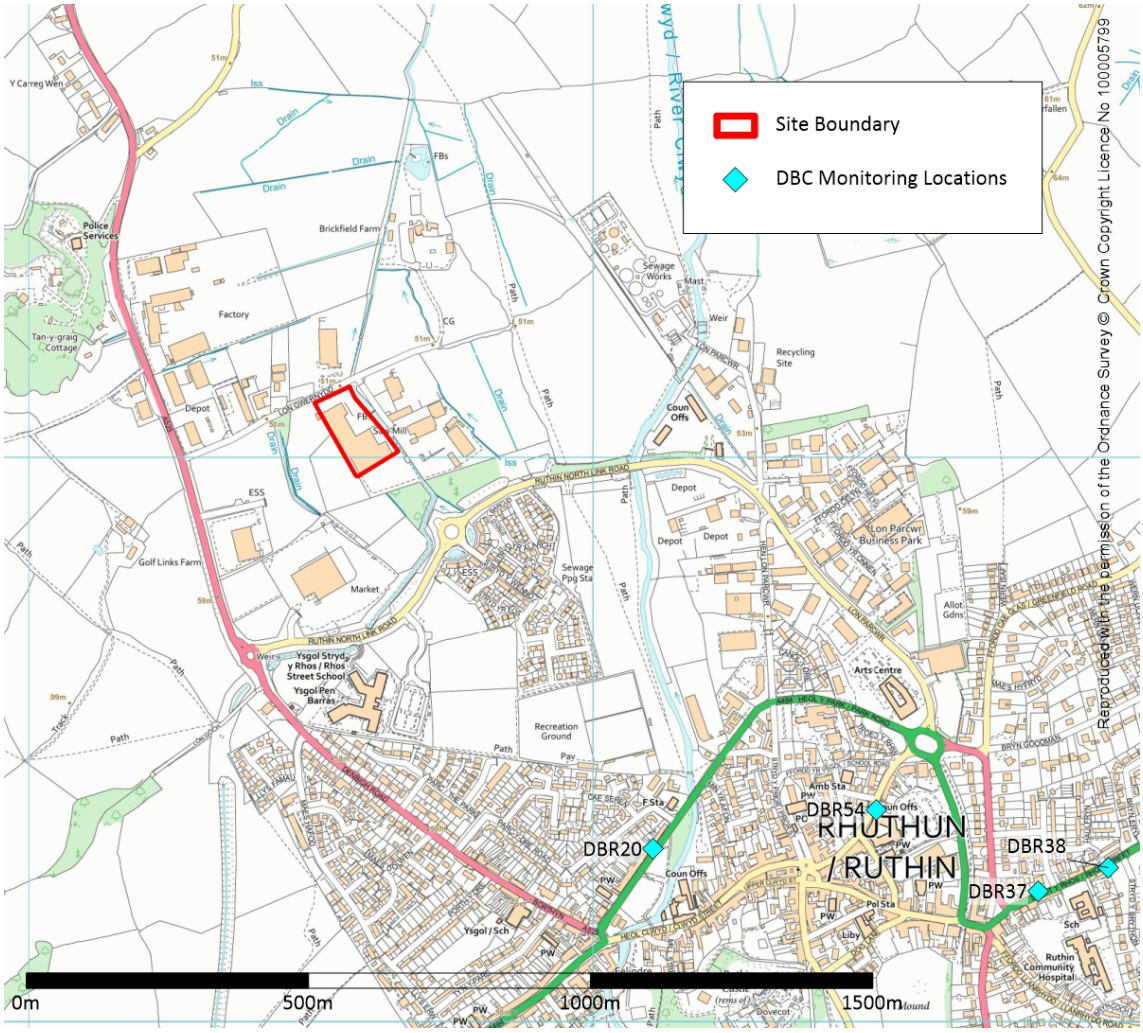
Table 5.6: Measured Annual Mean Nitrogen Dioxide Concentrations

Site ID	Annual Mean Concentration (µg/m^3) (bias adjusted)				
	2015	**2016**	**2017**	**2018**	**2019**
DBR20	21.2	19.8	21.3	20.5	20.3
DBR37	28.0	26.6	26.2	23.7	26.4
DBR38	16.5	16.8	17.2	14.6	14.1
DBR54	13.2	13.7	12.0[1]	-	-

1: less than 75% data capture and data annualised
Any exceedances of the long-term UK AQO (40 µg/m^3) are shown in **bold**

5.6.4 The annual mean NO_2 concentrations are all well below the UK annual objective of 40 µg/m^3.

Figure 5.3: Location of Air Quality Monitoring



5.7 Industrial Emissions and Other Emission Sources

5.7.1 Clifford Jones Timber operates on the neighbouring premises to the east. Activities at this facility are not likely to have significant impacts on local air quality with regards to the pollutants under consideration, as discussed later in section 7.0.

5.7.2 No other local facilities have been identified within 2km of the site that may significantly impact local air quality. No installations operating under an Environmental Permit that may significantly impact local air quality have been identified within 3km of the application site.

5.8 Wind speed and direction

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

- wind direction: determines the broad direction of the transport of the emission;
- wind speed: affects the ground levels concentrations by determining the initial dilution of pollutants emitted;
- atmospheric stability: a measure of atmospheric turbulence and hence dispersion of pollutants.

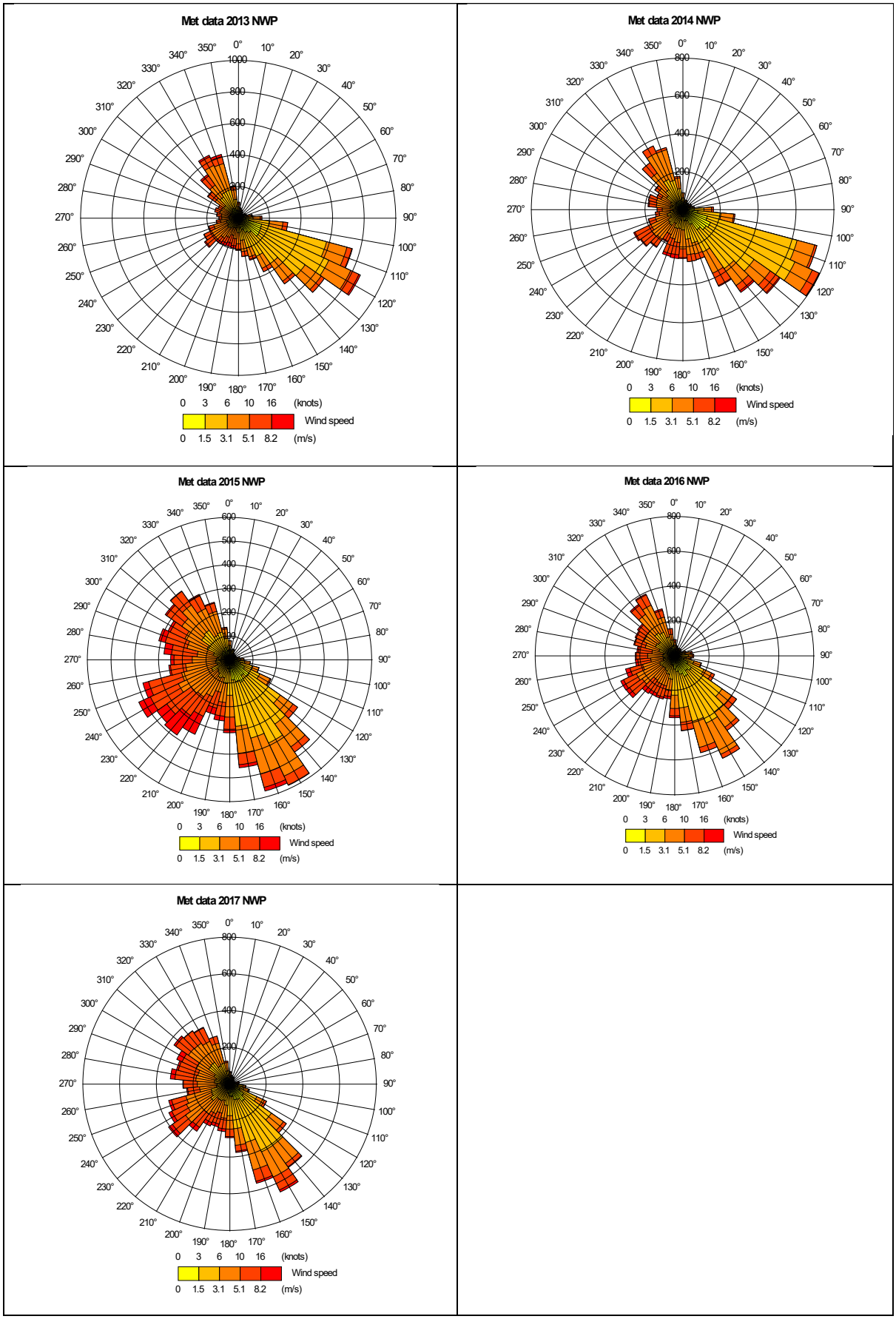
5.8.2 The two closest meteorological stations to the Site are located at Rhyl No 2 (NGR: 299448 374652; 77m aod), about 19.7km to the northwest, and at Bala (NGR: 293549, 335636; 163m aod), about 29.5km to the southwest. Although referred to as Rhyl No 2, the Rhyl station is located inland away from the town of Rhyl.

5.8.3 The annual windroses for Bala and Rhyl for the years 2006-2015 and 2007-2016 are provided in Appendix B. The Rhyl No 2 windrose shows the prevailing wind direction to be broadly south-easterly to north-easterly, consistent with typical UK conditions. The Bala windrose is very different with a prominent south-westerly wind direction, atypical for the UK, and thought to be heavily influenced by the valley of Llyn Tegid / Bala Lake to the southwest.

5.8.4 Meteorological conditions at the Site itself will be influenced by the location of the Afon Clwyd valley and presence of the Clwydian Range to the east and northeast of the Site. Given the uncertainties in the applicability of the available monitored meteorological data to conditions at the Site the assessment has referred to NWP (Numerical Weather Prediction) meteorological data obtained from the Met Office for the Site for the years 2012-2016 and provided below in Figure 5.2.

5.8.5 The windroses show prevailing winds to be east-southeasterly through to south-southeasterly consistent with the influences of the Clwydian Range.

Figure 5.4: Annual Windroses derived from Site-Specific NWP Data (years 2012-2016)



6 Model Set-Up

6.1 Introduction

6.1.1 The ADMS atmospheric dispersion model (ADMS 5 version 5.2) has been used to model potential ground-level pollutant concentrations arising from the existing and proposed stack emissions.

6.2 Sources of Emissions

6.2.1 The model set-up included both the existing CHP boiler and Stela dryers *(pre-relocation of the existing Stela dryer),* the proposed additional CHP boiler and Stela dryer and the relocated existing dryer. The model has been run for the following scenarios:

Table 6.1: Model Scenarios

Scenario	Comment
A	Original stacks and layout *(pre-relocation of the Stela dryer);* existing CHP stack ELVs
B	Existing **and** proposed future CHP and Stale dryer stacks and layout *(including re-located existing Stela dryer);* proposed CHP stack ELVs

6.2.2 The existing and proposed stack characteristics have been based on information provided by NEL and the supplier (OEM: Original Equipment Manufacturer), including recent monitoring data (reproduced for information in Appendix B), as summarised below in Table 6.2.

Table 6.2: Stack Characteristics

	Biomass boilers	
Biomass Boilers[1]	**No 1 (existing)**	**No 2 (new)**
National Grid References	311633.7, 359010.3	311601.7, 359022.2
stack heights	20m	20m
effective internal diameter	0.9m	
volumetric flow rate (reference conditions)	8,352 (6% O_2; dry gas) Nm^3/h	
volumetric flow rate (actual conditions)	22,574 Am^3/h	
exhaust velocity	10.5 m/s	
flue gas temperature	202°C	
Stela Dryers[2]	**No 1 & 2 (relocated)**	**No 3 & 4 (new)**
National Grid References	1: 3115867.7, 358990.8 2: 311593.4, 358994.5	3: 311591.4, 358978.6 4: 311598.1, 358982.4
stack heights	12m	12m
effective internal diameter	2.0m	
volumetric flow rate (actual conditions)	4 x 89,500 Am^3/h	
exhaust velocity	7.9 m/s	
flue gas temperature	40°C	

1: based on monitoring data for existing CHP Plant; Element, ref: EMT-01425, monitoring date 3rd August 2021
2: based on OEM data

6.2.3 The proposed new CHP plant boiler and Stela dryers are the same specification as the existing boiler and dryers.

6.2.4 The pollutant emission concentrations and emission rates for each stack based on the above data are detailed in Tables 6.3 and 6.4. The existing and proposed Emissions Limit Values (concentrations) for the CHP plant are as set out in the previous SGP response to NRW[7]. The Stela dryers do not have specified ELVs and the concentrations are based on information provided by the manufacturer and subsequent monitoring.

Table 6.3: Summary Emission Rates – Biomass Boilers

Pollutant	Emission Limit Value (ELV) (mg/Nm^3)[1]	Emission rate[2] ($g\ s^{-1}$)
Existing Biomass Stack[3]		
Oxide of nitrogen (NO and NO_2, expressed as NO_2)	475	1.1
Dust (total particulate matter)[4]	50	0.12
CO	225	0.52
TVOC[5]	30	0.07
Proposed Biomass Stack[6]		
Oxide of nitrogen (NO and NO_2, expressed as NO_2)	300	0.70
Dust (total particulate matter)[4]	30	0.07
CO[7]	n/a (225)	n/a (0.52)
TVOC[7]	n/a (30)	n/a (0.07)

1: Defined at a temperature of 273.15K, pressure of 101.3kPa and after correction for water vapour content of the waste gases as at standardised O2 content of 6% (for MCP using solid fuels)
2: Calculated from relevant ELV using relevant stack characteristics
3: ELVs specified for existing permit for CHP plant (identifier 2766)
4: Dust = Total Particulate Matter of which PM_{10} and $PM_{2.5}$ will be a proportion
5: TVOC = Total Volatile Organic Carbon of which benzene and 1,3-butaiene will be a proportion
6: Expected ELVs for new CHP plant stack (identifier 2885) as a new MCP and Tranche B Specified Generator
7: No ELVs expected for new CHP plant; emission rates for CO and TVOC included in assessment as requested by NRW and set at existing ELVs (in brackets)

Table 6.4: Summary Emission Rates – Stela Dryers

Pollutant	Emission Concentration (mg/Nm^3)	Emission rate[1] ($g\ s^{-1}$)
Existing Stela Dryers (per stack)		
Dust (total particulate matter)[3]	Dust = <10 mg/Nm^3	Dust = 0.427 g/s (combined)
Proposed Stela Dryers (per stack)		
Dust (total particulate matter)[3]	Dust = <10 mg/Nm3	Dust = 0.427 g/s (combined)

1: Calculated from OEM emission concentration data using relevant stack characteristics
2: Dust = Total Particulate Matter of which PM_{10} and $PM_{2.5}$ will be a proportion

6.2.5 The scheme also includes two emergency stacks which are to be provided for the biomass boiler. NEL has advised that these stacks will vent for a 20-minute period in the event of an emergency shut-down; the likelihood of such an event is considered to be extremely low. The controlled shut-down of the plant will take place twice a year and will vent from the main stack. Given the unlikely

occurrence of emissions from these stacks, and the short-term nature of any such emissions if they do occur, further assessment is not considered necessary.

6.3 General Model Input Parameters

6.3.1 The general model input parameters have been retained as per the 2018 AQA; for ease of reading these are re-produced below.

Meteorological Data

6.3.2 The dispersion modelling has been undertaken using 5 years of hourly sequential NWP modelled data (years 2013-2017) provided by the Met Office; the use of 5 years' data is recommended by the EA[17].

Building Wake Effects

6.3.3 Buildings in the vicinity of a stack are known to affect the dispersion of flue gases. In practice, the significance of building effects depends on their proximity to the stack and their height in relation to height of the stack. In this case the main site building and adjoining building have been included within the model as shown below.

Terrain

6.3.4 The presence of hills and valleys can modify the dispersion of emissions and the resulting pollutant concentrations. CERC, the provider of the ADMS modelling software, advise that terrain effects should be considered if the slope of the terrain exceeds 1 in 10. The area immediately surrounding the Site is relatively level with the ground starting to rise towards the Clwydian Range about 1km to the east. On this basis terrain effects were not considered important in this instance.

Surface Roughness

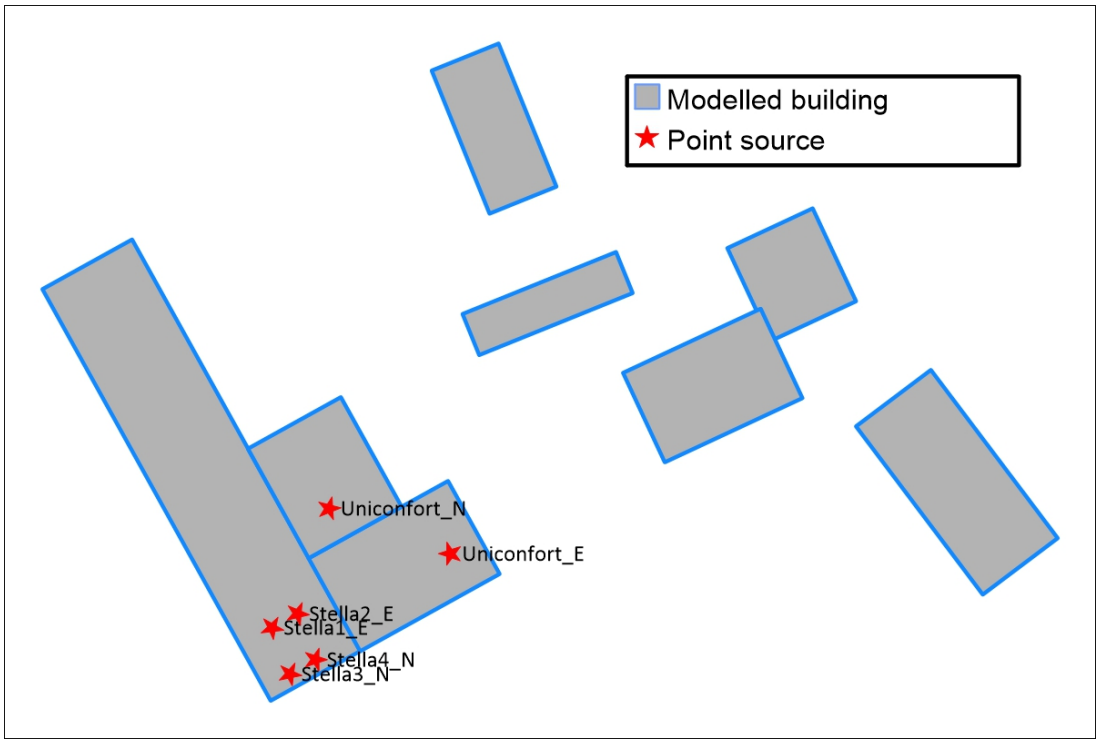
6.3.5 Surface roughness plays an important part in determining the mechanical turbulence generated in the atmosphere as wind passes and generates turbulence which can modify the dispersion of gases and needs to be considered in the modelling process. The area surrounding the works is mixed with light industrial to the east and north, fields to the west and built development to the south. A surface roughness length of 0.5m has therefore been used in the model.

Operational Hours

6.3.6 The assessment has considered 365/24/7 operational hours.

[17] Environment Agency (EA) / Department for Environmental, Food and Rural Affairs (Defra), www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports, published 1st November 2014

Figure 6.1: Model Set-Up



Modelled Domain and Receptors

6.3.7 A variable grid spacing was used within the modelled domain based on a 15m spacing across a 400m x 400m area centred on the Site and a 50m spacing across a wider 2km by 2km area centred on the site.

6.3.8 In addition to the area assessment, individual receptors in the locality have been identified for consideration as detailed in the following table. These have been selected to represent a range of potentially sensitive locations within 1km of the site and include the closest centres of public occupation and use.

Table 6.5: Individual Receptors – relevant receptors

ref	name	type	X (m)	Y (m)	distance & orientation[1]
Human Health Receptors					
R1	Glasdir shared school access	school	311576	358668	310m S
R2	Glasdir shared school access	school	311673	358718	275m S
R3	Stryd Yr Ehedydd	residential (community)	311731	358743	275m SSE
R4	Stryd Yr Wennol	residential (community)	311741	358816	210m SSE
R5	Stryd Yr Wennol	residential (community)	311799	358892	175m SE
R6	Stryd Yr Alarch	residential (community)	311886	358937	215m SE
R7	Golf Links Farm	residential (isolated)	311195	358842	395m W
R9	Granary, Tyddan Isaf	residential (assumed)	311112	359186	405m NW
R10	Footpath	leisure	311904	359136	270m E

ref	name	type	X (m)	Y (m)	distance & orientation[1]
R11	Ruthin Livestock Market	leisure / commercial	311543	358868	115m SW
R12	Bodlondeb	residential (community)	311221	359538	530m NW
R13	Bodlondeb	residential (community)	311222	359578	560m NW
R14	A525	residential (community)	311148	359589	610m NW
R15	Cae Seren	residential (community)	311921	358457	615m SE
R16	Y Parc	residential (community)	311805	358474	545m SE
R17	Y Parc	residential (community)	311582	358503	470m S
R18	Canol-Y-Dre	residential (community)	312327	358695	735m SE
R19	Min Yr Afon	residential (community)	312220	358441	815m SE
R20	Brickfield Farm	residential (isolated)	311691	359394	270m NE
Ecological receptors					
E1	Llwyn SAC	ecological	308403	363827	8.8km NW
E2	Alyn Valley Woods SAC	ecological	318174	362477	7.5km ENE
E3	Alyn Valley Woods SAC	ecological	317734	364887	8.5km NE
E4	Ancient Woodland[4]	ecological	311047	359122	400m NW
E5	Ancient Woodland[4]	ecological	311221	358426	645m SW
E6	Ancient Woodland[4]	ecological	312124	358060	1.0km SSE
E7	Ancient Woodland[4]	ecological	312239	358125	995m SSE

1: Distance from wider site boundary to nearest 5m; orientation from site

2: R1 & R2 represent leisure use at new school; R11, the livestock market has been included as it may represent a location where members of the public may spend 1 hour or more

3. R8 not used as represents former farm buildings now demolished as part of school development

4: Locations of possible Ancient Woodland derived from Forestry Commission data on magic.defra.gov.uk

6.3.9 Receptor points R1-R20 represent locations where members of the public may be exposed to ambient air (residential properties, schools, footpaths etc). The majority represent locations where long-term and short-tern EALs are relevant (predominantly residential properties); R1-R2 and R10-R11 representing areas of open leisure use where only short-term EALs are relevant.

6.3.10 Receptor points E1-E7 represent ecological / nature conservation sites, with E4-E7 representing the nearest areas of possible ancient woodland identified to the site. Given the distance and orientation to these modelled points these are considered appropriate for assessment of the wider possible areas of Ancient Woodland and the Lady Bagots LWS.

Figure 6.1: Site Location and Modelled Human Health Receptors

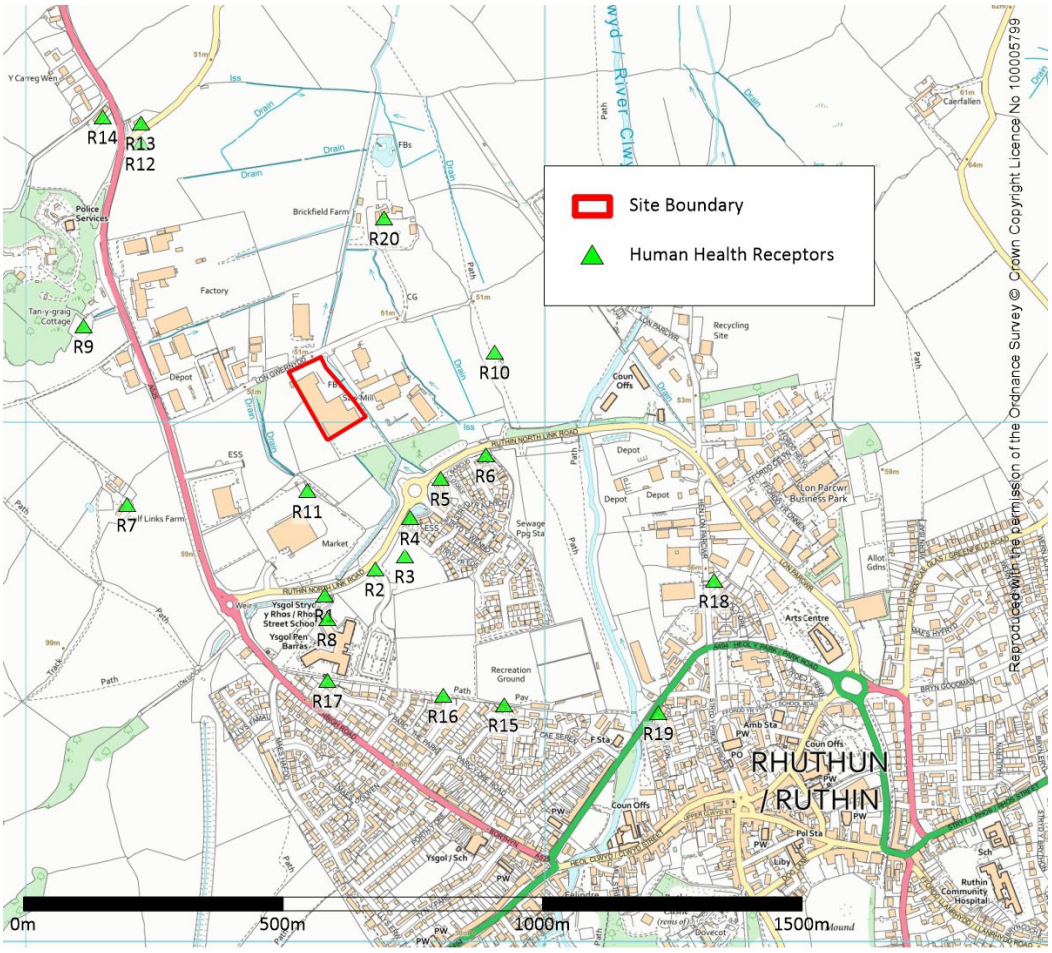


Figure 6.2a: Site Location and Modelled Nature Conservation Sites Receptors (European Sites)

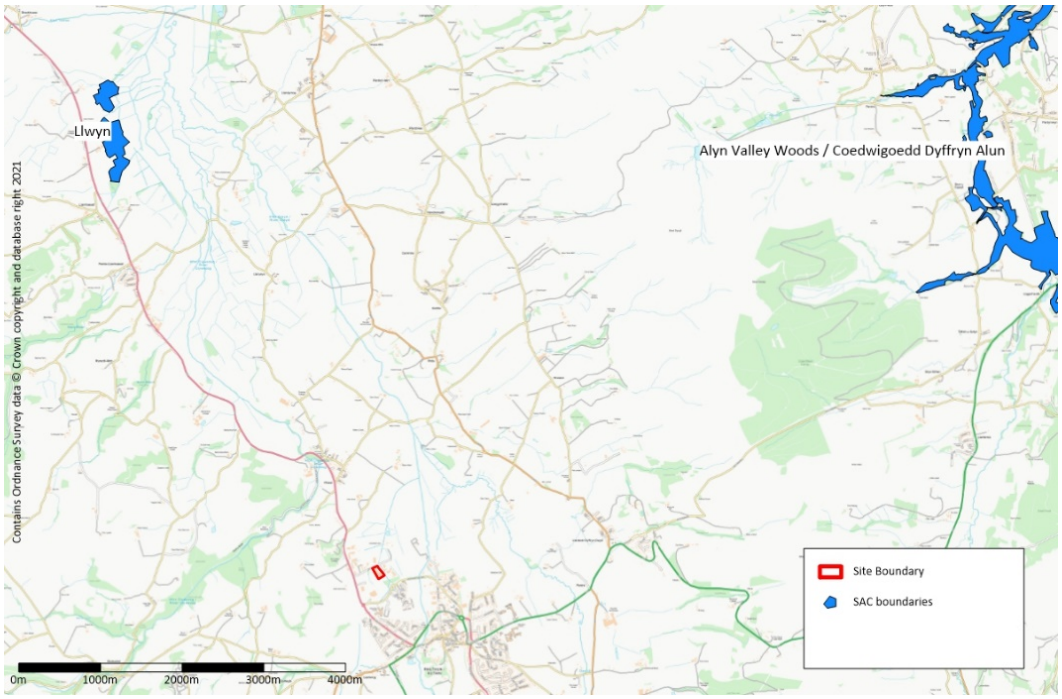
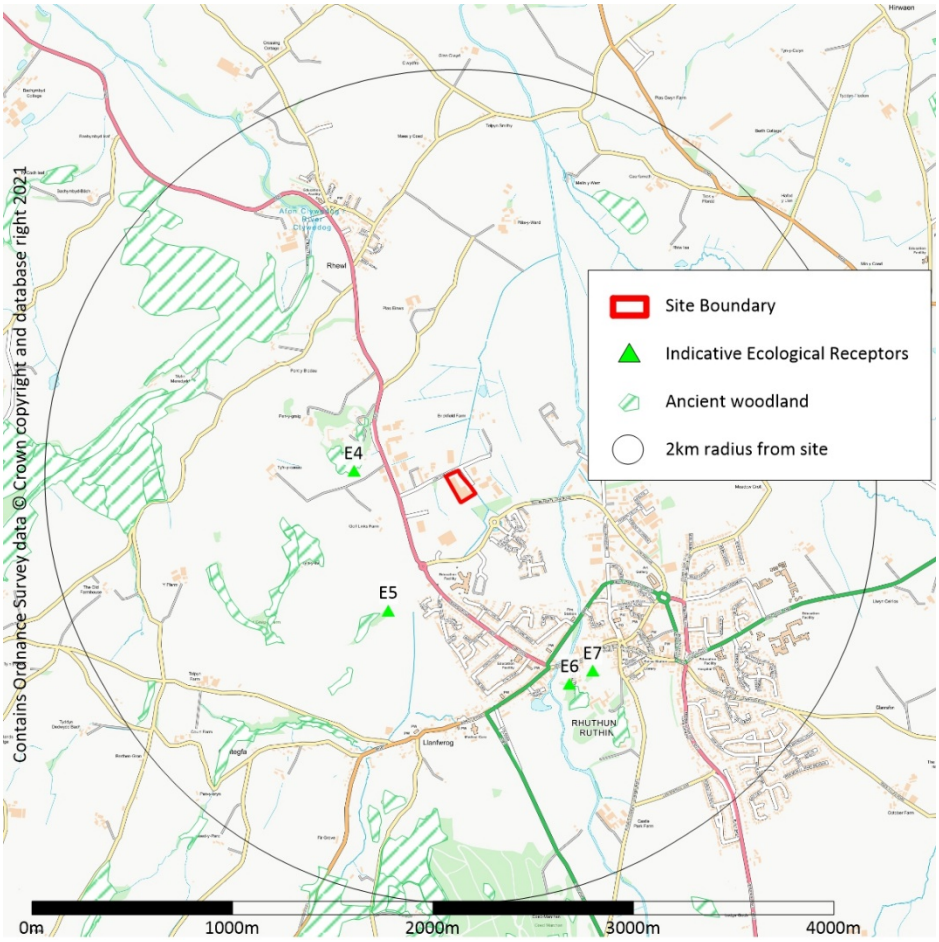


Figure 6.2a: Site Location and Modelled Nature Conservation Sites Receptors (Local Sites)



Summary Model Conditions

6.3.11 The general model conditions are summarised below:

Table 6.6: ADMS Model Input Parameters

Variables	Model Input
emissions	Stack emissions: NO_x, PM_{10}, $PM_{2.5}$, CO, TVOCs
emission profiles	average throughout 24 hours; 8,760 hours per annum operation
surface roughness at source	0.5m; parkland and open suburbia
terrain	not included
meteorological data	5 years (2013-2017) hourly sequential NWP data centred on the site
surface roughness at meteorological data location	0.5m
Minimum Monin-Obukhov length for Stable conditions	1m (default)
grid spacing	15m: 400m x 400m 50m: 2km x 2km

Variables	Model Input
receptor location	x, y coordinates, z = 0m (see Table 6.6 and Figures 6.1 and 6.2)
model output	modelled pollutant concentrations for different averaging periods within modelled domain and at modelled receptors

6.4 Post-Model Processing

6.4.1 The ADMS model has been used to predict potential Process Contributions (PCs) for NO_x, CO, PM_{10}, $PM_{2.5}$, and TVOCs from the CHP and dryer stacks within the model domain and at the specified receptors for both scenarios.

Oxides of Nitrogen / Nitrogen Dioxide

6.4.2 A proportion of emissions of NO_x are likely to be nitric oxide (NO), for which no air quality objective or limit exists, rather than NO_2. The emitted NO will be converted in part to NO_2 at a rate dependent upon several factors including ozone concentrations and solar radiation levels. EA guidance[18] advises that the assessment of NO_2 is undertaken using 35% and 70% conversion of the modelled NO_x to NO_2 values for short-term and long-term average concentrations respectively. This approach remains conservative as actual conversion rates are expected to be lower than these levels.

[18] EA AQMAU FAQs: Conversion Ratios for NO_x and NO_2, www.environment-agency.gov.uk

7 Assessment – Human Health

7.1 Introduction

7.1.1 The maximum predicted Process Contributions (PCs) for each pollutant from the stack emissions for the existing and proposed scenarios within the modelled domain and at each modelled receptor for each year are provided in Appendix E. As requested by NRW the following assessment has focused on the results obtained for Scenario B3, the PCs arising from the combined aerial emissions from the existing and proposed CHP plants and dryers, and not the differences that would arise due to the proposals.

7.2 Maximum Predicted Ground Level PCs

7.2.1 The maximum predicted ground-level PCs within the modelled domain associated with the combined existing and proposed emissions, across the 5 years, with respect to human health and the proposed development are summarised below in Table 7.1.

Table 7.1: Maximum Predicted PCs within the Modelled Domain (Scenario B): Human Health[1]

Pollutant	Averaging Period	EAL	PC[1]	Year	PC % EAL	Comment
Long-term concentrations						
NO_2[2]	annual mean (1 hr)	40	5.74	2013	14.3	PC ≥1% EAL; further assessment required
PM_{10}[3]	annual mean (1 hr)	40	26.38	2013	66.0	
$PM_{2.5}$[3]	annual mean (1 hr)	20	26.38	2013	131.9	
benzene[4]	annual mean (1 hr)	5	0.66	2013	13.29	
1,3-butadiene[4]	annual mean (1 hr)	2.25	0.66	2013	29.5	
Short-term concentrations						
NO_2[5]	1-hour (99.79th %ile)	200	43.62	2013	21.81	PC ≥10% EAL; further assessment required
PM_{10}[3]	daily mean (90.14th %ile)	50	47.95	2017	95.9	PC ≥10% EAL; further assessment required
CO (mg/m^3)	8hr running mean (100%ile)	10	0.08	2017	0.8	*PC <10% EAL; no further assessment required*

Notes: No further assessment required when maximum predicted process contributions within the modelled domain are less than the screening thresholds (i.e. <1% of EAL for long-term and <10% of EAL for short-term)
1: assumes facility operates 8,760 hours per annum
2: assumes 70% conversion of modelled NO_x to NO_2
3: assumes PM_{10} and $PM_{2.5}$ each emitted as 100% PM
4: assumes benzene and 1,3-butadiene each emitted as 100%TVOCs
5: assumes 35% conversion modelled NO_x to NO_2
All concentrations $\mu g/m^3$ unless stated otherwise

7.2.2 The maximum long-term NO_2, PM_{10}, $PM_{2.5}$, benzene and 1,3-butadiene PCs and short-term NO_2 and PM_{10} PCs are above the screening thresholds referred to. These maximums are experienced in close proximity to the plant and not necessarily at sensitive receptors; further

assessment has therefore been undertaken of predicted PCs at the modelled receptors. Further assessment is not required with regards to CO as the predicted short-term PCs are well below 10% of the EAL within the modelled domain.

7.2.3 The maximum predicted ground-level PCs at relevant across the modelled receptors across the 5 years are summarised below in Table 7.2.

Table 7.2: Maximum Predicted PCs at Modelled Receptors (Scenario B): Human Health[1]

Pollutant	Averaging Period	AQAL	PC[1]	Receptor	PC % EAL	Comment
Long-term concentrations						
NO_2[2]	annual mean (1 hr)	40	2.91	R5	7.3	PC ≥1% EAL; further assessment required
PM_{10}[3]	annual mean (1 hr)	40	2.99	R4	7.5	
$PM_{2.5}$[3]	annual mean (1 hr)	20	2.99	R4	15.0	
benzene[4]	annual mean (1 hr)	5	0.32	R5	6.3	
1,3-butadiene[4]	annual mean (1 hr)	2.25	0.32	R5	14.1	
Short-term concentrations						
NO_2[5]	1-hour (99.79th %ile)	200	19.0	R5	9.5	*PC <10% EAL; no further assessment required*
PM_{10}[3]	daily mean (90.4th %ile)	50	10.8	R4	21.5	PC ≥10% EAL; further assessment required

Notes: No further assessment required when maximum predicted process contributions within the modelled domain are less than the screening thresholds (i.e. <1% of EAL for long-term and <10% of EAL for short-term)
1: assumes facility operates 8,760 hours per annum
2: assumes 70% conversion of modelled NO_x to NO_2
3: assumes CHP stack PM_{10} and $PM_{2.5}$ each emitted as 100% PM
4: assumes benzene and 1,3-butadiene each emitted as 100%TVOCs
5: assumes 35% conversion modelled NO_x to NO_2
All concentrations µg/m^3 unless stated otherwise

7.3 Long-Term Assessment

7.3.1 The maximum predicted long-term (annual mean) NO_2, PM_{10}, $PM_{2.5}$, benzene and 1,3-butadiene concentrations across the modelled receptors are above 1% of the EAL. Further assessment has therefore been undertaken considering the background concentrations at the most affected receptors as summarised below in Table 7.3.

Table 7.3: Maximum Predicted PCs at a Relevant Receptor: Long-term Assessment[1]

Pollutant	Averaging period	AQAL	PC[1]	Receptor	BC[3]	PEC	PEC %AQAL
NO_2[1]	annual mean (1hr)	40	2.91	R5	4.83	7.74	19
PM_{10}[4]	annual mean (1hr)	40	2.99	R4	9.49	12.48	31
$PM_{2.5}$[4]	annual mean (1hr)	20	2.99	R4	6.35	9.34	47
benzene[5]	annual mean (1 hr)	5	0.32	R5	0.1	0.42	8

Pollutant	Averaging period	AQAL	PC[1]	Receptor	BC[3]	PEC	PEC %AQAL
1,3-butadiene[5]	annual mean (1 hr)	2.25	0.32	R5	0.03	0.35	15

All concentrations µg/m^3 unless stated otherwise

1: assumes facility operates 8,760 hours per annum

2: assumes 70% conversion of modelled NO_x to NO_2

3: BC = Defra predicted long-term background pollutant concentration for 2021 for relevant grid square

4: assumes CHP stack PM_{10} and $PM_{2.5}$ each emitted as 100% PM

5: assumes benzene and 1,3-butadiene each emitted as 100% TVOCs

7.3.2 The maximum predicted long-term PCs are predicted at receptor points R4 (PM_{10} and $PM_{2.5}$) and R5 (NO_2, benzene and 1,3-butadiene). These both represent the residential receptors to the south of the Site beyond the Ruthin North Link Road. Contour plots are provided in Appendix C for the annual mean NO_2 PCs showing the drop off in pollutant concentrations away from the Site.

7.3.3 All resulting predicted PECs, taking into account the background pollutant concentrations, are all less than 50% of the relevant EAL.

7.3.4 The above assumes that PM_{10} and $PM_{2.5}$ are each emitted as 100% total particulate matter (TPM). This is highly conservative as in reality these are only emitted as a proportion of the total particulate matter, with PM_{10} potentially being in the order of 10% of TPM and $PM_{2.5}$ being a smaller proportion again.

7.3.5 Similarly, the above assumes benzene and 1,3-butadiene are each emitted as 100% total VOCs, whereas these would each only be emitted as a proportion of the total VOCs.

7.4 Short-Term Assessment

7.4.1 The maximum predicted short-term PM_{10} PCs concentrations across the modelled receptors are above 10% of the EAL. Further assessment has therefore been undertaken considering the background concentrations at the most affected receptors.

Table 7.4: Maximum Predicted PCs at a Relevant Receptor: Short-Term Assessment[1]

Pollutant	Averaging period	AQAL	PC[1]	Receptor	BC_{ST}[2]	PEC	PEC %AQAL
PM_{10}[3]	daily mean (90.4th %ile)	50	10.8	R4	18.98	29.74	59.5

All concentrations µg/m^3 unless stated otherwise

1: assumes facility operates 8,760 hours per annum

2: BC_{ST} - short term background concentration = 2 x Defra predicted long-term background pollutant concentration for 2021 for relevant grid square

3: assumes CHP stack PM_{10} emitted as 100% PM

7.4.2 The maximum predicted short-term PM_{10} PCs are predicted at receptor point R4 representing the residential receptors to the south of the Site beyond the Ruthin North Link Road.

7.4.3 All resulting predicted PECs, taking into account the background pollutant concentrations, are all less than 60% of the relevant EAL.

7.4.4 The above assumes that PM_{10} is emitted as 100% total particulate matter. As noted above this is highly conservative as these are only emitted as a proportion of the total particulate matter, with PM_{10} potentially being in the order of 10% of TPM and $PM_{2.5}$ being a smaller proportion again.

7.5 Other Considerations

7.5.1 The proximity of the Clifford Jones Timber facility is noted. SGP is not aware of any specific aerial emission sources from this facility other than potential fugitive dust from the handling and processing of wood and a small biomass boiler of less than 1MW. The proposed additional capacity at the Site is not expected to give rise to a greater risk of fugitive dust emissions than currently, with the existing Stela dryer operations being relocated internally.

7.5.2 The small biomass boiler at the adjoining facility will give rise to some NO_x and particulate matter emissions but is below a size that requires an Environmental Permit, either now or in the future under the MCPD, and hence these are unlikely to be significant. Given the expected relatively short height of the Clifford Jones boiler stack (actual height unknown) the pollutant footprint would be expected to be concentrated within the vicinity of the stack with substantially reduced concentrations away from the stack. These would be expected to be negligible at the nearest receptors. Also of note the Defra predicted background data takes into account existing sources of pollution with an area; the predicted background pollutant concentrations are all well below the relevant AQALs.

7.5.3 Due to the spatial separation of the stack to those on the application site the maximum ground-level PCs from all the stacks will not coincide. With reference to the assessment of the application site proposals the resulting short-term and long-term PECs due to NO_2, PM_{10} and $PM_{2.5}$ at the most affected modelled receptors are all well below the relevant EALs as summarised above in Tables 7.3 and 7.4 x.

7.5.4 On this basis, the cumulative emissions from the proposed development and the existing nearby small biomass boiler, are not predicted to result in any exceedances of an EAL at any relevant receptor.

7.5.5 Hence, no particular issues have been identified with the cumulative impacts with the adjoining operations.

7.6 Assumptions and Limitations

7.6.1 The modelling has been undertaken based on recent monitoring data provided by NEL for the existing CHP plant and original OEM data provided by the technology provider for the Stela dryers and is therefore considered robust.

7.6.2 The meteorological data has been undertaken using NWP data for the specific location provided by the Met Office. The use of this data is therefore considered robust and appropriate for this site location and assessment.

7.6.3 Background data has been taken from Defra provided modelled data for the locality for 2021 (NO_2, PM_{10} and $PM_{2.5}$). It is acknowledged that there remains some current uncertainty in future NO_x / NO_2 concentrations due to a number of factors, such as higher real-world vehicle emission factors and variances in the UK fleet from expectations. However, the data is based on the most recent issued data by Defra, issued in 2020, and incorporates the latest vehicle emission factors and fleet composition. It is also acknowledged that the implications of the on-going Covid-19[19] pandemic on predicted future background air quality is unknow. However, the assessment has been based on the most up to date available information and is considered appropriate.

7.7 Summary of Potential Impacts

7.7.1 The modelling has been used to predict the process contributions from the combined emissions of the current and proposed CHP stacks and Steal dryer stacks. All resulting total pollutant concentrations are predicted to remain well below the relevant standards.

[19] COVID-19: Following the outbreak of a global pandemic of the Coronavirus disease 2019 (COVID-19) due to the SAR-CoV-2 virus, the UK Government declared several restrictions on non-essential travel and movement during March 2020. Various restrictions remained in place during 2020 and 2021 with resulting implications on transport movements across the UK.

8 Assessment – Ecological Impacts

8.1.1 Introduction

8.1.2 The modelled receptor points E1-E7 have been selected to include the identified relevant nature conservation sites within the relevant screening distances of the Site, as detailed below in Table 8.1.

Table 8.1: Individual Nature Conservation Site Modelled Receptor Points

Name	Designation	Modelled Receptor Points
International sites within 10km		
Llwyn (UK0030185)	SAC	E1
Alyn Valley Woods (UK0030078)	SAC	E2-E3
National or local sites within 2km		
SSSIs		
none		
Other National / Local sites		
Lady Bagot's Woods	LWS	*subsumed by below*
Ancient Woodlands	Ancient Woodlands	E4-E7[1]

1: Receptor points represent closest identified Ancient Woodlands

8.2 Critical Levels Results and Assessment

8.2.1 A Critical Level assessment has been undertaken to assess the potential impacts of the aerial emissions from the proposed development on the identified ecological sites, in accordance with the methodology as described in Section 4.

8.2.2 A range of habitat features for ambient NO_x are provided by APIS for the statutory nature conservation sites, the most sensitive of which are summarised below. Full details are provided in Appendix A. Information is not available for the Local Wildlife Sites and Ancient Woodlands and hence reference is made to information available for the relevant habitat features expected to be present, as summarised below:

Table 8.2: Ambient NO_x – Critical Levels

Site	Status	Feature	Critical Level[1]
Llwyn	SAC	Alluvial forests with Alnus glutinosa and Fraxnus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	*habitat not sensitive*[2]
Alyn Valley Woods	SAC	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)	30 µg/m^3 annual mean / 75 µg/m^3 24 hour mean
Lady Bagot's Wood	LWS	Broad leaved woodland[3]	
Ancient Woodlands	Ancient woods	Broad leaved woodland[3]	

1: As provided on APIS (www.apis.gov.uk)

2: APIS advises habitat not sensitive to NO_x; NRW has advised Llwyn SAC is sensitive to nitrogen deposition[20] and hence for a conservative assessment has been included in the ambient NO_x assessment
3: assumed from available information

8.2.3 The maximum modelled PCs at the ecological receptors are as follows in Table 8.2. Full results are presented in Appendix E.

Table 8.3: Maximum Predicted PCs at Relevant Receptors - Ecological: Critical Levels

pollutant	averaging period	EAL	PC	Rec	PC %EAL	Comment
long term						
European sites (E1-E3)						
NO_x[1]	annual mean (1 hr)	30	0.14	E1	0.5	*PC≤1% EAL; PC insignificant*
SSSIs						
n/a						
Local Nature Sites (E4-E7)						
NO_x[1]	annual mean (1 hr)	30	0.90	E4	3.0	*PC≤100% EAL; PC insignificant*
short term						
European sites (E1-E7)						
NO_x[2]	daily mean (24 hr)	75	1.06	E1	1.4	*PC≤10% EAL; PC insignificant*
SSSIs						
n/a						
Local Nature Sites (E4-E7)						
NO_x[2]	daily mean (24 hr)	75	10.59	E4	14.13	*PC≤100% EAL; PC insignificant*

All concentrations µg/m^3 unless stated otherwise

1 assumes 100% modelled NO_x emissions; assumes 8,760 hours per annum operation

8.2.4 The long-term and short-term NO_x PCs at the nearest points of the Alyn Valley Woods SAC and Llwyn SAC are well below the relevant screening thresholds. No further assessment is required.

8.2.5 The long-term and short-term NO_x PCs at the nearest points of the Lady Bagats Woods LWS and identified ancient woodlands are all well below the relevant screening thresholds. No further assessment is required.

8.3 Critical Loads Results and Assessment

8.3.1 A Critical Loads assessment considering potential nitrogen and acid deposition has also been undertaken for the identified nature conservation sites.

8.3.2 The annual dry deposition fluxes of NO_2 at the nature conservation sites have been calculated using the ADMS modelled ambient NO_x concentrations and deposition velocities and conversion factors as provided by the EA. The deposition velocities and conversion factors are based on

[20] E-mail from NRW to SGP dated 12.11.2019

those provided in EA guidance and as provided in Table 8.4. Details on the relevant ones used for each nature conservation sites assessment are provided in Appendix C.

Table 8.4: EA Recommended Pollutant Dry Deposition Velocities and Conversion Factors

Pollutant	Recommended deposition velocity (m/s)	
NO_2	Grassland *(also applied to water bodies)*	0.0015
	Forest	0.003
	Conversion factors	
	Nitrification (µg/m^2/s to kg N/ha/yr)	95.9
	Acidification (µg/m^2/s to keq/ha/yr)	6.84

8.3.3 It should be noted that the modelling of deposition of gaseous pollutants is subject to some uncertainty with respect to the physical processes involved and to the resulting effects on the habitats. In particular, deposition rates are directly proportional to deposition velocity in the modelling.

8.3.4 The resulting deposition fluxes were compared to relevant Critical Loads specified on the Air Pollution Information System (APIS) website[21] for the identified sites.

Nutrient Nitrogen

8.3.5 A range of habitat features for nutrient nitrogen deposition are provided by APIS for the statutory conservation sites as detailed in Appendix C. The assessment has therefore referred to the most sensitive habitats and Critical Loads classes deemed relevant to the nature conservation sites to provide a conservative assessment of potential impacts of emissions, as summarised below.

Table 8.5: Nitrogen Deposition – Critical Loads

Site	Status	Feature[1]	Habitat[1]	Critical Load Range (kg/N/ha/y)[2]
Llwyn (E1)[3]	SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)[3]	Carex paniculata woodland, Urtica dioica woodland, Lysimachia nemorum woodland	10-20
			Mercurialis perennis woodland	15-20
Alyn Valley Woods (E2&E3)[4]	SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)[4]	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	10-20

[21] http://www.apis.ac.uk/

Site	Status	Feature[1]	Habitat[1]	Critical Load Range (kg/N/ha/y)[2]
		Tilio-Acerion forests of slopes, screes and ravines	Meso- and eutrophic Quercus woodland	15-20
Lady Bagots Woods	LWS	Broadleaved deciduous woodland[5]	-	10-20
Ancient woodlands (E4-E7)	Ancient woodlands	Broadleaved deciduous woodland[5]	-	10-20

1: most sensitive habitat feature and Critical Load range noted for the site, *where feature is sensitive to nutrient nitrogen impacts on broad habitat*; feature may not be present within area of impacts.

2: Critical Loads are dependent on aspects of habitat including the nature of the surface and sensitivity of the habitat to changing deposition rates

3: Llwyn SAC not identified on APIS as having any features sensitive to nitrogen deposition; NRW advises habitat features are sensitive[19]

4: NRW advises differing sensitivities and Critical Loads to APIS at Alyn Valley Woods SAC[20]

5: assumed from available information

8.3.6 The resulting modelled maximum nitrogen dry deposition due to NO_2 at the modelled receptor points within each nature conservation site are presented below.

Table 8.6: Maximum total N deposition and assessment at modelled receptor points within nature conservation sites

receptor	NO_2-N		% PCs of lowest CL[3]	BC	PEC	% PEC of lowest CL[3]
	Dry[1]	as N[1]				
	µg/m²/s	kg/ha/y				
International Sites						
Llwyn SAC	0.0003	0.028	0.28	*PC <1% EAL; PC insignificant*		
Alyn Valley Woods SAC	0.0001	0.006	0.06	*PC <1% EAL; PC insignificant*		
Local Sites						
Lady Bagots Woods LWS / Ancient woodlands	0.0019	0.181	1.81	*PC <100% EAL; PC insignificant*		

1: NO_2 deposition velocity referred to as provided in AQTAG06 2014; assumes 70% modelled NO_x to NO_2 conversion in accordance with EA guidance; 8,760 hours per annum operation

2: calculated based on conversion factor of 95.9 as provided in AQTAG06

3: where CL is as per Table 3.5

8.3.7 The maximum modelled combined PCs in the closest parts of the nature conservation sites are below the relevant screening thresholds. No further assessment is required.

Acid Deposition

8.3.8 As for nitrogen deposition, a wide range of acid deposition Critical Load information is provided by APIS for the nature conservation sites. The assessment has therefore been undertaken for the relevant acid deposition Critical Loads for the most sensitive habitats:

Table 8.7: Acid Deposition – Critical Loads

Site	Status	Feature[1]	Habitat[2]	Critical Loads (kg/N/ha/y)[2]
Llwyn	SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	not sensitive[3]	MinCLminN:0.142 MinCLMaxS:1.729 MinCLmaxN: 1.877
Alyn Valley	SAC	Tilio-Acerion forests of slopes, screes and ravines	Unmanaged Broadleafed/Coniferous Woodland	MinCLminN:0.142 MinCLMaxS:1.721 MinCLmaxN: 1.863
Lady Bagots Woods	LWS	Broadleaved deciduous woodland[4]	-	*No estimate available*
Ancient woodlands (E4-E7)	Ancient woodlands	Broadleaved deciduous woodland[4]	-	*No estimate available*

1: most sensitive habitat feature and Critical Load range noted for the site, *where feature is sensitive to acid deposition impacts on broad habitat;* feature may not be present within area of impacts.

2: Critical Loads are dependent on aspects of habitat including the nature of the surface and sensitivity of the habitat to changing deposition rates; information presented for minimum Critical Loads

3: Llwyn SAC not identified on APIS as having any features sensitive to acid deposition; NRW advises habitat features are sensitive[19]

4: assumed from available information

8.3.9 The resulting modelled maximum acid deposition due to NO_2 at the modelled receptor points within each nature conservation site are presented below.

Table 8.8: Maximum total N acid deposition and assessment at modelled receptor points within nature conservation sites

Receptor	PC[1]		BG[2]	
	total N[3]	total S	N	S
	keq/ha/y			
International Sites				
Llwyn SAC (E1)	0.002	n/a	2.5	0.2
Alyn Valley Woods SAC (E2&E3)	0.0004	n/a	2.4	0.2
Local Sites				
Lady Bagats Woods LWS / Ancient wodlands	*No Critical Load estimate provided; no further assessment*			

1: Calculated using conversions provided in EA guidance AQTAG06

2: Background data provided on APIS for the site of interest; required in use of Critical Load Function Tool; average background deposition data referred to

3: assumes 70% modelled values

8.3.10 The Critical Load Function Tool on the APIS website has been used to calculate the exceedances and deposition as a proportion of the Critical Load for acid deposition.

Table 8.9: Results and Exceedances – Acidification

Receptor	PC		PEC	
	Exceedance	% of lower CL function	Exceedance	% of Lower Critical Load function
Llwyn SAC (E1)	none	0	*No further assessment required*	
Alyn Valley Woods SAC (E2&E3)	none	0	*No further assessment required*	

Notes: calculated using the APIS Critical Load Function Tool

8.3.11 All combined PCs modelled in the closest parts of the nature conservation sites are below the relevant screening thresholds and are insignificant irrespective of background concentrations. No further assessment is required

8.4 <u>In-Combination Assessment</u>

8.4.1 With regards to the two SACs within 10km of the Site NRW has requested an *'in-combination assessment of the combined impacts of all permissions, plans or projects that affect each respective habitat site'*.

8.4.2 There is currently little guidance available as to when an in-combination assessment is required. Guidance provided by the IAQM suggests that relevant projects and plans to be considered include those that may have been approved but are, as yet, incomplete (e.g. a committed development), the subject of an outstanding appeal, or ongoing review. It is also noted that IAQM advice is that *it is rare for a proposed new or enlarged industrial installation to be located close*

to other proposed new or enlarged industrial facilities and the risk of the plumes overlapping and giving rise to a significant effect on a designated site is generally low.

8.4.3 It is considered appropriate to determine whether any such plans or projects exist that may require consideration within 10km of the identified nature conservation sites being assessed rather than 10km of the Site. This is to ensure any potential overlap of emission plumes within the nature conservation sites are taken into account. Consultations have therefore been held with NRW, DCC and the neighbouring local authority, Flintshire County Council (FCC), to determine the presence of any such plans or projects. Responses have been received from NRW and the Environmental Health Officers of DCC and FCC and no such plans or projects have been identified.

8.5 Summary and Conclusions

8.5.1 The screening assessment identified the Llwyn SAC and Alyn Valley Woods SAC within 10km of the Site along with the Lady Bagats Wood LWS and several ancient woodlands within 2km. Detailed assessment has therefore been undertaken of potential impacts due to ambient NO_x, nitrogen deposition and acid deposition arising from aerial emissions from the Site on these sites. The assessment has considered the combined impacts of the process contributions existing and proposed CHP plant stacks and Stela dryers, not just the change due to the proposed additional CHP stack that is subject to the permit variation.

8.5.2 All process contributions of long-term and short-term NO_x, and nitrogen and acid deposition are well below the screening thresholds referred to and no further assessment is required.

8.5.3 No other plans or projects have been identified within 10km of the two SACs that require consideration within an in-combination assessment.

9 Conclusions

9.1 Proposals are for the operation of additional equipment comprising a CHP biomass boiler and a Stela dryer at the existing wood drying facility operated by Blazer's Fuels / Newbridge Energy Ltd in Ruthin. The new plant would supplement the existing CHP plant and Stela dryer installed in 2017 at the facility. The additional facility will be served by a main flue associated with the biomass boiler (and two emergency stacks) and two stacks associated with the dryer. The proposals also included for the re-location of the two stacks associated with the existing Stela dryer; these have now been relocated and are operational in the new location.

9.2 An Environmental Permit is held for the existing facility which specifies emission limit values (ELVs) for aerial emissions from the CHP biomass boiler stack. An application has been submitted to NRW to vary the existing Permit to include the proposed additional biomass boiler.

9.3 An air quality assessment was produced in support of the planning application for the proposed development and which was submitted with the subsequent Environmental Permit variation application. This original air quality assessment was based on emissions data provided by the manufacturer for the plant and subsequent available monitored data. The assessment considered the potential impacts of aerial emissions from the stacks associated with the plant on nearby human health receptors through detailed dispersion modelling. Subsequent addendums were provided during the original Environmental Permit application considering potential impacts on ecological receptors. The original assessment and subsequent addendums have been revised and updated to reflect the ELVs for the existing plant and proposed ELVs for the new plant and to incorporate additional information and assessment as requested by NRW. As previously the assessment has included consideration of the existing and proposed Stela dryers although these are not required to operate to specified ELVs under the Permit.

9.4 The proposed development lies within an industrial / commercial use area on the north-western outskirts of Ruthin. The closest residential properties are located 175m to the southeast off Stryd Yr Wennol. The buildings of the recently completed Ysgol Stryd y Rhos and Ysgol Pen Barras are located 385m to the south of the site, with accesses off the Ruthin North Link Road 310m and 275m from the site boundary.

9.5 Background air quality in the general area is good with annual mean concentrations of the primary pollutants of consideration of NO_2, PM_{10} $PM_{2.5}$, along with those of CO, benzene and 1,3-butadience, all predicted to be well below the relevant Environmental Assessment Levels. The modelling has been used to predict the process contributions from the combined emissions of the current and proposed CHP stacks and Stela dryer stacks on nearby human health receptors. All resulting total pollutant concentrations are predicted to remain well below the relevant standards.

9.5.1 The assessment has also included consideration of potential impacts on designated nature conservation sites identified within relevant search radii; namely two SACs within 10km of the site and a LWS and several ancient woodlands within 2km. All process contributions of long-term and short-term NO_x, and nitrogen and acid deposition are well below the screening thresholds referred to at these sites and no further assessment is required.

Appendix A

Bala and
Rhyl No.2 Windroses

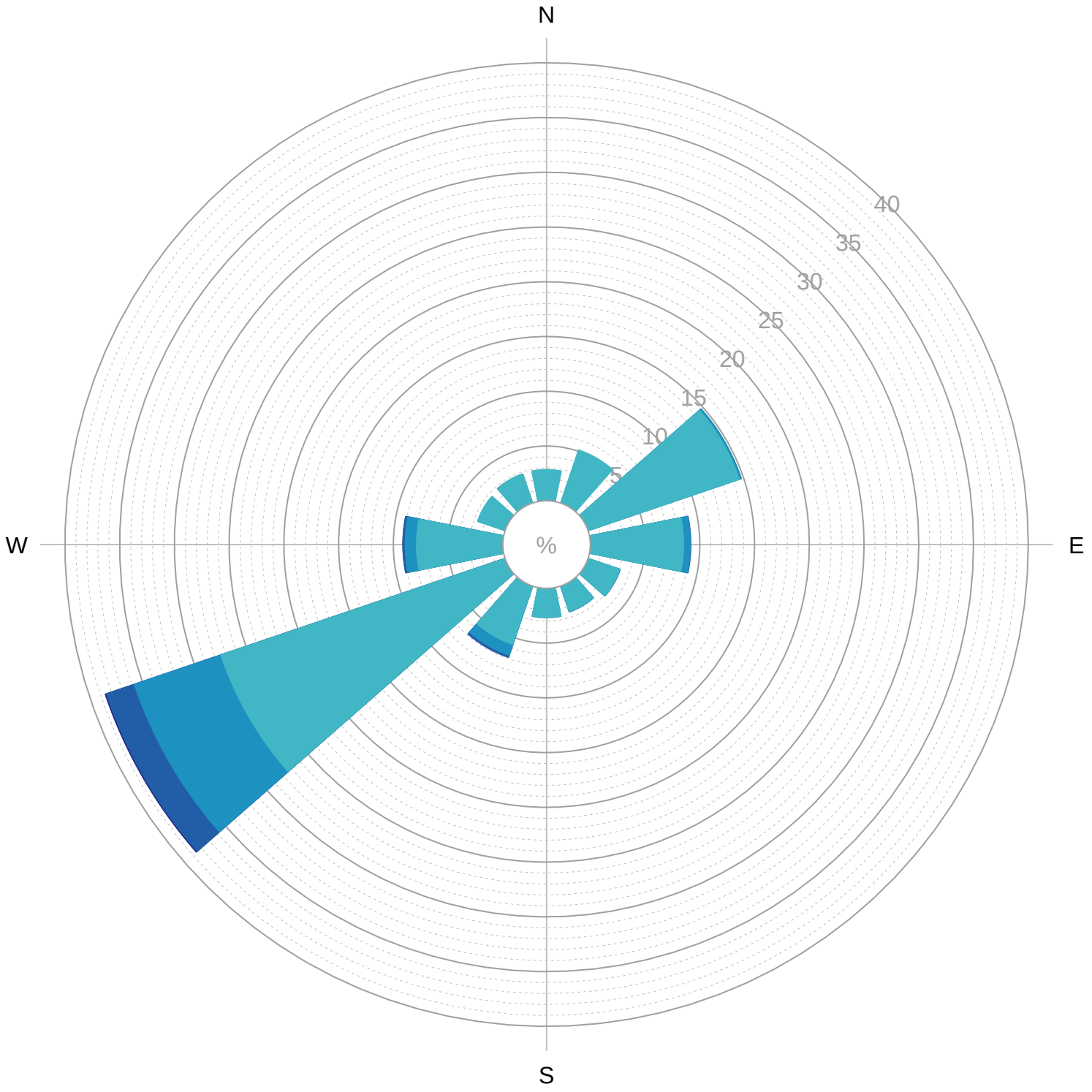
HOURLY MEAN WIND ROSE FOR BALA

NGR: 2935 E 3356 N

ALTITUDE: 163 metres AMSL

SEASON: ANNUAL

Period of data: Jan 2007 − Dec 2016



87,064 OBSERVATIONS

6.8% CALM

0.0% VARIABLE

1−10	11−16	17−27	28−33	>33

Hourly mean wind speed (knots)

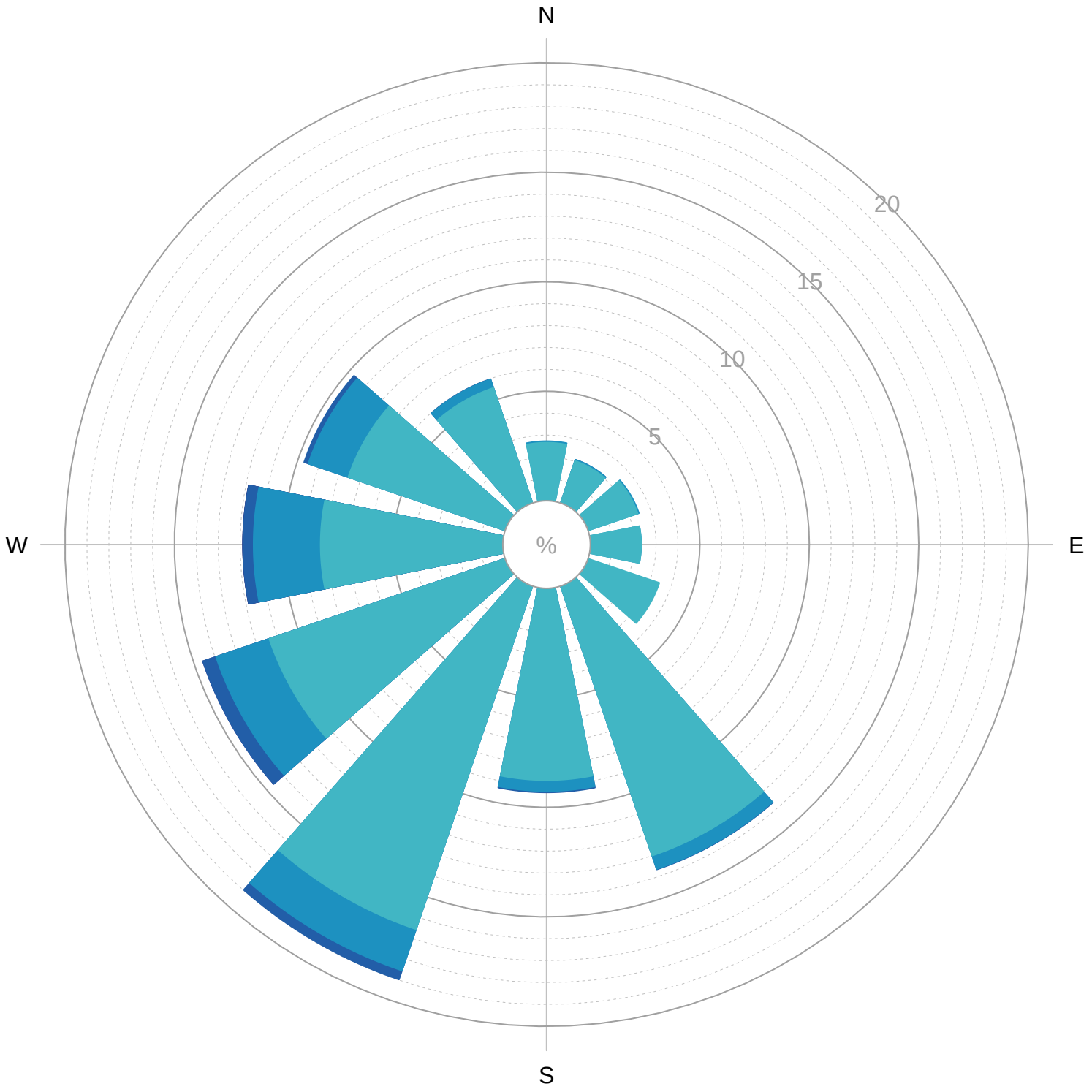
HOURLY MEAN WIND ROSE FOR RHYL NO 2

NGR: 2994 E 3747 N

ALTITUDE: 77 metres AMSL

SEASON: ANNUAL

Period of data: Jan 2006 − Dec 2015



86,935 OBSERVATIONS

2.1% CALM

0.0% VARIABLE

1−10 11−16 17−27 28−33 >33

Hourly mean wind speed (knots)

Appendix B

Monitoring Data

Element Materials Technology, Unit C6, Emery Court, The Embankment Business Park, Heaton Mersey, Stockport, SK4 3GL
Your Element Contact: Scott Pilkington (07825 991 537)
E: scott.pilkington@element.com

Stack Emissions Testing Report Commissioned by
Blazers Fuels Ltd

Installation Name & Address
Newbridge Energy Ltd
Brickfield Lane
Ruthin
Denbighshire
North Wales
LL15 2TN

Stack Reference
Biomass CHP Plant Exhaust

Dates of the Monitoring Campaign
3rd August 2021

Job Reference Number
EMT-01425

Report Written by
Matthew Miller Team Leader MCERTS Level 2 MM 14 1313 TE1 TE2 TE3 TE4

Report Approved by
Richard Carter Senior Team Leader MCERTS Level 2 MM 07 861 TE1 TE2 TE3 TE4

Report Date
10th August 2021

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

Newbridge Energy Ltd, Ruthin
Biomass CHP Plant Exhaust
3rd August 2021

Overall Aim of the Monitoring Campaign

Element were commissioned by Blazers Fuels Ltd to carry out stack emissions testing for Newbridge Energy Ltd on the Biomass CHP Plant Exhaust at Ruthin.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Oxides of Nitrogen (as NO_2)

Executive Summary

MONITORING RESULTS

Newbridge Energy Ltd, Ruthin
Biomass CHP Plant Exhaust
3rd August 2021

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	20.9	2.0	30	g/hr	175	31	-
Oxides of Nitrogen (as NO_2) [1]	mg/m³	288	12.0	300	g/hr	2406	380	-
Oxygen	% v/v	**Dry** 9.9	0.25					
Water Vapour	% v/v	13.1	0.73					
Stack Gas Temperature	°C	202						
Stack Gas Velocity	m/s	10.5	1.5					
Volumetric Flow Rate (ACTUAL)	m³/hr	22574	3441					
Volumetric Flow Rate (REF) [1]	m³/hr	8352	1273					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, dry gas, 6% oxygen.

Executive Summary

MONITORING DATE(S) & TIMES

Newbridge Energy Ltd, Ruthin
Biomass CHP Plant Exhaust
3rd August 2021

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	19.3	g/hr	161	03/08/2021	12:06 - 12:38	32
Total Particulate Matter	R2	mg/m³	19.7	g/hr	164	03/08/2021	12:45 - 13:17	32
Total Particulate Matter	R3	mg/m³	23.8	g/hr	199	03/08/2021	13:25 - 13:57	32
Oxides of Nitrogen (as NO_2)	R1	mg/m³	290	g/hr	2419	03/08/2021	12:06 - 12:38	32
Oxides of Nitrogen (as NO_2)	R2	mg/m³	283	g/hr	2366	03/08/2021	12:45 - 13:17	32
Oxides of Nitrogen (as NO_2)	R3	mg/m³	291	g/hr	2434	03/08/2021	13:25 - 13:57	32
Oxygen	R1	% v/v	9.8			03/08/2021	12:06 - 12:38	32
Oxygen	R2	% v/v	9.8			03/08/2021	12:45 - 13:17	32
Oxygen	R3	% v/v	10.1			03/08/2021	13:25 - 13:57	32
Velocity Traverse	R1					03/08/2021	09:25 - 09:35	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Newbridge Energy Ltd, Ruthin
Biomass CHP Plant Exhaust
3rd August 2021

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	3 Tonnes / Hour
Continuous or Batch Process	Continuous
Feedstock (if applicable)	Wood Chip Pellets
Abatement System	Bag Filter & Cyclone
Abatement System Running Status	On
Fuel	Wood Chips
Plume Appearance	Not visible from the sampling location

Executive Summary

(Page 5 of 7)

MONITORING & ANALYTICAL METHODS

Newbridge Energy Ltd, Ruthin
Biomass CHP Plant Exhaust
3rd August 2021

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	CAT-TP-01	MCERTS	EET	CAT-TP-03	Gravimetric	MCERTS	EET	MCERTS	0.48 mg/m³
Water Vapour	EN 14790	CAT-TP-05	MCERTS	EET	CAT-TP-05	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Oxides of Nitrogen (as NO_2)	EN 14792	CAT-TP-39	MCERTS	EET	Chemiluminescence by Horiba PG-350E				MCERTS	0.41 mg/m³
Oxygen	EN 14789	CAT-TP-39	MCERTS	EET	Dry Paramagnetic Cell by Horiba PG-350E				MCERTS	0.1 %
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	CAT-TP-41	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.8 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element Materials Technology (EET)	ISO 17025 Accreditation Number: 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Total Particulate Matter	1, 2, 3	One out of two sampling lines was used due to sampling location restrictions, however the number of sample points used on the available line were increased to the minimum required by the Standard

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.87
Width	m	-
Area	m^2	0.59
Port Depth	cm	30
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	5" Flange

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Permanent
Inside / Outside	Inside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Sampling Plane Validation Criteria (from EN 15259)

Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	60.8	> 5 Pa	Yes
Mean Velocity	m/s	10.75	-	-
Lowest Gas Velocity	m/s	10.66	-	-
Highest Gas Velocity	m/s	10.84	-	-
Ratio of Above	: 1	1.02	< 3 : 1	Yes
Maximum Angle of Swirl	°	3.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

Executive Summary

PLANT PHOTOS

Photo 1

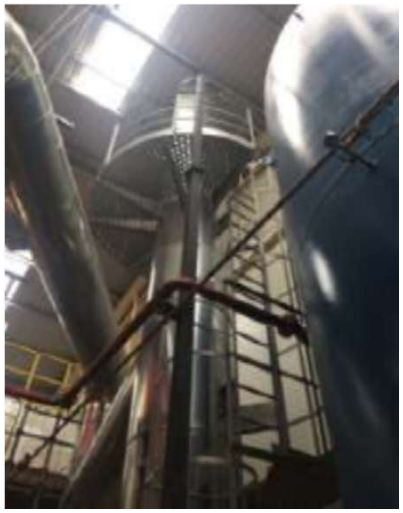
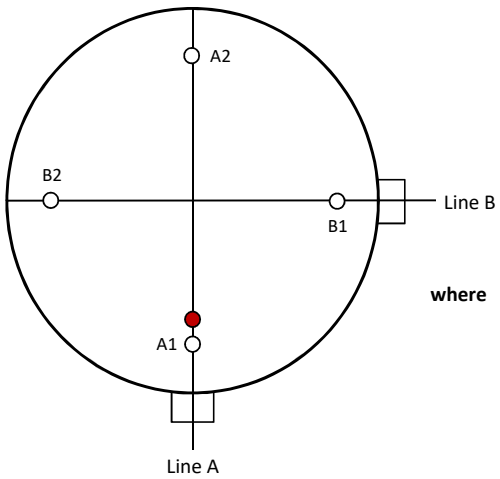


Photo 2

Photo 3

Photo 4

SAMPLE POINTS



where
- ○ = isokinetic point sampled at
- ● = isokinetic point not sampled at
- ● = combustion gases sample point
- ● = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Matthew Miller	MCERTS Level 2	MM 14 1313	TE1 TE2 TE3 TE4
Trainee	Afraz Rajah	MCERTS Trainee	MM 21 1621	None

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.5
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 4.96
Box Thermocouples (2)	CAT 4.97
Umbilical (1)	CAT 3.12
Umbilical (2)	-
Oven Box (1)	CAT 12.36
Oven Box (2)	-
Heated Probe (1)	-
Heated Probe (2)	CAT 5.19
Heated Probe (3)	-
S-Pitot (1)	-
S-Pitot (2)	CAT 21P.126
L-Pitot	CAT 21L.29
Site Balance	CAT 17.20
500g / 1Kg Check Weights	CAT 17.20
Last Impinger Arm	-
Callipers	CAT 23.7
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-350E	CAT 39.29
Horiba PG-250 SRM	-
Servomex 4900	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	CAT 4.0030
Gasmet DX4000	-
Gasmet Sampling System	-
Bernath 3006 FID	-
M&C PSS	CAT 12.139
Mass Flow Controller (1)	CAT 6.19
Mass Flow Controller (2)	CAT 6.20
Mass View (1)	-
Mass View (2)	-
Hioki 5043 (V)	-
Easylogger EN-EL-12 Bit	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.124
Digital Manometer (2)	CAT 3.125
Digital Temperature Meter	-
Stopwatch	CAT 14.25
Barometer	CAT 13.29
Stack Thermocouple (1)	-
Stack Thermocouple (2)	-
Stack Thermocouple (3)	CAT 4.00099
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	CAT 20.170
20m Heated Line (2)	-
Dual Channel Heater Controller	CAT 3.18
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.26

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	CAT-TP-01
Water Vapour	EN 14790	CAT-TP-05
Oxides of Nitrogen (as NO_2)	EN 14792	CAT-TP-39
Oxygen	EN 14789	CAT-TP-39
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	CAT-TP-41

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.87
Stack Width, W	m	-
Stack Area, A	m^2	0.59
Average Stack Gas Temperature, T_a	°C	199.5
Average Stack Gas Pressure	mmH_2O	6.3
Average Stack Static Pressure, P_{static}	kPa	0.010
Average Barometric Pressure, P_b	kPa	101.4
Average Pitot Tube Calibration Coefficient, C_p	-	0.83

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	10.00	8.69	0.1000	44.01	1.9635	0.19635
O_2	-	9.91	8.62	0.0991	32.00	1.4277	0.14150
N_2	-	80.09	69.62	0.8009	28.01	1.2498	1.00099
Moisture (H_2O)	-	-	13.07	0.1307	18.02	0.8037	0.10501

Where: p = M / 22.41

p_i = r x p

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.339
Wet Density (STP), P_{STW}	kg/m³	1.269
Dry Density (Actual), P_{Actual}	kg/m³	0.774
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	0.734

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	199.5	0.0
Total Pressure	kPa	101.4	101.3
Moisture	%	13.07	0.00
Oxygen (Dry)	%	9.9	6.0

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	23004
Gas Volumetric Flowrate (STP, Wet)	m³/hr	13305
Gas Volumetric Flowrate (STP, Dry)	m³/hr	11567
Gas Volumetric Flowrate REF [1]	m³/hr	8551

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	03/08/2021
Time of Survey	-	09:25 - 09:35
Atmospheric Pressure	kPa	101.4
Average Stack Static Pressure	Pa	10
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with Liquid Incline Manometer	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.83
Number of Lines Available	-	2
Number of Lines Used	-	2

		Sampling Line A					Sampling Line B				
Traverse Point	**Depth m**	**ΔP mmH_2O**	**Temp °C**	**Wet Density kg/m^3**	**Velocity m/s**	**Swirl °**	**ΔP mmH_2O**	**Temp °C**	**Wet Density kg/m^3**	**Velocity m/s**	**Swirl °**
STATIC (Units: Pa)		*10.0*					*10.0*				
Mean		**6.2**	**199.5**	**0.734**	**10.66**		**6.4**	**199.5**	**0.734**	**10.83**	
1	0.13	6.2	199.0	0.735	10.66	2.0	6.4	199.0	0.735	10.83	2.0
2	0.74	6.2	200.0	0.733	10.67	3.0	6.4	200.0	0.733	10.84	3.0

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.864	Pa
- Resolution	u(res)	0.52154	
- Calibration	u(cal)	0.397	
- Drift	u(drift)	1.096	
- Lack of Fit	u(fit)	0.460	
- Overall corrections to dynamic measurements	u(Cf)	2.475	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00008	-
- $\varphi O_2,w$	-	8.616	
- $\varphi CO_2,w$	-	8.693	
- Oxygen, dry	u(ϕO_2,d)	0.303	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.306	
- Water Vapour	u(ϕH_2O)	0.667	
- Oxygen, wet	u(ϕO_2,w)	0.272	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.274	
Standard uncertainty associated with the stack temperature	u(Tc)	2.411	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.697	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.318	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00395	-
Standard uncertainty associated with the local velocities	u(vi)	1.592	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.798	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	1.564	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	14.56	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	3506.6	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00605	
- $u^2(qV,w)$	-	3200890	
- $u(qV,w)$	-	1789.1	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	15.24	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Newbridge Energy Ltd, Ruthin
Biomass CHP Plant Exhaust

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3		Mean
Concentration	mg/m³	19.3	19.7	23.8		20.9
Uncertainty	±mg/m³	1.8	1.9	2.2		2.0
Mass Emission	g/hr	161	164	199		175
Uncertainty	±g/hr	29	30	36		31

Parameter	Units	Run 1	Run 2	Run 3		Mean
Water Vapour	% v/v	12.3	13.8	13.1		13.1
Uncertainty	±% v/v	0.7	0.8	0.7		0.7

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.80		0.80

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	CAT-TP-01	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Glass Fibre	
Number of Sampling Lines Used	2 / 2	FORMAT: Number Used / Number Required
Number of Sampling Points Used	4 / 4	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1, A2, B1 & B2	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 6% oxygen.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1	Run 2	Run 3
Absolute pressure of stack gas, P_s				
Barometric pressure, P_b	mmHg	760.6	760.6	760.6
Stack static pressure, P_{static}	mmH_2O	1.0	1.0	1.0
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	760.6	760.6	760.6
Volume of water vapour collected, V_{wstd}				
Total mass collected in impingers (liquid trap)	g	44.5	49.8	47.6
Total mass collected in impingers (silica trap)	g	16.4	14.0	10.4
Total mass of liquid collected, V_{lc}	g	60.9	63.8	58.0
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0759	0.0795	0.0723
Volume of gas metered dry, V_{mstd}				
Volume of gas sample through gas meter, V_m	m^3	0.6300	0.5930	0.5730
Gas meter correction factor, Y_d	-	0.9530	0.9530	0.9530
Average dry gas meter temperature, T_m	°C	31.2	38.3	39.7
Average pressure drop across orifice, ΔH	mmH_2O	36.0	32.8	31.0
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	0.5411	0.4975	0.4785
Moisture content, B_{wo} & R_{wv}				
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.1230	0.1378	0.1312
B_{wo} as a percentage	% v/v	12.30	13.78	13.12
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	12.30	13.78	13.12
Volume of gas metered wet, V_{mstw}				
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	0.6170	0.5770	0.5508
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$				
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No	No	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	8.54	8.54	8.79
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	9.82	9.83	10.11
% oxygen reference condition, $REF\%O_2$	% v/v	6.00	6.00	6.00
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	1.20	1.20	1.23
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	1.34	1.34	1.38
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	0.5126	0.4791	0.4485
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	0.4033	0.3705	0.3475
Molecular weight of dry gas stream, M_d				
CO_2 (Estimated)	% v/v	10.00	10.00	10.00
O_2	% v/v	9.82	9.83	10.11
Total	% v/v	19.82	19.83	20.11
N_2	% v/v	80.18	80.17	79.89
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	29.99	29.99	30.00
Molecular weight of stack gas (wet), M_s				
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.52	28.34	28.43
Velocity of stack gas, V_s				
Pitot tube velocity constant, K_p	-	34.97	34.97	34.97
Velocity pressure coefficient, C_p	-	0.83	0.83	0.83
Average of velocity heads, ΔP_{avg}	mmH_2O	6.60	5.90	5.58
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.57	2.43	2.36
Average stack gas temperature, T_s	°C	199.8	201.8	203.3
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	11.01	10.46	10.17
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})				
Area of stack, A_s	m^2	0.59	0.59	0.59
$Q_a = (60)(A_s)(V_s)$	m^3/min	392.7	373.2	362.8
Conversion factor (K/mm.Hg), C_f	-	0.3592	0.3592	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	227.0	214.8	208.1
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	199.0	185.2	180.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	188.6	178.4	169.5
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	148.3	137.9	131.3
Percent isokinetic, %I				
Nozzle diameter, D_n	mm	8.00	8.00	8.00
Nozzle area, A_n	mm^2	50.23	50.23	50.23
Total sampling time, q	min	32	32	32
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	100.6	99.4	97.9

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3
Sampling Times	-	12:06 - 12:38	12:45 - 13:17	13:25 - 13:57
Sampling Dates	-	03/08/2021	03/08/2021	03/08/2021
Sampling Device	-	ISO	ISO	ISO
Volume Sampled (REF)	m^3	0.4033	0.3705	0.3475
Filter I.D. Number	-	47-82962	47-82865	47-82869
Start Filter Mass	g	0.14612	0.14541	0.14646
End Filter Mass	g	0.15175	0.15174	0.15450
Total Mass on Filter	g	0.00563	0.00633	0.00804
Probe Rinse I.D. Number	-	PR-47-82962	PR-47-82865	PR-47-82869
Start Probe Rinse Mass	g	3.05673	3.08869	2.89624
End Probe Rinse Mass	g	3.05889	3.08965	2.89647
Total Mass in Probe Rinse	g	0.00216	0.00096	0.00023
Total Mass Collected	mg	7.79	7.29	8.27
Calculated Concentration	mg/m^3	19.32	19.67	23.80
Balance Uncertainty / LOD	mg/m^3	0.45	0.49	0.52

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	03/08/2021
Average Volume Sampled (REF)	m^3	0.3738
Filter I.D. Number	-	47-82631
Start Filter Mass	g	0.14435
End Filter Mass	g	0.14444
Total Mass on Filter	g	0.00009
Probe Rinse I.D. Number	-	PR-47-82631
Start Probe Rinse Mass	g	2.99162
End Probe Rinse Mass	g	2.99183
Total Mass in Probe Rinse	g	0.00021
Total Mass Collected	mg	0.30
Calculated Concentration	mg/m^3	0.80
Balance Uncertainty / LOD	mg/m^3	0.48

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1	Run 2	Run 3
Mean Sampling Rate	l/min	18.8	17.7	17.1
Pre-Sampling Leak Rate	l/min	0.15	0.20	0.25
Allowable Leak Rate	l/min	0.40	0.40	0.40
Leak Test Acceptable	-	Yes	Yes	Yes

Water Droplets	Units	Run 1	Run 2	Run 3
Are Water Droplets Present	-	No	No	No

MU (Concurrent Water Vapour)	Units	Run 1	Run 2	Run 3
Measurement Uncertainty (MU)	%	5.4	5.6	5.7
Allowable MU	%	20.0	20.0	20.0
MU Acceptable	%	Yes	Yes	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1	Run 2	Run 3
Less than 50% Faded	%	Yes	Yes	Yes

Isokinetic Criterion Compliance	Units	Run 1	Run 2	Run 3
Isokinetic Variation	%	100.6	99.4	97.9
Allowable Isokinetic Range	%	95 - 115	95 - 115	95 - 115
Isokineticity Acceptable	-	Yes	Yes	Yes

Weighing Uncertainty Criteria	Units	Run 1	Run 2	Run 3
Overall Weighing Uncertainty	± mg	0.36	0.36	0.36
Overall Weighing Uncertainty	± mg/m³	0.89	0.97	1.04
ELV [Daily ELV for IED]	mg/m³	30.00	30.00	30.00
Allowable Weighing Uncertainty	mg/m³	1.50	1.50	1.50
Weighing Uncertainty Acceptable	-	Yes	Yes	Yes

Filter Temperatures	Units	Run 1	Run 2	Run 3
Pre-Conditioning Temperature	°C	180	180	180
Post-Conditioning Temperature	°C	160	160	160
Maximum Filter Temperature	°C	202	202	204

Test Conditions	Units	Run 1	Run 2	Run 3
Ambient Temperature Recorded?	-	Yes	Yes	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.10
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	3.0
Blank Acceptable	-	Yes

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	2	3	
One out of two sampling lines was used due to sampling location restrictions, however the number of sample points used on the available line were increased to the minimum required by the Standard	wx	wx	wx	

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value				Standard uncertainty				
Measured Quantities	**Symbol**	**Run 1**	**Run 2**	**Run 3**	**Symbol**	**Units**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (Actual)	V_m	0.6300	0.5930	0.5730	uV_m	m^3	0.0126	0.0119	0.0115
Sampled Gas Temperature	T_m	304.2	311.3	312.7	uT_m	K	2.00	2.00	2.00
Sampled Gas Pressure	ρ_m	101.4	101.4	101.4	$u\rho_m$	kPa	0.50	0.50	0.50
Sampled Gas Humidity	H_m	0.00	0.00	0.00	uH_m	% v/v	1.00	1.00	1.00
Leak	L	0.80	1.13	1.47	uL	%	-	-	-
Mass of Particulate	m	7.79	7.29	8.27	um	mg	0.18	0.18	0.18
Uncollected Mass	UCM	0.30	0.30	0.30	uUCM	mg	-	-	-

	Uncertainty as a Percentage				
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	2.00	2.00	≤2%
Sampled Gas Temperature	%	0.66	0.64	0.64	≤1%
Sampled Gas Pressure	%	0.49	0.49	0.49	≤1%
Sampled Gas Humidity	%	1.00	1.00	1.00	≤1%
Leak	%	0.80	1.13	1.47	≤2%
Mass of Particulate	%	1.49	1.62	1.73	<5% of ELV
Uncollected Mass	%	-	-	-	-

	Uncertainty in Measurement Units					Sensitivity Coefficient		
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 2**	**Run 3**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (STP)	V_m	m^3	0.5411	0.4975	0.4785	35.70	39.55	49.73
Leak	L	mg/m^3	0.089	0.129	0.201	1.00	1.00	1.00
Mass of Particulate	L_r	mg	7.790	7.290	8.270	2.48	2.70	2.88
Uncollected Mass	UCM	mg	0.17	0.17	0.17	2.48	2.70	2.88

	Uncertainty in Result			
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**
Sampled Volume (STP)	mg/m^3	0.515	0.533	0.647
Leak	mg/m^3	0.0892	0.1286	0.2013
Mass of Particulate	mg/m^3	0.4464	0.4858	0.5180
Uncollected Mass	mg/m^3	0.4295	0.4674	0.4984

	Oxygen Correction Part of MU Budget			
Measured Quantities	**Units**	**Run 1**	**Run 2**	**Run 3**
O_2 Correction Factor	-	1.34	1.34	1.38
Stack Gas O_2 Content	% v/v	9.82	9.83	10.11
MU for O_2 Correction	-	0.06	0.06	0.06
Overall MU For O_2 Measurement	%	4.47	4.48	4.59

Parameter	**Units**	**Run 1**	**Run 2**	**Run 3**
Combined uncertainty	mg/m^3	0.81	0.87	0.99
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	1.59	1.70	1.94
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	1.81	1.92	2.22
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	1.81	1.92	2.22
Reported Uncertainty	mg/m^3	1.81	1.92	2.22
Expanded uncertainty (95% confidence), without Oxygen Correction	%	8.2	8.7	8.1
Expanded uncertainty (95% confidence), with Oxygen Correction	%	9.4	9.7	9.3
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	9.4	9.7	9.3
Reported Uncertainty	%	9.4	9.7	9.3

OXIDES OF NITROGEN (as NO_2): RESULTS SUMMARY

Newbridge Energy Ltd, Ruthin
Biomass CHP Plant Exhaust

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3	Mean
Concentration	mg/m³	290	283	291	288
Uncertainty	±mg/m³	12	12	12	12
Mass Emission	g/hr	2419	2366	2434	2406
Uncertainty	±g/hr	382	374	385	380

General Sampling Information

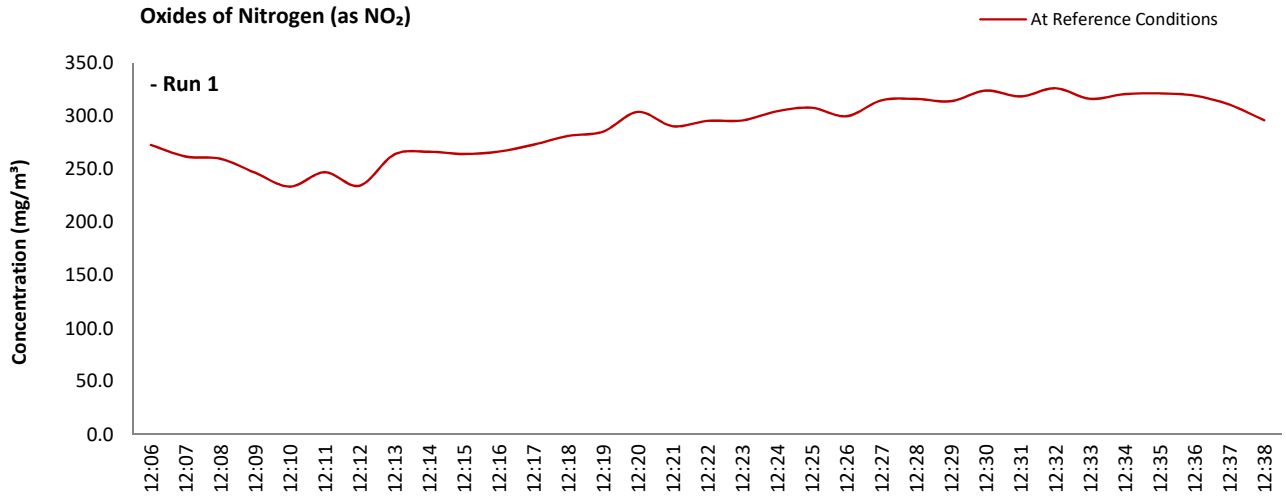
Parameter	Value	
Standard	EN 14792	
Technical Procedure	CAT-TP-39	
Probe Material	Titanium	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Date & Result of Last Converter Check	26/05/2021 - 95.1%	
Span Gas Type	Nitrogen Monoxide	
Span Gas Reference Number	CYL 12.0339	
Span Gas Expiry Date	30/01/2023	
Span Gas Start Pressure (bar)	80	
Gas Cylinder Concentration (ppm)	403.9	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

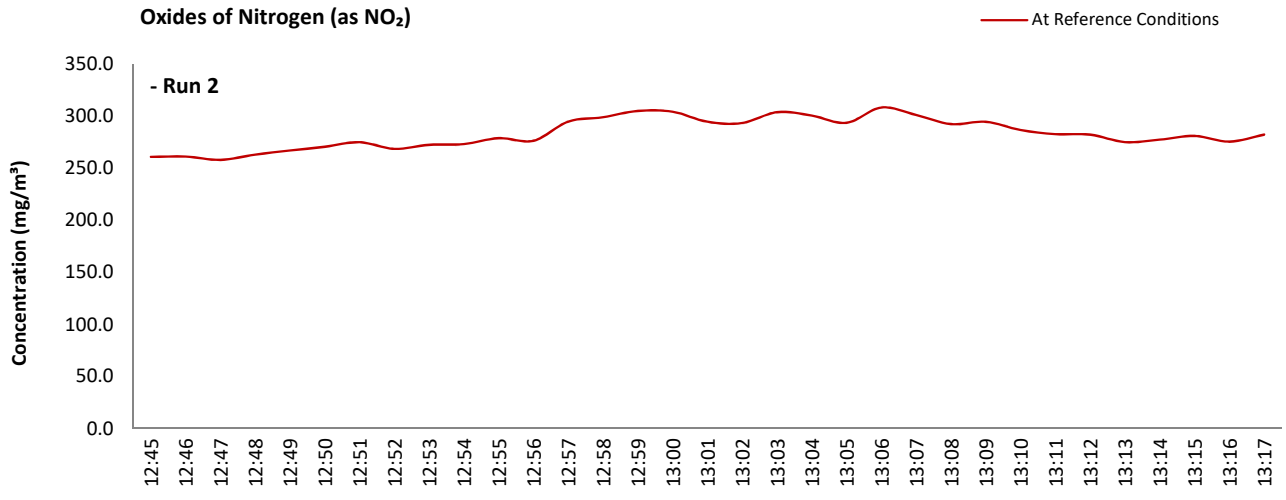
Reference Conditions

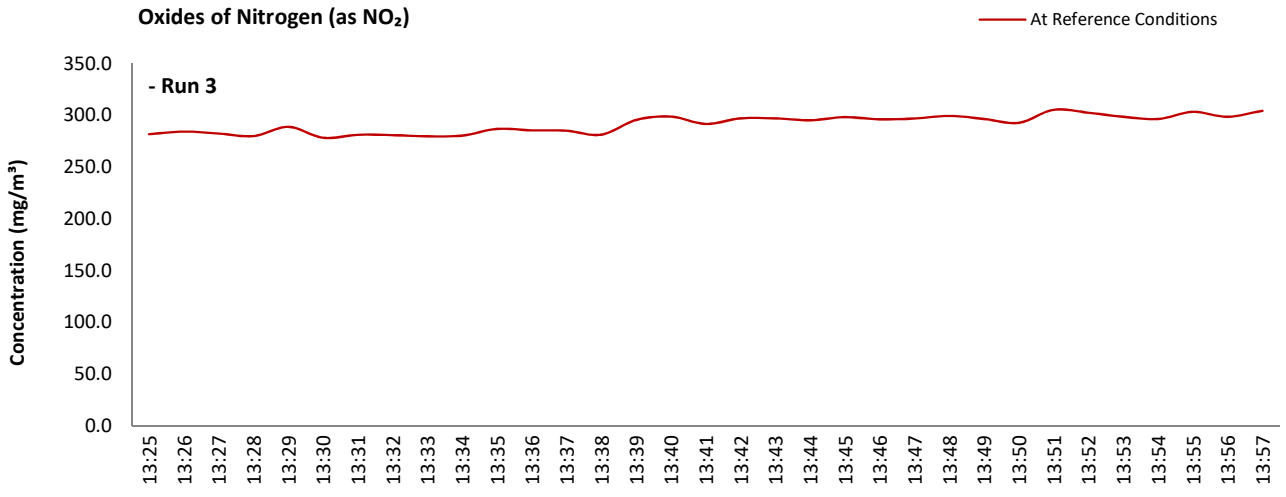
Reference Conditions are: 273K, 101.3kPa, dry gas, 6% oxygen.

OXIDES OF NITROGEN (as NO_2): DATA TREND

Graphical Trend of Data







OXIDES OF NITROGEN (as NO_2): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1	Run 2	Run 3
Sampling Times	-	12:06 - 12:38	12:45 - 13:17	13:25 - 13:57
Sampling Dates	-	03/08/2021	03/08/2021	03/08/2021
Instrument Range	ppm	500	500	500
Span Gas Value	ppm	146.2	146.2	146.2

Quality Assurance

Conditioning Unit Temperature	Units	Run 1	Run 2	Run 3
Average Temperature	°C	2.5	2.5	2.5
Allowable Temperature	< °C	4.0	4.0	4.0
Temperature Acceptable	-	Yes	Yes	Yes

	Zero Drift	Units	Run 1	Run 2	Run 3
CAL 1	Zero at Analyser (Pre)	ppm	0.00	0.00	0.00
CAL 1	Zero at Analyser (Post)	ppm	0.00	0.00	0.00
CAL 1	Zero Drift	ppm	0.00	0.00	0.00
CAL 1	Zero Drift	%	0.00	0.00	0.00
CAL 1	Drift Correction Applied	2-5%	No	No	No
	Allowable Zero Drift	± %	5.00	5.00	5.00
	Zero Drift Acceptable	-	Yes	Yes	Yes

	Span Drift	Units	Run 1	Run 2	Run 3
CAL 1	Span at Analyser (Pre)	ppm	146.00	146.00	146.00
CAL 1	Span at Analyser (Post)	ppm	143.9	143.90	143.90
CAL 1	Span Drift	ppm	-2.10	-2.10	-2.10
CAL 1	Zero Adj. Span Drift	%	1.44	1.44	1.44
CAL 1	Drift Correction Applied	2-5%	No	No	No
	Allowable Span Drift	± %	5.00	5.00	5.00
	Span Drift Acceptable	-	Yes	Yes	Yes

Test Conditions	Units	Run 1	Run 2	Run 3
Run Ambient Temperature Range	°C	19 - 25	19 - 25	19 - 25

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	2	3
There are no deviations associated with the sampling employed.	x	x	x

OXIDES OF NITROGEN (as NO_2): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1	RUN 2	RUN 3	Units
Limit value	300.0	300.0	300.0	mg/m³ (REF)
Allowable MU	10.0	10.0	10.0	%
Measured concentration	216.40	210.99	211.99	mg/m³ (STP, dry)
Ratio NO / NO_2	5	5	5	%
Range Used	500.0	500.0	500.0	ppm
Range Used [A]	1026.1	1026.1	1026.1	mg/m³
Cal gas conc.	146.2	146.2	146.2	ppm
Conversion	2.05	2.05	2.05	ppm to mg/m³
MCERTS Range [B]	205.0	205.0	205.0	mg/m³
Lower of [A] or [B]	205.0	205.0	205.0	mg/m³
Cal gas conc.	300.0	300.0	300.0	mg/m³

Performance characteristics	RUN 1	RUN 2	RUN 3	Units
Response time	31	31	31	seconds
Number of readings in measurement	32	32	32	-
Repeatability at zero	0.00	0.00	0.00	% full scale
Repeatability at span level	0.10	0.10	0.10	% full scale
Deviation from linearity	0.28	0.28	0.28	% of value
Zero drift	0.00	0.00	0.00	% full scale
Span drift	-1.44	-1.44	-1.44	% full scale
Volume or pressure flow dependence	0.10	0.10	0.10	% of full scale
Atmospheric pressure dependence	0.10	0.10	0.10	% of value/kPa
Ambient temperature dependence	0.04	0.04	0.04	% full scale/10K
Combined interference	0.63	0.63	0.63	% range
Dependence on voltage	-0.23	-0.23	-0.23	% full scale/10V
Converter efficiency	95.1	95.1	95.1	%
Losses in the line (leak)	1.30	1.30	1.30	% of value
Uncertainty of calibration gas blending	1.40	1.40	1.40	% of value
Uncertainty of calibration gas	2.00	2.00	2.00	% of value

Performance characteristic	RUN 1	RUN 2	RUN 3	Units
Standard deviation of repeatability at zero	use rep at span	use rep at span	use rep at span	mg/m³
Standard deviation of repeatability at span level	0.02	0.02	0.02	mg/m³
Lack of fit	0.33	0.33	0.33	mg/m³
Drift	0.00	0.00	0.00	mg/m³
Volume or pressure flow dependence	0.00	0.00	0.00	mg/m³
Atmospheric pressure dependence	0.06	0.06	0.06	mg/m³
Ambient temperature dependence	0.01	0.01	0.01	mg/m³
Combined interference (from MCERTS Certificate)	0.75	0.75	0.75	mg/m³
Dependence on voltage	-0.03	-0.03	-0.03	mg/m³
Converter efficiency	0.31	0.30	0.30	mg/m³
Losses in the line (leak)	1.62	1.58	1.59	mg/m³
Uncertainty of calibration gas blending	1.75	1.71	1.71	mg/m³
Uncertainty of calibration gas	2.50	2.44	2.45	mg/m³

			RUN 1	RUN 2	RUN 3	Units
Measurement uncertainty		**Result**	216.40	210.99	211.99	mg/m³
Combined uncertainty			3.64	3.56	3.57	mg/m³
Expanded uncertainty	k =	1.96	7.14	6.98	7.01	mg/m³
Uncertainty corrected to std conds. (O_2)			9.55	9.37	9.63	mg/m³ (REF)

	RUN 1	RUN 2	RUN 3	Units
Expanded uncertainty (no O_2) - at 95% Confidence	3.30	3.31	3.30	% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	2.38	2.33	2.34	% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	10.0	10.0	10.0	% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**	**N/A**	**N/A**	-

	RUN 1	RUN 2	RUN 3	Units
Expanded uncertainty (with O_2) - at 95% Confidence	4.17	4.17	4.17	% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	4.08	4.03	4.09	% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	10.3	10.3	10.32	% at ELV
Result of Compliance with Uncertainty Requirement	**COMPLIANT**	**COMPLIANT**	**COMPLIANT**	-

Requirement for SRM is that Uncertainty should be <10% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 10% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components).

OXYGEN: RESULTS SUMMARY

Newbridge Energy Ltd, Ruthin
Biomass CHP Plant Exhaust

Sample Runs

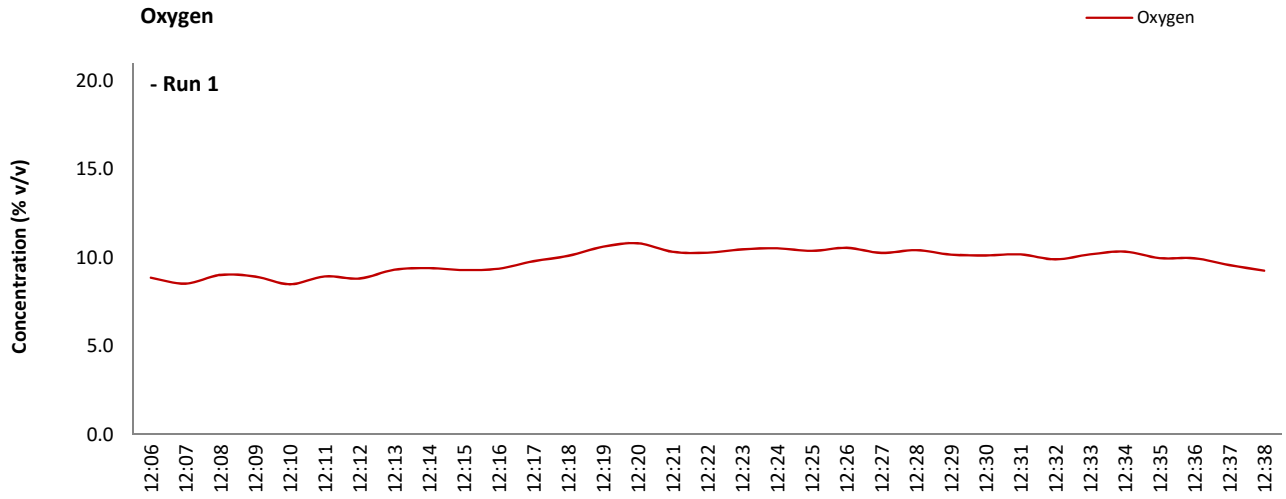
Parameter	Units	Run 1	Run 2	Run 3	Mean
Concentration	% v/v	9.8	9.8	10.1	9.9
Uncertainty	±% v/v	0.2	0.2	0.3	0.3

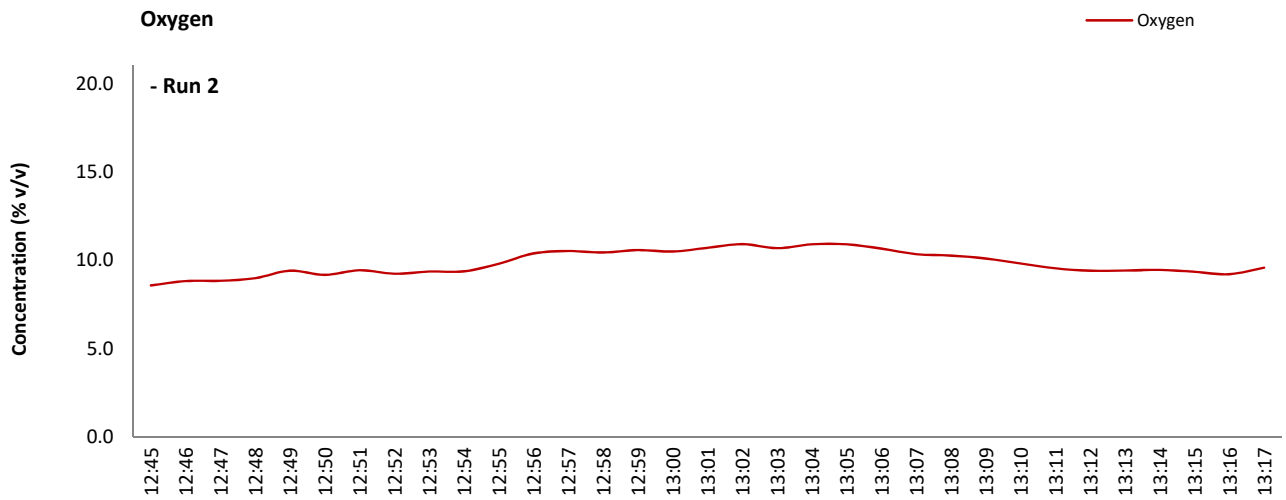
General Sampling Information

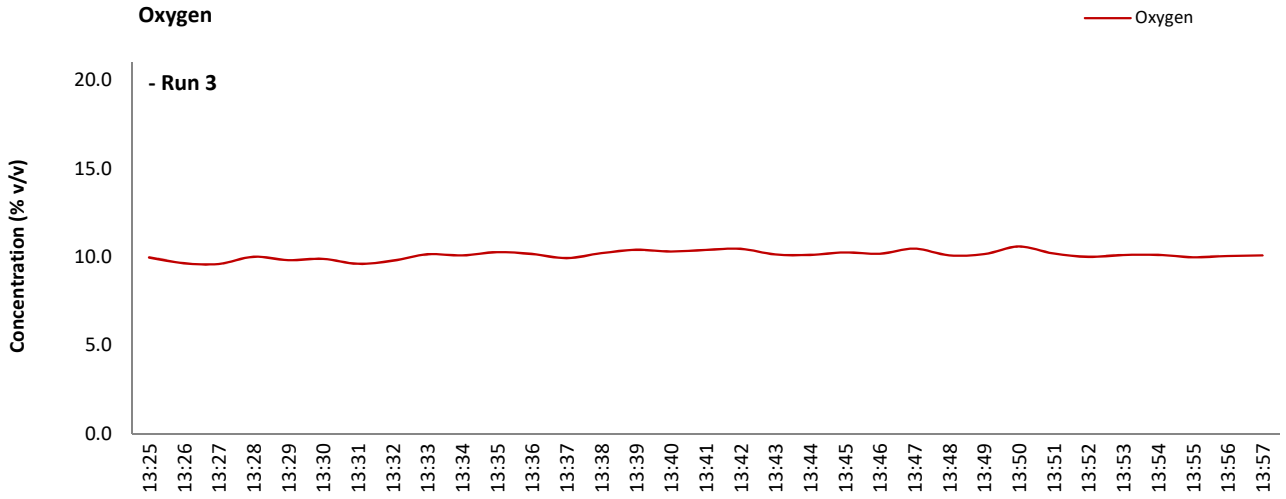
Parameter	Value	
Standard	EN 14789	
Technical Procedure	CAT-TP-39	
Probe Material	Titanium	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Synthetic Air (5 Grade)	
Span Gas Reference Number	CYL 11.0473	
Span Gas Expiry Date	18/05/2026	
Span Gas Start Pressure (bar)	100	
Gas Cylinder Concentration (% v/v)	21.13	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

OXYGEN: DATA TREND

Graphical Trend of Data







OXYGEN: SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1	Run 2	Run 3
Sampling Times	-	12:06 - 12:38	12:45 - 13:17	13:25 - 13:57
Sampling Dates	-	03/08/2021	03/08/2021	03/08/2021
Instrument Range	% v/v	25.0	25.0	25.0
Span Gas Value	% v/v	11.0	11.0	11.0

Quality Assurance

Conditioning Unit Temperature	Units	Run 1	Run 2	Run 3
Average Temperature	°C	2.5	2.5	2.5
Allowable Temperature	< °C	4.0	4.0	4.0
Temperature Acceptable	-	Yes	Yes	Yes

	Zero Drift	Units	Run 1	Run 2	Run 3
CAL 1	Zero at Analyser (Pre)	% v/v	0.00	0.00	0.00
CAL 1	Zero at Analyser (Post)	% v/v	0.09	0.09	0.09
CAL 1	Zero Drift	% v/v	0.09	0.09	0.09
CAL 1	Zero Drift	%	0.82	0.82	0.82
CAL 1	Drift Correction Applied	2-5%	No	No	No
	Allowable Zero Drift	± %	5.00	5.00	5.00
	Zero Drift Acceptable	-	Yes	Yes	Yes

	Span Drift	Units	Run 1	Run 2	Run 3
CAL 1	Span at Analyser (Pre)	% v/v	10.99	10.99	10.99
CAL 1	Span at Analyser (Post)	% v/v	11.01	11.01	11.01
CAL 1	Span Drift	% v/v	0.02	0.02	0.02
CAL 1	Zero Adj. Span Drift	%	0.64	0.64	0.64
CAL 1	Drift Correction Applied	2-5%	No	No	No
	Allowable Span Drift	± %	5.00	5.00	5.00
	Span Drift Acceptable	-	Yes	Yes	Yes

Test Conditions	Units	Run 1	Run 2	Run 3
Run Ambient Temperature Range	°C	19 - 25	19 - 25	19 - 25

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	2	3
There are no deviations associated with the sampling employed.	x	x	x

OXYGEN: MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1	RUN 2	RUN 3	Units
Limit value	N/A	N/A	N/A	%vol
Allowable MU	6.0	6.0	6.0	%
Measured concentration	9.79	9.83	10.09	%vol
Range Used	25.0	25.0	25.0	%vol
Cal gas conc.	21.1	21.1	21.1	%vol

Performance characteristics	RUN 1	RUN 2	RUN 3	Units
Response time	41	41	41	seconds
Number of readings in measurement	32	32	32	-
Repeatability at zero	0.02	0.02	0.02	% full scale
Repeatability at span level	0.02	0.02	0.02	% full scale
Deviation from linearity	0.07	0.07	0.07	% of value
Zero drift	0.82	0.82	0.82	% full scale
Span drift	-0.64	-0.64	-0.64	% full scale
Volume or pressure flow dependence	0.10	0.10	0.10	% of full scale
Atmospheric pressure dependence	0.19	0.19	0.19	% of value/kPa
Ambient temperature dependence	-0.21	-0.21	-0.21	% full scale/10K
Combined interference	0.00	0.00	0.00	% range
Dependence on voltage	0.02	0.02	0.02	% full scale/10V
Losses in the line (leak)	0.82	0.82	0.82	% of value
Uncertainty of calibration gas	2.00	2.00	2.00	% of value

Performance characteristic	RUN 1	RUN 2	RUN 3	Units
Standard deviation of repeatability at zero	use rep at span	use rep at span	use rep at span	%vol
Standard deviation of repeatability at span level	0.00	0.00	0.00	%vol
Lack of fit	0.01	0.01	0.01	%vol
Drift	0.00	0.00	0.00	%vol
Volume or pressure flow dependence	0.00	0.00	0.00	%vol
Atmospheric pressure dependence	0.01	0.01	0.01	%vol
Ambient temperature dependence	-0.03	-0.03	-0.03	%vol
Combined interference (from MCERTS Certificate)	0.00	0.00	0.00	%vol
Dependence on voltage	0.00	0.00	0.00	%vol
Losses in the line (leak)	0.05	0.05	0.05	%vol
Uncertainty of calibration gas	0.11	0.11	0.12	%vol

			RUN 1	RUN 2	RUN 3	Units
Measurement uncertainty		**Result**	9.79	9.83	10.09	%vol
Combined uncertainty			0.13	0.13	0.13	%vol
Expanded uncertainty	k =	1.96	0.25	0.25	0.26	%vol

	RUN 1	RUN 2	RUN 3	Units
Expanded uncertainty (no O_2) - at 95% Confidence	2.54	2.54	2.54	% of Value
Result of Compliance with Uncertainty Requirement	**COMPLIANT**	**COMPLIANT**	**COMPLIANT**	-

Requirement for SRM is that Uncertainty should be 0.3% vol absolute or 6% relative whichever is the lower, on a dry gas basis. Source, EN 14789.

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

Appendix C

Nature Conservation Sites:
Background Information

R2298D: Brickfields Lane, Ruthin
Appendix C: Summary of International Nature Conservation Sites within10km of Facility and Background Information

Site[1]	Site Interest Feature[2]	Sensitivity / Habitat / Class[2]	Critical Level / Load[2]	Background[2, 3]
Ambient NOx				
Llwyn SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) *[APIS information]*	not sensitive	n/a	n/a
	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) *[NRW information]*	NRW advises is sensitive to nitrogen deposition; APIS updated since 2018	annual mean: NOx 30 ug/m3; daily mean: NOx 75 ug/m3	Maximum: 5.9 Minimum: 5.52 Average: 5.56
Alyn Valley Woods SAC	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)	habitat is sensitive	annual mean: NOx 30 ug/m3; daily mean: NOx 75 ug/m3	Maximum: 6.96 Minimum: 5.95 Average: 6.54
Nitrification				
Llwyn SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) *[APIS information]*	not senstitive	n/a	n/a
	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) *[NRW information]*	Carex paniculata woodland, Urtica dioica woodland, Lysimachia nemorum woodland	10-20 kgN/ha/yr	Maximum: 35 Minimum: 32 Average: 34.8
		Mercurialis perennis woodland	15-20 kgN/ha/yr	Maximum: 35 Minimum: 32 Average: 34.8
Alyn Valley Woods SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) *[NRW information]*	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	10-20 kgN/ha/yr	Maximum: 34.3 Minimum: 32.2 Average: 33
	Tilio-Acerion forests of slopes, screes and ravines	Meso- and eutrophic Quercus woodland	15-20 N/ha/yr	Maximum: 34.3 Minimum: 32.2 Average: 33
Acidification				
Llwyn SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	not sensitive	n/a	n/a
		NRW advises features are senstvie	MinCLminN: 0.142 | MaxCLminN: 0.357 MinCLMaxS: 1.729 | MaxCLMaxS: 2.715 MinCLMaxN: 1.877 | MaxCLMaxN: 3.723	Maximum N|S : 2.5 | 0.2 Minimum N|S: 2.3 | 0.2 Average N|S: 2.5 | 0.2
Alyn Valley Woods SAC	Tilio-Acerion forests of slopes, screes and ravines	Unmanaged Broadleafed/Coniferous Woodland	MinCLminN: 0.142 | MaxCLminN: 0.142 MinCLMaxS: 1.721 | MaxCLMaxS: 6.036 MinCLMaxN: 1.863 | MaxCLMaxN: 6.178	Maximum N|S : 2.5 | 0.2 Minimum N|S: 2.3 | 0.2 Average N|S: 2.4 | 0.2

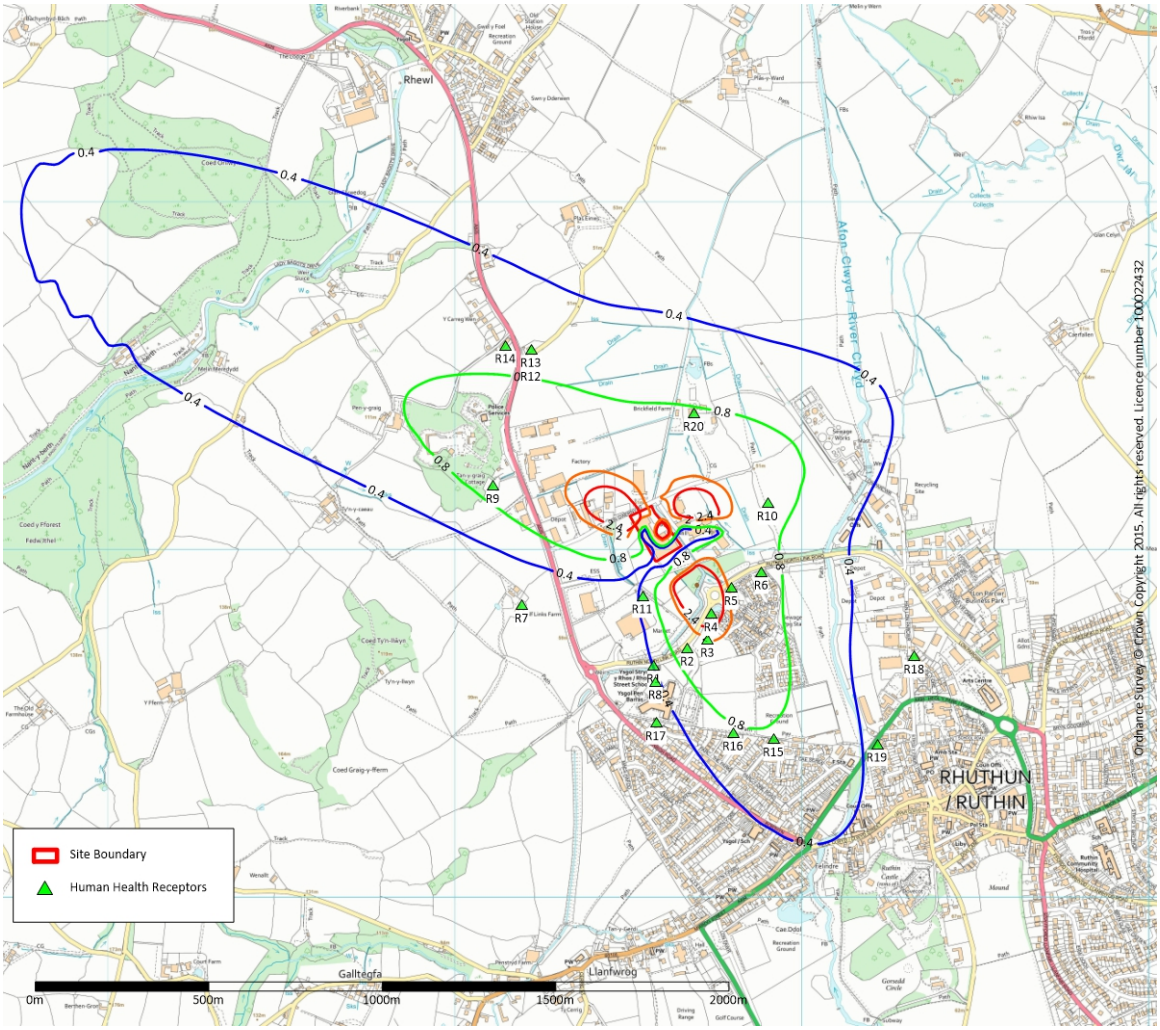
1: Information obtained from MAGIC website (www.magic.defra.gov.uk)*(1September 2021)*

2: Information obtained from APIS website (www.apis.ac.uk) and/or NRW *(September 2021)*

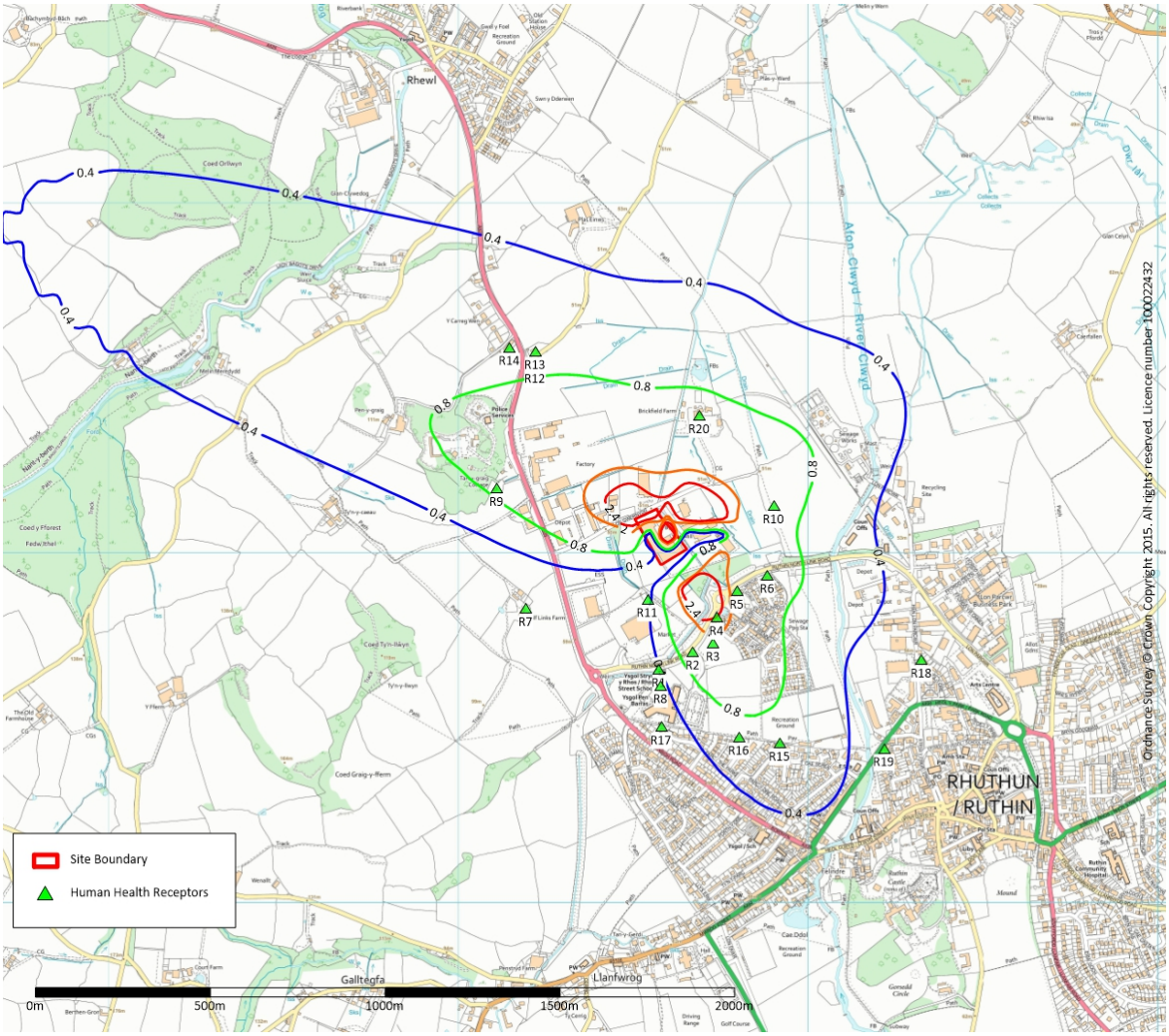
3: refers to the background for feature of interest across the nature conservation site

Appendix D

Stack Emission Model Outputs – NO_2 Contour Plots

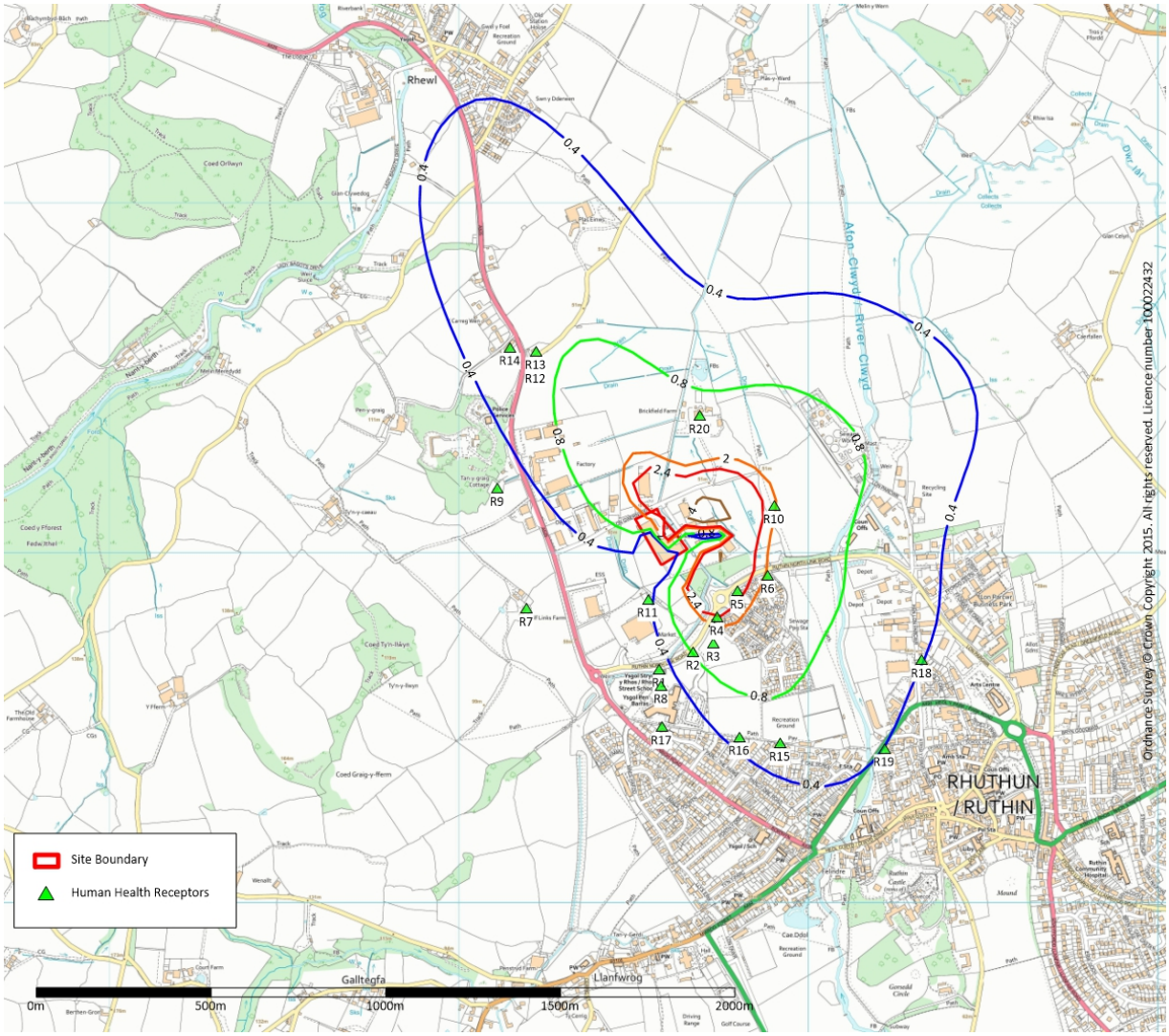


Appendix Di: Long-term NO_2 Process Contributions 2013: Scenario B Combined PCs (assumes 70% NO_x to NO_2 conversion)

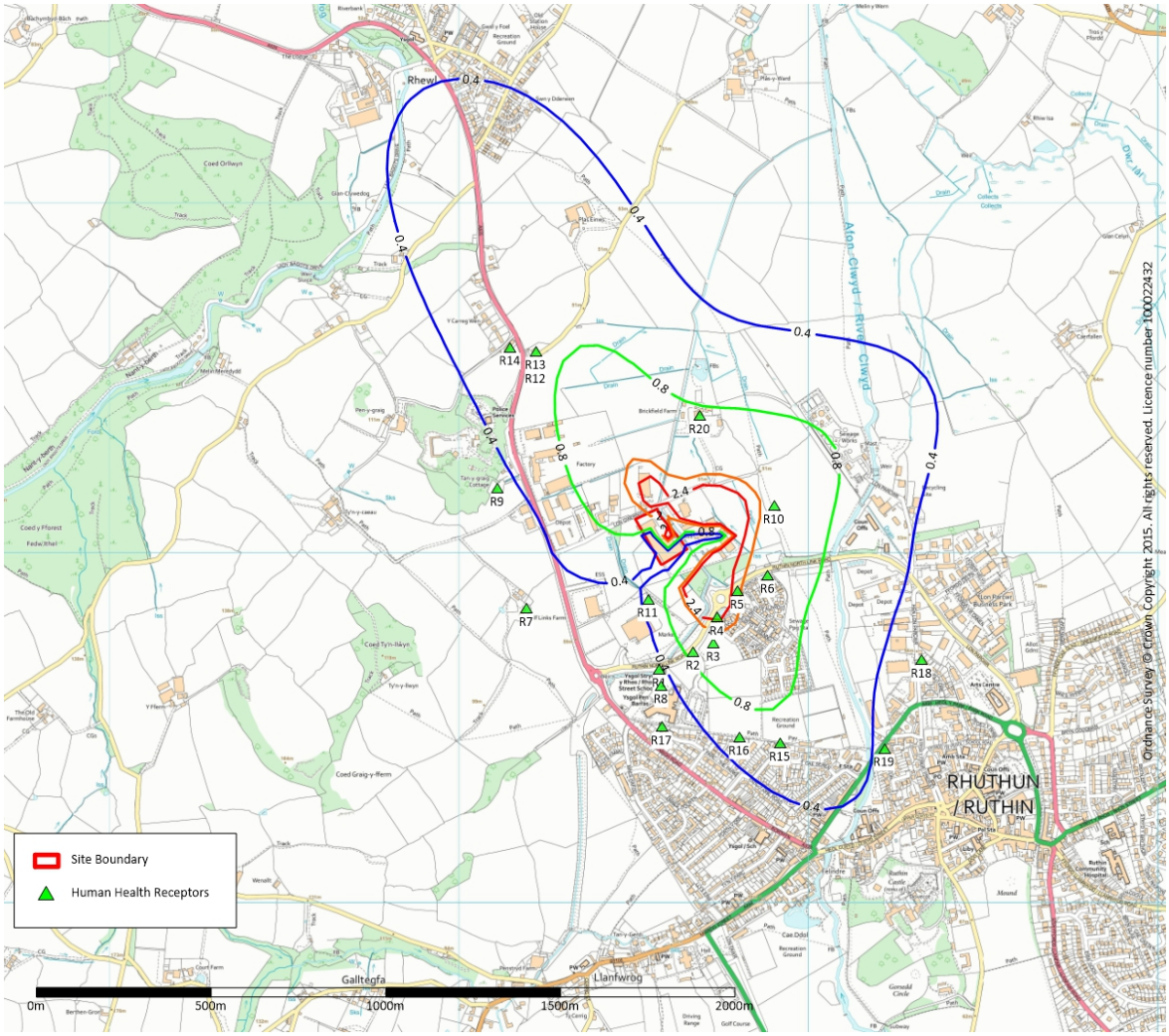


Appendix Dii: Long-term NO_2 Process Contributions 2014:

Scenario B Combined PCs (assumes 70% NO_x to NO_2 conversion)

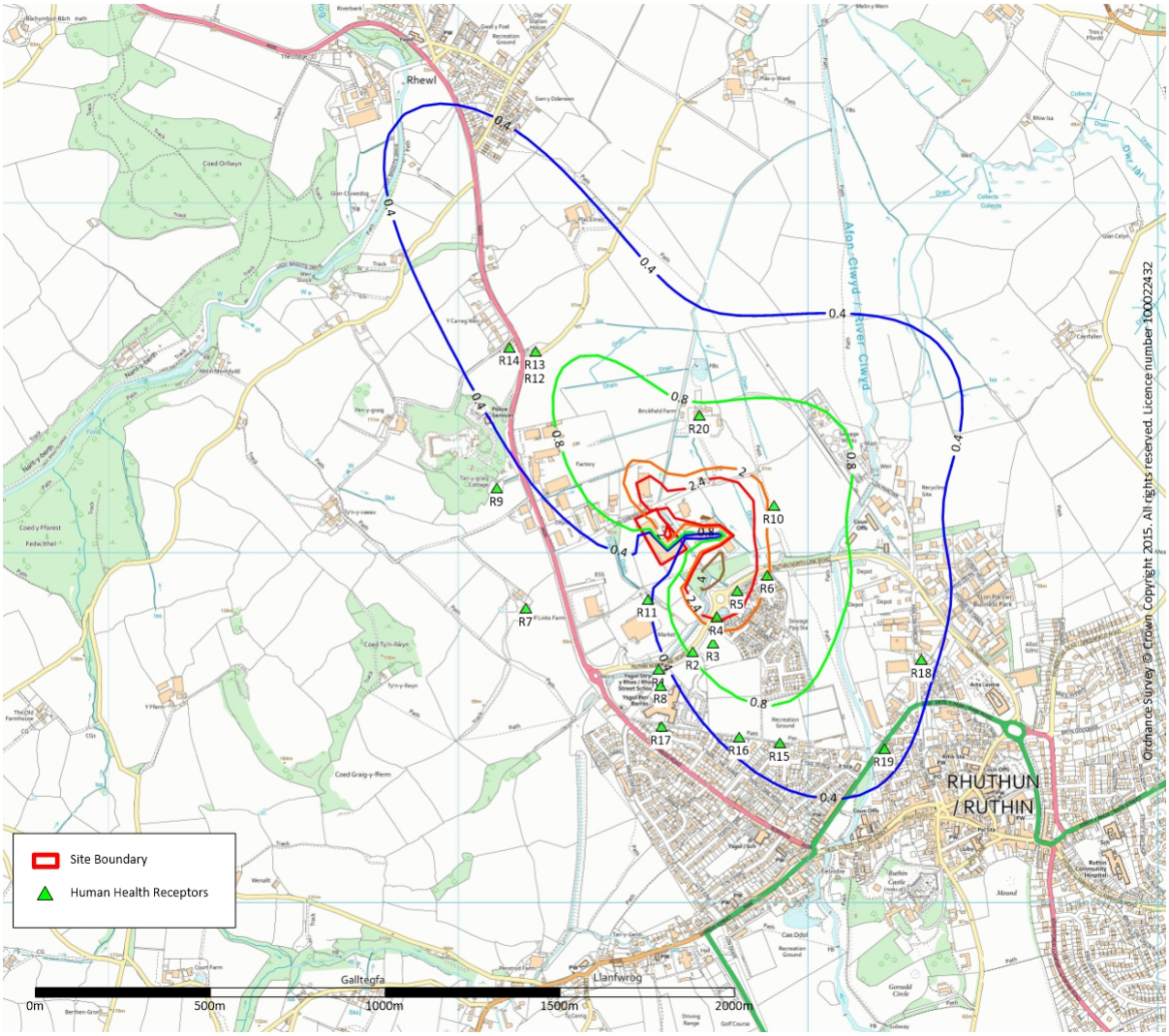


Appendix Diii: Long-term NO_2 Process Contributions 2015:
Scenario B Combined PCs (assumes 70% NO_x to NO_2 conversion)



Appendix Civ: Long-term NO_2 Process Contributions 2016:

Scenario B Combined PCs (assumes 70% NO_x to NO_2 conversion)

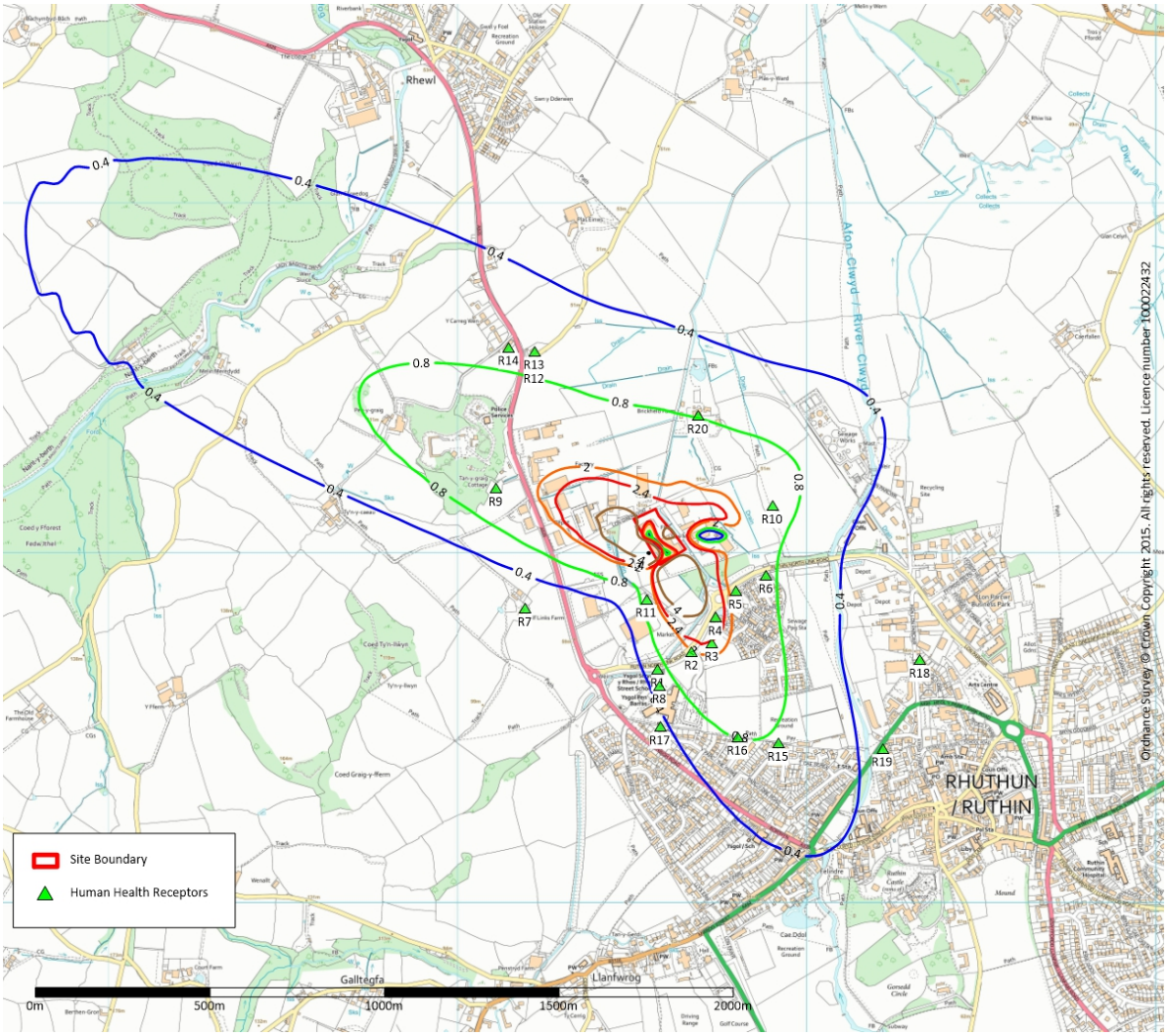


Appendix Cv: Long-term NO_2 Process Contributions 2017:

Scenario B: Combined PCs (assumes 70% NO_x to NO_2 conversion)

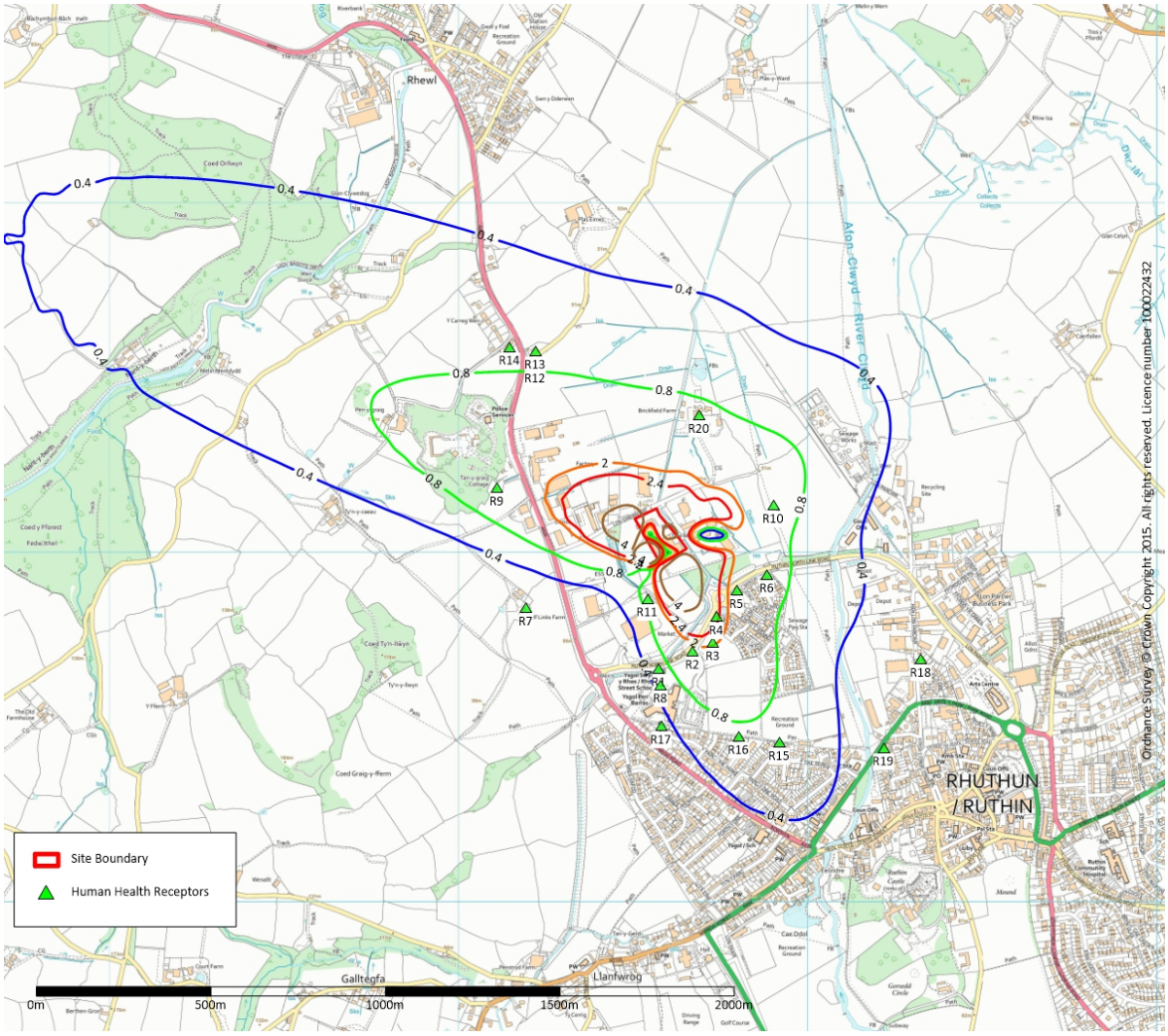
Appendix D

Stack Emission Model Outputs – PM_{10} Contour Plots



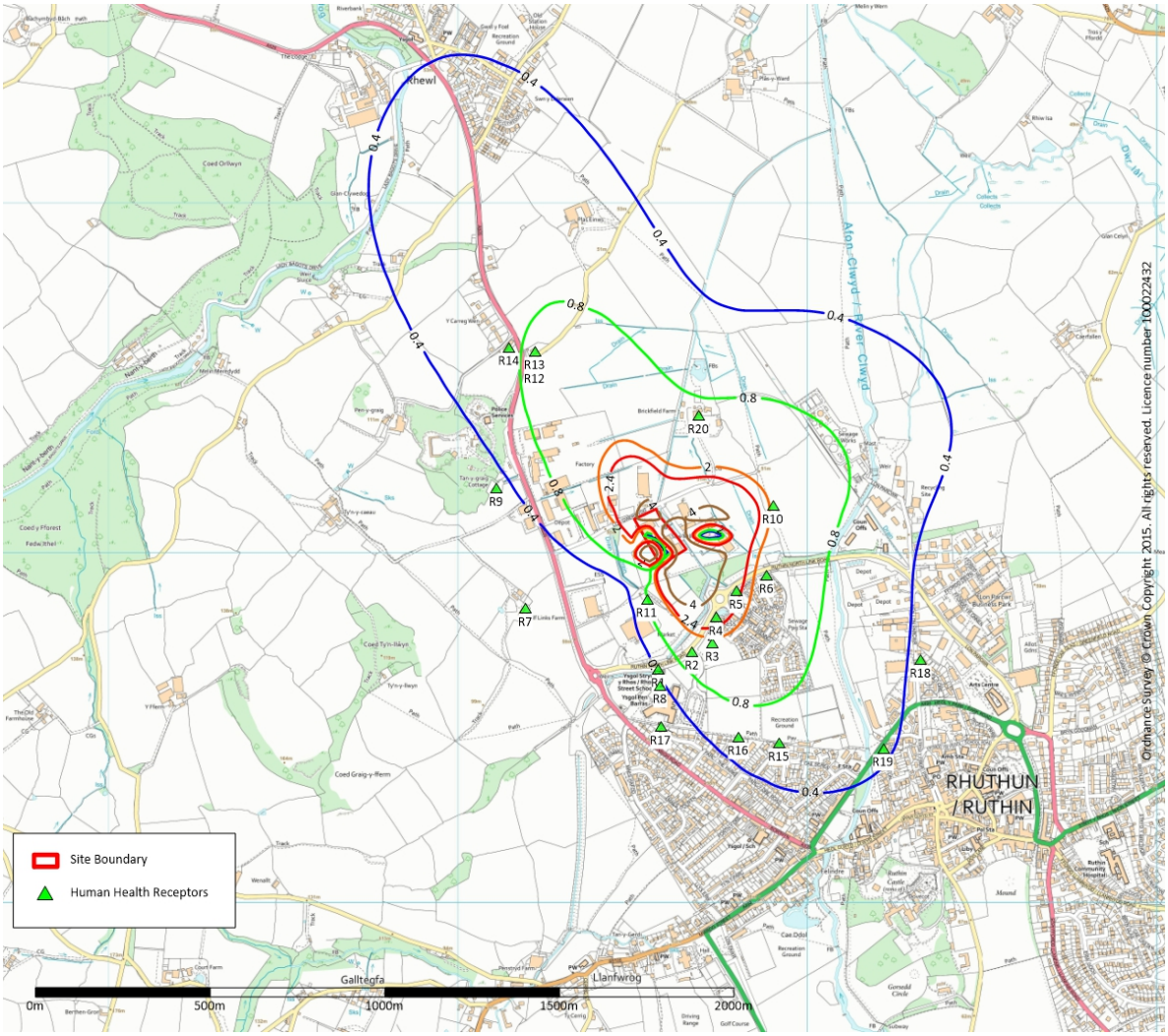
Appendix Ei: Long-term PM10 Process Contributions 2013:

Scenario B Combined PCs (assumes PM10 = 100%Particulate Matter)



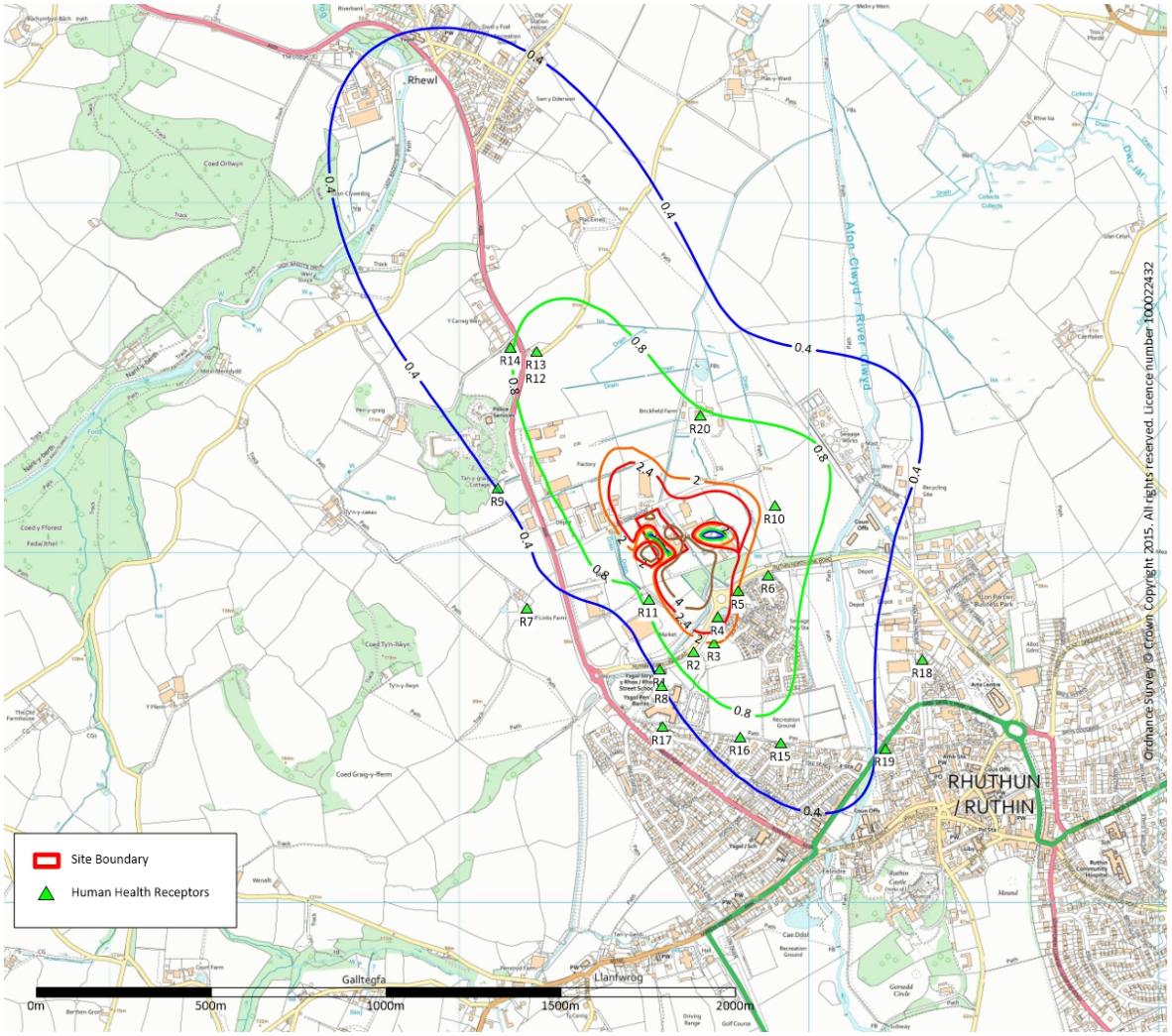
Appendix Eii: Long-term PM10 Process Contributions 2014:

Scenario B Combined PCs (assumes PM10 = 100%Particulate Matter)



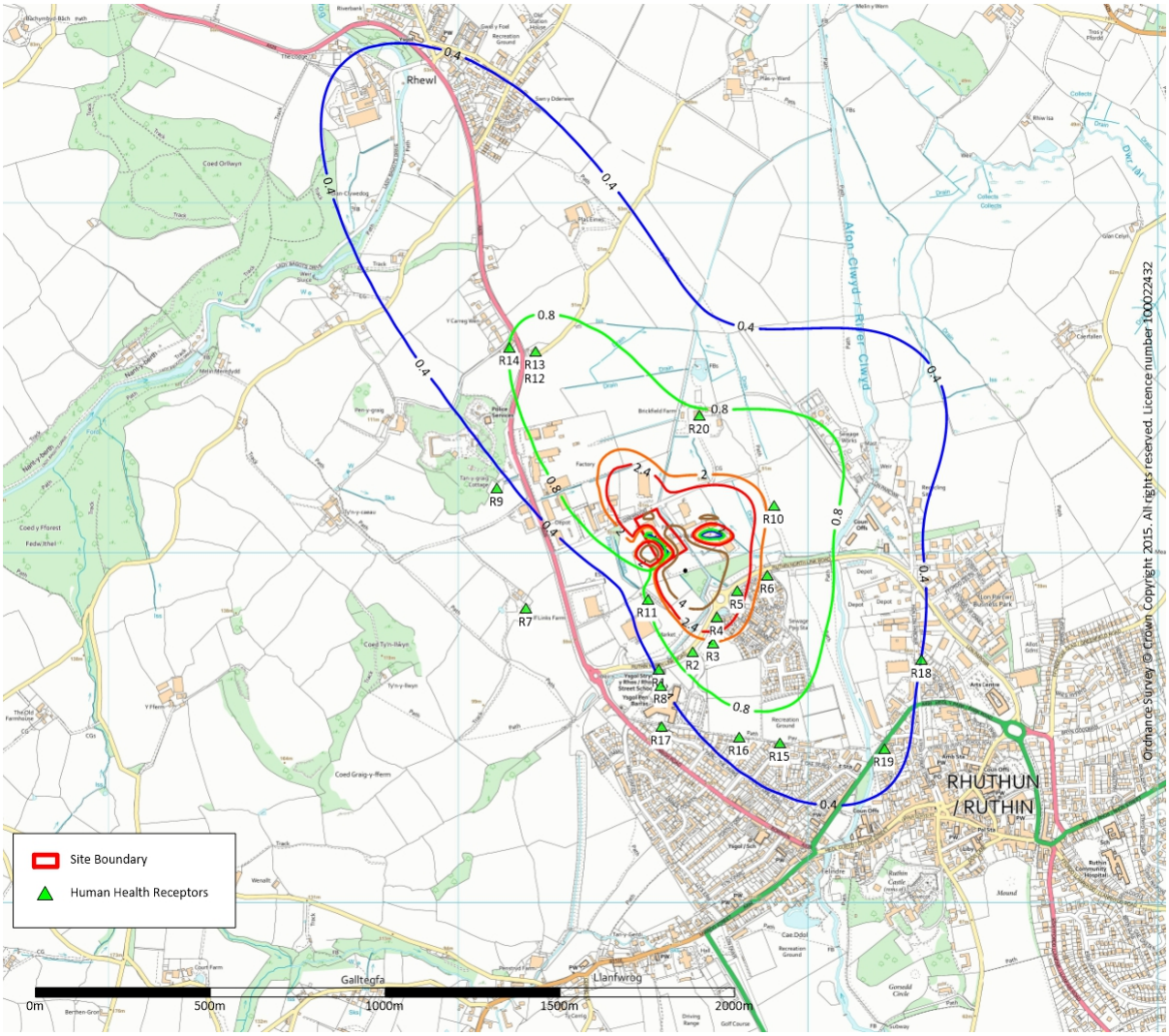
Appendix Eiii: Long-term PM10 Process Contributions 2015:

Scenario B Combined PCs (assumes PM10 = 100%Particulate Matter)



Appendix Eiv: Long-term PM10 Process Contributions 2016:

Scenario B Combined PCs (assumes PM10 = 100%Particulate Matter)



Appendix Ev: Long-term PM10 Process Contributions 2017:

Scenario B Combined PCs (assumes PM10 = 100%Particulate Matter)

APPENDIX F

Stack Emission Model Outputs – Detailed Results

R2298D

Maximum predicted Process Contributions within Modelled Domain

Maximums across 5 years

Scenario B (combined PCs)

Pollutant	Averaging Period	Units	2013	2014	2015	2016	2017	Max PC	AQAL	Max PC as %EAL
Long-Term Concentrations										
NO_2[1]	annual mean (1hr)	ug/m^3	**8.20**	7.50	7.49	5.54	6.39	**8.20**	40	20.49
NO_2[2]	annual mean (1hr)	ug/m^3	**5.74**	5.25	5.25	3.88	4.47	**5.74**	40	14.34
PM10[4]	annual mean (1hr)	ug/m^3	**26.38**	24.60	24.64	24.29	25.38	**26.38**	40	65.96
PM2.5[4]	annual mean (1hr)	ug/m^3	**26.38**	24.60	24.64	24.29	25.38	**26.38**	20	131.92
VOC (benzene)[5]	annual mean (1hr)	ug/m^3	**0.66**	0.61	0.57	0.42	0.48	**0.66**	5	13.29
VOC (1,3-butadiene)[5]	annual mean (1hr)	ug/m^3							2.25	29.53
Short-Term Concentrations										
CO	8hr running mean	mg/m^3	**0.08**	0.06	0.07	0.07	0.06	**0.08**	10	0.78
NO_2[1]	1hr (99.79th %ile)	ug/m^3	**124.64**	107.43	101.23	90.90	87.19	**124.64**	200	62.32
NO_2[3]	1hr (99.79th %ile)	ug/m^3	**43.62**	37.60	35.43	31.81	30.52	**43.62**	200	21.81
PM10[4]	24hrs (90.4th %ile)	ug/m^3	47.42	41.09	47.74	47.72	**47.95**	**47.95**	50	95.90

1: assumes 100% conversion of modelled NOx to NO2

2: assumes 70% conversion of modelled NOx to NO2

3: assumes 35% conversion of modelled NOx to NO2

4: assumes PM10 and PM2.5 each emitted as 100% PM

5: assumes benzene and 1,3-butadiene each emitted as 100% TVOCs

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Maximum Predicted Process Contributions at Modelled Receptors

Long-Term Assessment

Maximums acorss 5 years modelled met data

				NO2						PM10					PM2.5					
				PC			BG[3]	PEC		PC		BG[3]	PEC		PC		BG[3]	PEC		PC
				NO_2[1]	NO_2[2]	PC%EAL	NO2	NO2	PEC%EAL	PM10[4]	PC%EAL	PM10	PM10	PEC%EAL	PM2.5[5]	PC%EAL	PM10	PM10	PEC%EAL	VOC[6]
				ug/m3	ug/m3	%	ug/m3	ug/m3	%	ug/m3	%	ug/m3	ug/m3	%	ug/m3	%	ug/m3	ug/m3	%	ug/m3
Receptor name	X(m)	Y(m)	Z(m)	annual mean (1 hr)	annual mean (1 hr)		annual mean (1 hr)	annual mean (1 hr)		annual mean (1 hr)		annual mean (1 hr)	annual mean (1 hr)		annual mean (1 hr)		annual mean (1 hr)	annual mean (1 hr)		annual mean (1 hr)
R1	311576	358668	0	0.57	0.40	1.01	4.83	5.23	13.08	0.58	1.45	9.49	10.07	25.17	0.58	2.89	6.35	6.93	34.64	0.05
R2	311673	358718	0	1.81	1.27	3.16	4.83	6.10	15.24	1.84	4.60	9.49	11.33	28.33	1.84	9.21	6.35	8.19	40.96	0.14
R3	311731	358743	0	2.85	2.00	4.99	4.83	6.83	17.06	2.32	5.81	9.49	11.81	29.53	2.32	11.61	6.35	8.67	43.36	0.22
R4	311741	358816	0	4.05	2.84	7.09	4.83	7.67	19.17	**2.99**	**7.48**	9.49	12.48	31.21	**2.99**	**14.97**	6.35	9.34	46.72	0.31
R5	311799	358892	0	**4.16**	**2.91**	7.28	4.83	7.74	19.36	2.81	7.02	9.49	12.30	30.75	2.81	14.05	6.35	9.16	45.80	**0.32**
R6	311886	358937	0	2.89	2.02	5.06	4.83	6.85	17.13	1.79	4.48	9.49	11.28	28.20	1.79	8.95	6.35	8.14	40.70	0.22
R7	311195	358842	0	0.28	0.19	0.48	4.83	5.02	12.56	0.23	0.57	9.49	9.72	24.30	0.23	1.14	6.35	6.58	32.89	0.02
R8	311581	358622	0	0.52	0.36	0.91	4.83	5.19	12.98	0.49	1.23	9.49	9.98	24.95	0.49	2.46	6.35	6.84	34.21	0.04
R9	311112	359186	0	1.44	1.01	2.52	5.98	6.99	17.47	1.36	3.41	10.92	12.28	30.71	1.36	6.82	7.49	8.85	44.27	0.11
R10	311904	359136	0	2.93	2.05	5.12	5.98	**8.03**	**20.07**	1.94	4.85	10.92	**12.86**	**32.15**	1.94	9.70	7.49	**9.43**	**47.15**	0.23
R11	311543	358868	0	0.63	0.44	1.10	4.83	5.27	13.18	0.93	2.33	9.49	10.42	26.05	0.93	4.66	6.35	7.28	36.41	0.05
R12	311221	359538	0	1.06	0.74	1.85	5.98	6.72	16.80	0.93	2.33	10.92	11.85	29.63	0.93	4.67	7.49	8.42	42.12	0.08
R13	311222	359578	0	0.97	0.68	1.71	5.98	6.66	16.66	0.91	2.27	10.92	11.83	29.57	0.91	4.53	7.49	8.40	41.98	0.08
R14	311148	359589	0	0.94	0.66	1.65	5.98	6.64	16.60	0.81	2.03	10.92	11.73	29.33	0.81	4.07	7.49	8.30	41.52	0.07
R15	311921	358457	0	1.04	0.73	1.82	4.83	5.56	13.90	0.71	1.78	9.49	10.20	25.50	0.71	3.56	6.35	7.06	35.31	0.08
R16	311805	358474	0	1.03	0.72	1.80	4.83	5.55	13.88	0.78	1.95	9.49	10.27	25.67	0.78	3.89	6.35	7.13	35.64	0.08
R17	311582	358503	0	0.37	0.26	0.65	4.83	5.09	12.73	0.32	0.80	9.49	9.81	24.53	0.32	1.60	6.35	6.67	33.35	0.03
R18	312327	358695	0	0.62	0.44	1.09	6.86	7.30	18.24	0.40	1.00	9.79	10.19	25.47	0.40	1.99	6.44	6.84	34.19	0.05
R19	312220	358441	0	0.63	0.44	1.11	6.86	7.30	18.26	0.44	1.11	9.79	10.23	25.59	0.44	2.22	6.44	6.88	34.42	0.05
R20	311691	359394	0	1.47	1.03	2.56	5.98	7.01	17.51	0.99	2.49	10.92	11.91	29.79	0.99	4.97	7.49	8.48	42.42	0.11
			max	4.16	2.91	7.28	6.86	8.03	20.07	2.99	7.48	10.92	12.86	32.15	2.99	14.97	7.49	9.43	47.15	0.32

1: assumes 100% NOx to NO2 conversion

2: assumes 75% NOx to NO2 conversion

3: backgound = Defra predicted background for relevent grid square

4: assumes PM10 = 100% TPM

5: assumes PM2.5 = 100% TPM

6: assumes benzene and 1,3-butadiene each = 100% TVOCs

screening threshold = 1% EAL; where PC <1% EAL no further assessment necessary

R2298D
Maximum Predicted Process Contributions
Long-Term Assessment
Maximums acorss 5 years modelled met dat

				Benzene				1,3-butadiene			
Receptor name	**X(m)**	**Y(m)**	**Z(m)**	**PC %EAL**	**BG[3]**	**PEC**	**PEC%EAL**	**PC%EAL**	**BG[3]**	**PEC**	**PEC%EAL**
					ug/m3 annual mean (1 hr)	ug/m3 annual mean (1 hr)			ug/m3 annual mean (1 hr)	ug/m3 annual mean (1 hr)	
R1	311576	358668	0	0.92	0.1	0.15	2.92	2.04	0.03	0.08	3.38
R2	311673	358718	0	2.86	0.1	0.24	4.86	6.35	0.03	0.17	7.69
R3	311731	358743	0	4.42	0.1	0.32	6.42	9.83	0.03	0.25	11.16
R4	311741	358816	0	6.19	0.1	0.41	8.19	13.75	0.03	0.34	15.08
R5	311799	358892	0	**6.34**	0.1	**0.42**	**8.34**	**14.09**	0.03	**0.35**	**15.42**
R6	311886	358937	0	4.42	0.1	0.32	6.42	9.82	0.03	0.25	11.15
R7	311195	358842	0	0.43	0.1	0.12	2.43	0.96	0.03	0.05	2.29
R8	311581	358622	0	0.82	0.1	0.14	2.82	1.83	0.03	0.07	3.17
R9	311112	359186	0	2.26	0.1	0.21	4.26	5.01	0.03	0.14	6.34
R10	311904	359136	0	4.50	0.1	0.33	6.50	10.01	0.03	0.26	11.34
R11	311543	358868	0	1.00	0.1	0.15	3.00	2.22	0.03	0.08	3.55
R12	311221	359538	0	1.65	0.1	0.18	3.65	3.67	0.03	0.11	5.01
R13	311222	359578	0	1.52	0.1	0.18	3.52	3.39	0.03	0.11	4.72
R14	311148	359589	0	1.47	0.1	0.17	3.47	3.27	0.03	0.10	4.61
R15	311921	358457	0	1.61	0.1	0.18	3.61	3.59	0.03	0.11	4.92
R16	311805	358474	0	1.61	0.1	0.18	3.61	3.57	0.03	0.11	4.90
R17	311582	358503	0	0.59	0.1	0.13	2.59	1.32	0.03	0.06	2.65
R18	312327	358695	0	0.96	0.11	0.16	3.16	2.14	0.03	0.08	3.47
R19	312220	358441	0	0.98	0.11	0.16	3.18	2.17	0.03	0.08	3.51
R20	311691	359394	0	2.29	0.1	0.21	4.29	5.09	0.03	0.14	6.42
			max	6.34	0.11	0.42	8.34	14.09	0.03	0.35	15.42

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Maximum Predicted Process Contributions at Modelled Receptors
Short-Term Assessment
Maximums acorss 5 years modelled met data

				NO2							PM10						CO	
				PC		PC%EAL	LT BG[3]	ST BG[4]	PEC[5]	PEC%EAL	PC	%EAL	LT BG[3]	ST BG[4]	PEC[5]	PEC%EAL	PC	%EAL
				NO_2[1]	NO_2[2]						PM10[6]							
				ug/m3	ug/m3		ug/m3	ug/m3	ug/m3				ug/m3	ug/m3	ug/m3		mg/m3	
Receptor name	X(m)	Y(m)	Z(m)	annual mean (1 hr)	annual mean (1 hr)		annual mean (1 hr)	annual mean (1 hr)	annual mean (1 hr)		24 hr mean (90.41%ile)		annual mean (1 hr)	annual mean (1 hr)	annual mean (1 hr)		8 hour running mean	
R1	311576	358668	0	24.57	8.60	4.30	4.83	9.66	18.26	9.13	2.52	5.03	9.49	18.98	21.50	42.99	0.01	0.001
R2	311673	358718	0	32.80	11.48	5.74	4.83	9.66	21.14	10.57	7.47	14.94	9.49	18.98	26.45	52.90	0.02	0.002
R3	311731	358743	0	35.98	12.59	6.30	4.83	9.66	22.25	11.13	8.43	16.87	9.49	18.98	27.41	54.83	0.02	0.002
R4	311741	358816	0	48.57	17.00	8.50	4.83	9.66	26.66	13.33	**10.76**	**21.51**	9.49	18.98	**29.74**	**59.47**	0.03	0.003
R5	311799	358892	0	**54.18**	**18.96**	9.48	4.83	9.66	28.62	**14.31**	9.96	19.92	9.49	18.98	28.94	57.88	0.03	0.003
R6	311886	358937	0	42.18	14.76	7.38	4.83	9.66	24.42	12.21	6.72	13.43	9.49	18.98	25.70	51.39	0.02	0.002
R7	311195	358842	0	16.79	5.88	2.94	4.83	9.66	15.54	7.77	0.79	1.58	9.49	18.98	19.77	39.54	0.01	0.001
R8	311581	358622	0	21.26	7.44	3.72	4.83	9.66	17.10	8.55	2.12	4.24	9.49	18.98	21.10	42.20	0.01	0.001
R9	311112	359186	0	19.28	6.75	3.37	5.98	11.96	18.71	9.35	3.71	7.43	10.92	21.84	25.55	51.11	0.01	0.001
R10	311904	359136	0	31.99	11.20	5.60	5.98	11.96	23.16	11.58	5.80	11.61	10.92	21.84	27.64	55.29	0.02	0.002
R11	311543	358868	0	48.81	17.08	8.54	4.83	9.66	26.74	13.37	3.95	7.91	9.49	18.98	22.93	45.87	0.03	0.003
R12	311221	359538	0	15.92	5.57	2.79	5.98	11.96	17.53	8.77	2.67	5.35	10.92	21.84	24.51	49.03	0.01	0.001
R13	311222	359578	0	14.68	5.14	2.57	5.98	11.96	17.10	8.55	2.63	5.25	10.92	21.84	24.47	48.93	0.01	0.001
R14	311148	359589	0	14.21	4.97	2.49	5.98	11.96	16.93	8.47	2.32	4.63	10.92	21.84	24.16	48.31	0.01	0.001
R15	311921	358457	0	14.78	5.17	2.59	4.83	9.66	14.83	7.42	2.63	5.27	9.49	18.98	21.61	43.23	0.01	0.001
R16	311805	358474	0	15.67	5.49	2.74	4.83	9.66	15.15	7.57	2.90	5.80	9.49	18.98	21.88	43.76	0.01	0.001
R17	311582	358503	0	15.42	5.40	2.70	4.83	9.66	15.06	7.53	1.37	2.74	9.49	18.98	20.35	40.70	0.01	0.001
R18	312327	358695	0	12.48	4.37	2.18	6.86	13.72	18.09	9.04	1.40	2.79	9.79	19.58	20.98	41.95	0.01	0.001
R19	312220	358441	0	11.45	4.01	2.00	6.86	13.72	17.73	8.86	1.59	3.18	9.79	19.58	21.17	42.34	0.01	0.001
R20	311691	359394	0	25.71	9.00	4.50	5.98	11.96	20.96	10.48	3.64	7.28	10.92	21.84	25.48	50.96	0.01	0.001
			max	54.18	18.96	9.48	6.86	13.72	28.62	14.31	10.76	21.51	10.92	21.84	29.74	59.47	0.03	

1: assumes 100% NOx to NO2 conversion
2: assumes 35% NOx to NO2 conversion
3: BG = Defra predicted annual mean background for relevetn grid square
4: ST BG = 2 x LT BG
5: PEC = ST BG + PC

screening threshold = 10% EAL; where <10% EAL no further assessment necessary

R2286D

Maximum Predicted Process Contributions at Modelled Receptors

Ecological Assessment

					Ambient NOx				N deposition					Acid deposition
					LT NOx		ST NOx		70%NO2	N deposition		EAL		
					ug/m3	%EAL	ug/m3	%EAL	ug/m3	ug/m2/s	kg N/ha/yr	min CL	%min CL	keq/ha/yr
Receptor	Name	X(m)	Y(m)	Z(m)	annual mean (1 hr)		24 hour mean (100%ile)		annual mean (1 hr)					
International Nature Conservation Sites														
E1	Llwyn SAC	308403	363827	0	0.14	0.46	1.06	1.42	0.097	0.0003	0.0280	10	0.28	0.0020
E2	Alyn Valley Woods SAC	318174	362477	0	0.03	0.10	0.39	0.51	0.021	0.0001	0.0060	10	0.06	0.0004
E3	Alyn Valley Woods SAC	317734	364887	0	0.02	0.08	0.30	0.40	0.017	0.0001	0.0050	10	0.05	0.0004
Local Nature Sites / Ancient Woodlands														
E4	ancient woodland	311047.5	359122.6	0	0.90	3.00	10.59	14.13	0.630	0.0019	0.1813	10	1.81	0.0129
E5	ancient woodland	311221.3	358426.9	0	0.09	0.31	3.72	4.97	0.065	0.0002	0.0186	10	0.19	0.0013
E6	ancient woodland	312124.9	358060.3	0	0.49	1.65	5.02	6.70	0.346	0.0010	0.0994	10	0.99	0.0071
E7	ancient woodland	312239.9	358125.7	0	0.47	1.57	4.41	5.88	0.330	0.0010	0.0949	10	0.95	0.0068

Where:

Deposition velocities	grassland	0.0015	m/s
	forest	0.003	m/s
Conversion factors	nitrification	95.9	ug/m2/s to kg N/ha/yr
	acidification	6.84	ug/m2/s to keq/ha/yr