



**Land at Llay Hall
Farm, Wrexham**

**Ecological
Impact
Assessment**

Prepared by:
**The Environmental
Dimension
Partnership Ltd**

On behalf of:
**Biogas Technology
Limited**

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Executive Summary

- S1 The Environmental Dimension Partnership Ltd (EDP) Ltd was commissioned by Biogas Technology Limited to undertake an Ecological Impact Assessment of an area of land at Land at Llay Hall Farm, Wrexham.
- S2 The baseline ecological investigations included a desk study and an Extended Phase 1 Survey. All surveys were undertaken with reference to best practice guidance.
- S3 Llay Bog Sites of Specific Scientific Interest (SSSI) is a statutory site which requires consideration in regard to air quality. No further statutory, or non-statutory designations within the Application Site's Zone of Influence (Zol) would be materially affected by the proposals.
- S4 The Application Site consists of gravel and hard standing colonised by some vegetation with concrete foundations to support power generators. The Application Site is bordered by an adjacent industrial park and quarry to the south and east and farmland to the west. The habitats within the Application Site are of less than Local Ecological Value.
- S5 The Application Site is unlikely to support any Protected and Notable Species. However, the vegetation lining the access track is capable of supporting low numbers of common and widespread breeding birds and foraging bats.
- S6 Policy for the conservation and enhancement of the natural environment in Wales aims to ensure that "development plan strategies, policies and development proposals must consider the need to... support the conservation of biodiversity, in particular the conservation of wildlife and habitats." (Planning Policy Wales, December 2018).
- S7 Accordingly, the ecological mitigation strategy for the scheme includes avoidance measures embedded within the proposals and measures which should be incorporated at the construction stage.
- S8 On this basis, EDP considers that the scheme is capable of compliance with relevant legislation and planning policy for the conservation of the natural environment at all levels.

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Section 1

Introduction, Purpose and Context

- 1.1 This Ecological Impact Assessment (EclA) has been prepared by EDP on behalf of Biogas Technology Limited and considers the ecological implications of a proposed change in land use at Land at Llay Hall Farm, Wrexham (hereafter referred to as 'the Application Site').
- 1.2 EDP is an independent environmental planning consultancy with offices in Cirencester, Cheltenham, Cardiff and Shrewsbury. The practice provides advice to private and public-sector clients throughout the UK in the fields of landscape, ecology, archaeology, cultural heritage, arboriculture, rights of way and master planning. Details of the practice can be obtained at our website www.edp-uk.co.uk.

Site Context

- 1.3 The Application Site is centred approximately at Ordnance Survey Grid Reference (OSGR) SJ 321 560 and the Local Planning Authority (LPA) is Wrexham County Borough Council. The Application Site comprises a small compound area, which is linked to the B5102 Llay Road by an access track. The principal ecological features within and surrounding the Application Site (identified through site survey) are illustrated on the Extended Phase 1 Habitat Plan (**Plan EDP 1**) and described with illustrative photographs in **Appendix EDP 1**.

Development Proposals

- 1.4 The proposal is to install two generator units and ancillary structures to produce green energy. The majority of the habitats within the Application Site will remain unchanged with the generators being situated on the existing concrete plinths within the compound. Minor scrub clearance is anticipated alongside the existing access track in order to initially transport the equipment.

Scope of Assessment

- 1.5 This EclA describes the current ecological interest within and around the Application Site, which has been identified through standard desk and field-based investigations. It then considers the potential ecological impacts based on proposed works in the context of relevant legislation and planning policy. Finally, the necessary additional measures to avoid potential impacts, and the mechanisms for securing such measures are investigated.

1.6 The remainder of this report is structured as follows:

- **Section 2** summarises the methodology employed in determining the baseline ecological conditions within and around the Application Site;
- **Section 3** summarises the baseline ecological conditions, identifies and evaluates any pertinent ecological features/receptors;
- **Section 4** considers the potential impacts of the proposal on pertinent ecological features in the context of legislative, planning policy and biodiversity action planning considerations. Recommended mitigation and enhancement measures are provided; and
- **Section 5** summarises the inherent and recommended mitigation measures and provides the overall conclusions of the assessment.

Section 2

Methodology (Baseline Investigations)

- 2.1 This section summarises the methodologies employed in determining the baseline ecological conditions within and around the Application Site. The assessment has been undertaken by appropriately qualified Ecologists using relevant best practice methodologies wherever appropriate.

Desk Study

- 2.2 The desk study enables the initial collation and review of contextual information, such as designated sites, together with known records of protected and priority species¹.
- 2.3 The desk study involved collating biodiversity information from the following sources:
- North Wales Environmental Information Service (COFNOD); and
 - Multi-agency Geographic Information for the Countryside (MAGIC) website².
- 2.4 The desk study was undertaken during June 2019 and involved obtaining the following information:
- 10km radius for sites of European importance;
 - 2km radius for sites of National importance;
 - 1km radius for sites of Local importance;
 - 1km radius for other protected/notable species records; and
 - 500m radius for Priority Habitats.
- 2.5 These search areas are sufficient to cover the potential Zol³ of the proposed development in relation to designated sites, habitats and species. Results are shown in **Appendix EDP 2**.
- 2.6 In addition to the standard sources of ecological data, a Dispersion Modelling Assessment (REC, 2019) was used to determine the impacts of the proposals on sensitive ecological receptors (specifically, Llay Bog SSSI, and Midland Meres and Mosses).

¹ Priority species relate to those listed on Section 41 of the Natural Environment and Rural Communities Act (2006) considered to be of Principal Importance for conservation of biodiversity in England.

² www.magic.gov.uk.

³ Zone of Influence - the areas and resources that may be affected by the proposed development.

Extended Phase 1 Survey

- 2.7 The survey technique adopted for the initial habitat assessment was at a level based on the standard 'Extended Phase 1 Habitat Survey' technique⁴, based on habitat mapping and description, as well as relevant information relating to the presence, absence or level of suitability for Protected and Notable Species.
- 2.8 The Extended Phase 1 Survey of the Application Site was completed on 04 June 2019 by a suitably qualified Ecologist. All principal habitat types and dominant plant species present per habitat type were identified and the distribution of habitats identified is illustrated on **Plan EDP 1**.

Limitations

- 2.9 June is considered an optimal month for habitat surveys, as it is the flowering period for most plants. Thus, the conclusions are not considered to be constrained.

Detailed (Phase 2) Surveys

- 2.10 No further Phase 2 Surveys were considered necessary at the Application Site and a brief explanation for this is provided in **Table EDP 2.1**.

Table EDP 2.1: Ecology Surveys Scoped Out

Survey Type	Reasons for Scoping Out
Botanical Surveys	The Phase 1 Survey information was sufficient to confirm habitat value with no indication of high value habitat present.
Great Crested Newt	It is assumed that great crested newts are present at the location. However, the Application Site does not represent great crested newt habitat as it is comprised of hardstanding, therefore, no impacts are anticipated. Where minor vegetation removal is required at the edges of the access track, this would be managed through Reasonable Avoidance Measures (RAMS) as a precautionary mitigation measure.
Bat Roosting	There are no trees, buildings or other structures which could be used by roosting bats on or surrounding the Application Site.
Bat Activity	Habitat suitable for foraging bats is limited to the surrounding hedgerows and trees which will not be impacted by the proposed development.
Reptiles	The very limited terrestrial habitat on the Application Site is restricted to the edges of the access track. The intensive management of the surrounding arable land is considered to be a barrier to reptile movement onto the Application Site.
Notable Mammals	The Application Site holds no habitat suitable for any notable mammal species such as brown hare, badger, hedgehog, water vole or otter.
Invertebrates	The Application Site holds no habitat suitable for any notable invertebrate species.

⁴ Joint Nature Conservation Council (2004) *Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit* (reprinted with minor corrections for original Nature Conservancy Council publication).

Evaluation

- 2.11 In 2013, the UK Biodiversity Action Plan (BAP) Priority Habitats and Priority Species and the Section 42 Species and Habitats of Principal Importance for Conservation under the Natural Environment and Rural Communities (NERC) Act 2006 were rationalised. This rationalisation occurred under the 'Post - 2010 Biodiversity Framework'. As a result, a new list of Priority Species and Priority Habitats is now in operation at the UK level.
- 2.12 These new lists supersede the former UK BAP and NERC Act Section 41 and 42 habitats and species, they are the new 'Biodiversity Indicators' that are used to monitor the status of biodiversity at the UK level. Each of the four devolved countries of the UK also has a similar list. For Wales, the Section 42 Species and Habitats of Principal Importance for Conservation under the NERC Act 2006 were rationalised post 2010. Each of the four devolved countries of the UK also has a list. In Wales, Priority Habitats and Species are listed under Section 7 of the Environment (Wales) Act 2016.
- 2.13 Within this Ecological Impact Assessment, where relevant, these species and habitats of National Nature Conservation priority will, therefore, be referred to as 'Priority Species' and 'Priority Habitats', except where indicated otherwise.
- 2.14 Where a particular ecological feature/receptor has been confirmed to be present, or presence is inferred based on habitat suitability, the ecological value or significance of the population or assemblage is assessed on the following geographic scale:
- International importance (ecological features which if impacted, would affect the distribution and/or conservation status of this feature in Europe);
 - National importance (ecological features which if impacted, would affect the distribution and/or conservation status of this feature in Wales);
 - County importance (ecological features which if impacted, would affect the distribution and/or conservation status of this feature in Wrexham County Borough); and
 - Local (ecological features that if impacted, would affect the distribution and/or conservation status of this feature in the town of Wrexham and its immediate surroundings).
- 2.15 Any other ecological features/receptors will be assessed as of less than local level importance.

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Section 3

Results (Baseline Conditions)

- 3.1 This section summarises the baseline ecological conditions determined through the course of the investigations described in **Section 2**. It identifies and evaluates those ecological features that lie within the Application Site's potential Zol and which are pertinent in the context of the proposed development.

Designated Sites

- 3.2 Information regarding designated sites was obtained during the desk study from COFNOD and the MAGIC website. Statutory designations (those receiving legal protection) and non-statutory designations (those receiving planning policy protection only) are discussed in turn below.

Statutory Designations

- 3.3 Statutory designations represent the most significant ecological receptors, being of recognised importance at an International and/or National level. International designations include Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites. National designations include SSSIs and National Nature Reserves (NNRs) and local designation includes Local Nature Reserves (LNRs).
- 3.4 The Application Site itself is not covered by any statutory designations, however, 18 such designations occur within the search area of which many have multiple designation levels⁵.

Table EDP 3.1: Non-statutory Designations within the Site's Potential Zol

Site Name	Approx. Distance from Application Site	Interest Feature(s)
Ramsar		
Midlands Meres and Mosses Phase 2	3.8km South-east	Nationally important series of SSSIs which demonstrate open water and peatland sites. <i>Including:</i> Vicarage Moss SSSI Geomorphological and Botanical Interest - largest example of a basin mire in Clwyd, the vegetation being distinctly zoned with <i>Sphagnum</i> , sedges and heather.

⁵ Natural Resources Wales. Designated Sites. [online] Available from: <https://nrwcm001.azurewebsites.net/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/?lang=en>. Accessed 18 June 2019.

Site Name	Approx. Distance from Application Site	Interest Feature(s)
SAC		
Berwyn A Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains	7.2km South-west	Nationally important series of SSSIs which have blanket bog, base rich scree, crevice dwelling plants, dry heath, dry grassland and quaking bogs. <i>Including:</i> Llandegla Moor SSSI Botanical and Fauna Interest - habitat example of heather (<i>Calluna vulgaris</i>) dominated dwarf-shrub heath. <i>Sphagnum</i>, heather and a large and diverse bird assemblage. <i>And</i> Ruabon/Llantysilio Mountains and Minera SSSI Botanical, Fauna and Geological Interest – dry dwarf shrub heath, dominated by heather, disused quarry workings are used by hibernating lesser horseshoe bat (<i>Rhinolophus hipposideros</i>) and a diverse assemblage of birds noted.
River Dee And Bala Lake/Afon Dyfrdwy A Llyn Tegid	7.5km East	Cross border river which supports multiple Annex II species including sea lamprey (<i>Petromyzon marinus</i>), bullhead (<i>Cottus gobio</i>), otter (<i>Lutra lutra</i>), Atlantic stream crayfish (<i>Austropotamobius pallipes</i>) and Annex I listed floating vegetation of <i>Ranunculus</i> of plane and sub-mountainous rivers. <i>Including:</i> Noted as two separate SSSIs: Afon Dyfrdwy (River Dee) and River Dee (England) Geological, Riparian Habitat Interest – noted for migratory fish, depend upon the whole river ecosystem and above SAC citation.
Deeside and Buckley Newt Sites	8.2km North	Nationally important series of SSSIs which are a strong hold for great crested newt (<i>Triturus cristatus</i>). <i>Including:</i> Buckley Claypits and Commons SSSI Fauna and Geological Interest - largest known breeding populations of the great crested newt in Great Britain. Torch night counts revealed 100+ on several occasions.
Johnstown Newt Sites	8.7km South	Nationally important series of SSSIs which are a strong hold for great crested newt.

Site Name	Approx. Distance from Application Site	Interest Feature(s)
		<i>Including:</i> Stryt Las A'r Hafod SSSI Fauna and Geological Interest - largest known breeding populations of the great crested newt in Great Britain. Torch night counts revealed 250+ on several occasions.
SSSI		
Llay Bog	450m South	Botanical Interest - species include: <i>Sphagnum</i> mosses, a variety of sedges, marsh cinquefoil (<i>Potentilla palustris</i>), marsh pennywort (<i>Hydrocotyle vulgaris</i>), alder - birch carr with purple moor grass (<i>Molinia caerulea</i>).
Chwarel Singret	2.2km West	Geological Interest
Marford Quarry	3.3km West	Entomological Interest – diverse butterfly and moth assemblage associated to the flora which is indicative of calcareous and gravel substrate.
Coedwig Ffossil Brymbo Fossil Forest	3.5km South-west	Geological Interest
Coed Talon Marsh	4.8km North-west	Botanical Interest – largest and one of the best examples in Clwyd of southern mesotrophic mire which has a restricted range. Large areas of willow carr, fen vegetation and sedges.
LNR		
Alyn Waters	830m South	Largest country park in Wrexham with woodland, grassland and riparian habitats. Former country estate with quarrying background.

Non-statutory Designations

- 3.5 Non-statutory designations in North Wales are known as Wildlife Sites. The Application Site itself is not covered by any LWSs. However, six occur within 1km as per COFNOD data. These are listed in **Table EDP 3.2**.

Table EDP 3.2: Wildlife Sites within the Site's Potential ZOI

Site Name	Approx. Distance from Application Site	Interest Feature(s)
Alyn Waters	500m South-west	Regenerating neutral grassland with semi-natural broadleaved woodland. Interesting species include several orchids, yellow rattle (<i>Rhinanthus minor</i>) and yellow-wort (<i>Blackstonia perfoliata</i>). Breeding skylarks (<i>Alauda arvensis</i>) and otter (<i>Lutra lutra</i>) presence.
Blast Road Pond	560m South-west	A fishing lake with mare's tail and an unimproved grassland slope with diverse species mix.
Rhydym Hall Grassland	850m North-west	Grassland adjacent to River Alyn with frequent meadowsweet (<i>Filipendula ulmaria</i>), black knapweed (<i>Centaurea nigra</i>) and Yorkshire fog (<i>Holcus lanatus</i>). Some broadleaved woodland and scrub.

Site Name	Approx. Distance from Application Site	Interest Feature(s)
Nant-y-Gaer and Llay Valley	860m East	Semi-natural woodland mainly sycamore and ash. Semi-improved neutral grassland and grazed oak woodland present.
Sydallt Wood	960m West	Riparian woodland with planted beech and oak. Diverse storey levels with semi-improved neutral grassland. Diverse with several uncommon species.
Hope Mountain and Ffrwdd Wood	980m West	Broad leaved woodland, scrub, bracken, neutral, acid and calcareous grassland, marshy grassland and swamp. Diverse and abundant mix of flora species including field scabious (<i>Knautia arvensis</i>) and great knapweed (<i>Centaurea scabiosa</i>).

Habitats

- 3.6 Information on habitats within and around the Application Site was obtained during the desk study and Extended Phase 1 Survey.
- 3.7 The distribution of the habitat types within the Application Site is illustrated on **Plan EDP 1** with illustrative photographs and detailed descriptions of the habitat types provided in **Appendix EDP 1**.
- 3.8 A summary and qualitative assessment of those habitats assessed within the Application Site is provided in **Table EDP 3.3** overleaf.

Table EDP 3.3: Summary of Habitats within the Application Site

Habitat or Feature	Distribution within Application Site	Intrinsic Ecological Importance
Hard Standing	Entirety of the Application Site and enclosed by metal fencing.	Less than Local - sparsely vegetated with low species richness.

- 3.9 As noted within **Table EDP 3.3**, the Application Site comprises of habitat of limited ecological value. These habitats may be of importance for supporting populations of Protected/and or Notable Species and this is discussed below.
- 3.10 The Application Site does not contain any Priority Habitats, and none occur within 500m.

Protected and/or Notable Species

- 3.11 The likelihood of presence, or confirmed presence, of Protected/and or Notable Wildlife Species within the Application Site is summarised below with reference to desk study records, habitat suitability and detailed surveys where relevant.

- 3.12 Where a particular species or taxonomic group has been confirmed to be present, or presence is inferred based on habitat suitability, the ecological value or significance is assessed on a geographical scale.

Breeding Birds

- 3.13 Records of 56 red or amber listed⁶ bird species were returned during the desk study, many of which are not pertinent to the Application Site as it provides no breeding habitat for them. Goldcrest (*Regulus regulus*), green woodpecker (*Picus viridis*), song thrush (*Turdus philomelos*) and tree sparrow (*Passer montanus*) could potentially nest in the scrub and plantation woodland along the access track but the likely assemblage present in this habitat is considered to be of less than local importance.

Bats

- 3.14 The desk study returned records, no records of bat species within the last ten years. Pre-2008 records included common and widespread bat species; brown long eared (*Plecotus auritus*), myotis, common pipistrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*) within 1km.
- 3.15 There are no suitable roosting features within the Application Site, and the value to foraging bats is negligible. The assemblage of bats likely to be using the access track is considered to be of less than local value.

Notable Mammals

- 3.16 Records of badger (*Meles meles*) and hedgehog (*Erinaceus europaeus*) were returned during the desk study.
- 3.17 There is no suitable habitat for badger within the Application Site. Foraging is restricted to the scrub along the access track. Similarly, the Application Site holds very limited foraging for hedgehog and it is restricted to the access track edges.
- 3.18 The Application Site is considered to be of negligible value to notable mammal species and they are not considered further in this assessment.

Reptiles

- 3.19 Multiple records of grass snake (*Natrix natrix helvetica*) have been recorded within 1km with the closest observation at 520m north of the Application Site. However, as is the case for great crested newt, the site is of negligible value, and surrounded by intensive agricultural land which acts as a barrier to dispersal.
- 3.20 The Application Site is considered to be of negligible value to notable mammal species and they are not considered further in this assessment.

⁶ Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R.D., Aebischer, N.J., Gibbons, D.W., Evans, A. And Gregory, R.D. 2009 "Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man" British Birds, Vol. 102, pages 296-341.

Amphibians

- 3.21 Records of great crested newt and the Priority Species, common toad (*Bufo bufo*) were returned during the desk study with the nearest observation 15m east of the Application Site within the quarry. Local BAP species, palmate newt (*Lissotriton helveticus*) and smooth newt (*Lissotriton vulgaris*) were also recorded at this location.
- 3.22 There are suitable breeding habitats for amphibians, 50m west and 60m east as confirmed by COFNOD data pre-2008. Six further ponds are located within 500m of the Application Site.
- 3.23 The scrub present along the western edge of the access track which could potentially be considered terrestrial habitat although this is negligible in area and surrounded by farmland and hardstanding. In general, the works will be restricted to unsuitable habitat, no ponds will be affected, and the likelihood of encountering great crested newts or other amphibians is assessed as negligible. As it is accepted that great crested newts are known to be present in the general area, there would be no merit in undertaking survey work and the residual (very minor) risks can be managed through ecological supervision and adherence to a Non-Licensed Method Statement (NLMS).

Summary of Potential Issues Arising from Survey Findings

- 3.24 Based on the survey findings described above, the key ecological features/receptors pertinent to the development proposals are as follows:
- Breeding Birds – habitats suitable for breeding birds within the adjacent screening plantation woodland but are unlikely to support a notable assemblage of breeding bird species;
 - Great crested newt is known to be present in the area, but unlikely to be affected by the proposals. Residual risks may be appropriately managed through NLMS; and
 - Some consideration of the effects of NO_x deposition on Designated Wildlife Sites (DWS) is required.

Section 4

Predicted Impacts and Mitigation

- 4.1 This section considers the likely impacts of the proposed works included as **Appendix EDP 2** on the existing ecological resource. Where impacts cannot be avoided by inherent mitigation alone, additional mitigation or enhancement measures are recommended which, if implemented, would as a minimum enable the proposed development to meet legislative and/or planning policy requirements.
- 4.2 The term ‘significant impact’ is taken from the Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines⁷ to mean “*An effect that either supports or undermines nature conservation objectives for important ecological resources or features*”.
- 4.3 In accordance with the NERC Act 2006, within Wales, LPA have a statutory duty to have regard to effects upon biodiversity when exercising their functions, this includes; consideration of effects upon ecological features such as designated sites and Principle Habitats/Species when determining planning applications. In accordance with planning policy at all levels, LPAs must also consider whether ‘significant harm’ to biodiversity may occur due to effects upon such ecological features. This, and the statutory protection afforded to certain designated sites and species, is explored in further detail below.
- 4.4 In accordance with this, the Wrexham Unitary Development Plan⁸ provides detailed planning policies to manage and guide development across Wrexham. The Development Plan alongside its Planning Guidance Notes are a material consideration in the determination of planning applications.
- 4.5 Planning Guidance Note No.32 ‘Biodiversity and Development’⁹ contains several policies of relevance to the proposed development, which are discussed in turn below.
- 4.6 EDP’s overall summary and conclusions, based upon the above, are given in **Section 5**.

Designated Sites

Statutory Designations

- 4.7 Statutory designations receive legal protection under various National and International legislative instruments. This protection is also reflected in National Policy included within Planning Policy Wales Technical Advice Note 5: Nature Conservation and Planning (TAN5),

⁷ CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.

⁸ Wrexham County Borough Council (undated) Wrexham Unitary Development Plan (1996-2011) – Adopted 2005. [Online]. Available from: https://www.wrexham.gov.uk/assets/pdfs/planning/udp/written_statement_e.pdf [Accessed 21 June 2019].

⁹ Wrexham County Borough Council (2011) Local Planning Guidance Note, No. 32: Biodiversity and Development. [Online] Available from: <https://www.wrexham.gov.uk/assets/pdfs/planning/lpg/guide32.pdf> [Accessed 21 June 2019].

which are given material consideration during the planning application process. Such consideration is also afforded to non-statutory designations.

- 4.8 Policy EC6 of the Wrexham Unitary Development Plan states development within or close to sites of biodiversity interest will only be permitted where development clearly outweighs the need to safeguard the intrinsic nature conservation value of the site.
- 4.9 In terms of Llay Bog SSSI, the designation relates to the sensitive and rare flora associated to bog habitat. Vulnerabilities include changes to the water acidity level through pollution and nutrient enrichment. There is potential for the water quality change, as a result of emissions released by the proposed works. Therefore, Llay Bog SSSI is scoped into this assessment.
- 4.10 The following designations have been scoped out of this assessment with reasonings discussed in regard to the proposed works having unlikely adverse impacts.
- 4.11 Regarding, Midlands Meres and Mosses Phase 2 Ramsar (including Vicarage Moss SSSI), there are no likely significant effects to the botanical component of the citation in terms of nutrient enrichment by virtue of its significant spatial separation.
- 4.12 Berwyn A Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains SAC (including Llandegla Moor SSSI and Ruabon/Llantysilio Mountains and Minera SSSI) are designated for Annex I habitats including dry heath, grassland, blanket and quaking bog. Additional, Annex II listed species, lesser horseshoe bat (*Rhinolophus hipposideros*) are found hibernating in disused quarry workings and an important assemblage of birds are noted. There is limited ecological and hydrological connectivity to these Sites. Furthermore, there is no suitable habitat within the Application Site to support such species and Annex II bat species were not found within the desk study data.
- 4.13 River Dee And Bala Lake/Afon Dyfrdwy A Llyn Tegid SAC (including both Afon Dyfrdwy (River Dee) SSSI and River Dee (England) SSSI) is cited as containing Annex I habitats and multiple Annex II listed species which include; Atlantic salmon (*Salmo salar*), floating water-plantain (*Luronium natans*), several lamprey (*Lampetra*) species, bullhead (*Cottus gobio*) and otter (*Lutra lutra*) which are dependent upon water quality. The Sites are isolated from the Application Site in terms of hydrology and ecological connectivity. Several busy roads, housing and farmland separate these designated sites.
- 4.14 Those sites specifically designated for being a strong hold for great crested newt populations (Deeside and Buckley Newt Sites SAC and Johnstown Newt Sites SAC) are geographically isolated from the Application Site. There is no hydrological or ecological connectivity to these sites or on-site suitable habitat.
- 4.15 Marford Quarry SSSI is designated for its diverse entomological populations which are dependent upon the calcareous substrate. The Application Site has no ecological connectivity to the site and contains no suitable habitat. Additionally, there are no hydrological links to the SSSI.

- 4.16 Coed Talon Marsh SSSI is noted for its specialised unique flora on a rare southern mesotrophic mire. This habitat is dependent upon water quality and is not hydrologically or ecologically connected to the Application Site.
- 4.17 Chwarel Singret SSSI and Coedwig Ffossil Brymbo Fossil Forest SSSI, no likely significant effects are likely to occur due to the nature of their citations for geological reasons.
- 4.18 Alyn Waters LNR has restricted ecological connectivity to the Application Site as it is separated by agriculturally managed fields and the B5102 with no hydrological links. The mixed habitat site with public access is unlikely to adversely affect by proposed works.

Non-statutory Designations

- 4.19 Non-statutory designations/local sites do not receive any formal legal protection. However, they do receive Planning Policy Protection, as reflected in the Planning Policy Wales (2018) and are also covered within Policy EC6 of the Wrexham Unitary Development Plan.
- 4.20 As described in **Section 3**, there are six non-statutory designations within the Zol of the Application Site. The B5102 and a series of agriculturally managed fields separate the Application Site from Alyn Waters, Blast Road Pond, Nant-y-Gaer and Llay Valley Wildlife Sites which limits ecological connectivity between the Sites.
- 4.21 Sydalit Wood and Llay Valley Hope Mountain and Ffrwdd Wood Wildlife sites are designated for botanical interest within woodland, marsh, riparian and a variety of grassland habitat. Ecological connectivity between these Wildlife Sites and the Application Site is restricted. Multiple land uses including residential development, multiple agricultural fields and a railway are situated between the sites, acting as a barrier to dispersal.
- 4.22 Rhydun Hall Grassland Wildlife Site is designated for botanical interest along a riparian habitat. Ecological connectivity between this wildlife site and the Application Site is limited and confined to a series of agriculturally managed fields. As the citation does not cover mobile species, this further demonstrates fragmentation between the Application Site and Wildlife Site.
- 4.23 The Application Site supports no species or habitats relevant to the LWSs within the Zol and there are very limited surface terrestrial or hydrological links between them. This coupled with the short temporal scale, minimal area required for the construction works and the negligible difference in land use post development means, that there is minimal risk of a negative impact on LWSs as a result of the proposals.

Air Quality Impacts on Designated Sites

- 4.24 The REC Dispersion Modelling Assessment (**Appendix EDP 3**) presents a baseline, study methodology and results based on a 'worst-case scenario' of emissions from the

proposed installation. Three pollutants are considered; NO_x, NO₂ and CO, although of these it is NO_x which is the primary consideration from an ecological point of view.

- 4.25 In all cases, for all ecological receptors considered, and for all pollutants considered, the increase in pollutants was considered to be insignificant, and therefore based on this the proposals would not result in a negative impact on any Protected Wildlife sites or sensitive habitats.

Habitats

- 4.26 There are several mechanisms through which habitats receive protection with the statutory and non-statutory designated site frameworks. For instance, certain habitats are identified in policies within Planning Policy Wales. For example, the document states that local authorities must consider the need to:

- *“Ensure statutorily and non-statutorily designated sites are properly protected and managed;*
- *Safeguard protected and priority species and existing biodiversity assets from impacts which directly affect their nature conservation interests and compromise the resilience of ecological networks and the components which underpin them, such as water and soil, including peat; and*
- *Secure enhancement of and improvements to ecosystem resilience by improving diversity, condition, extent and connectivity of ecological networks”.*

- 4.27 Policy PS2 of the Wrexham Unitary Development Plan identifies that development must not detrimentally affect the quality of the natural environment. Policy PS11 encourages proposals to improve biodiversity value, protect and enhance. Where such development is permitted, damage should be kept to a minimum with compensatory measures provided.

- 4.28 The majority of the Application Site comprises building and hard standing. The access track is lined with a dense continuous scrub and agricultural land. All habitats are considered to be of less than local value.

- 4.29 Some temporary loss of the scrub is unavoidable. However, given the temporary nature of this impact, it is considered to have a negligible impact on biodiversity.

- 4.30 Some of the habitats present within the Application Site, including those of low or negligible intrinsic value, require further consideration in relation to supporting Protected Species as discussed below.

Protected and/or Notable Species

- 4.31 Certain species receive legal protection in the United Kingdom and are commonly known as 'Protected Species'. In reality, the level of protection for different species varies considerably, from protection solely against 'killing and injury' to full protection of the species and their places of refuge. Where pertinent, details of legal protection afforded to species/species-groups are provided below.
- 4.32 In addition to Protected Species, there are other species/species-groups that do not receive legal protection, but which are notable owing to their conservation status as Priority Species or other status as described in Paragraph 4.3. Details of any actual or Potential Notable Species within the Application Site are identified below.
- 4.33 Baseline investigations have identified Protected Species implications for the Application Site relating to breeding birds and bats which are discussed below.

Breeding Birds

- 4.34 All wild birds, their nests and eggs are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended). This makes it an offence to:
- Intentionally kill, injure or take any wild bird;
 - Take, damage or destroy the nest of any wild bird while it is in use or being built;
 - Take, damage or destroy the egg of any wild bird; or
 - To have in one's possession, or control, any wild bird (dead or alive) or egg or any part of a wild bird or egg.
- 4.35 Any breeding birds close to the Application Site will be associated with the scrub and trees surrounding the access track.
- 4.36 During transportation of the materials, the access road will need some minor works to the scrub in order to allow access for the vehicles and construction machinery.
- 4.37 Any required vegetation removal (unlikely) should occur outside of the bird breeding season (i.e. avoiding the period from March to August inclusive). If this is not possible, any areas for clearance will be checked for signs of nesting (nests or displaying males), by an Ecologist prior to commencement. If evidence of nesting is recorded, works within that particular area shall not proceed until the chicks have fledged with a buffer zone around the active nest of 5m. Toolbox talks should be conducted to site personnel prior to any vegetation works taking place.
- 4.38 Subject to these recommendations being fulfilled no significant impacts upon birds are anticipated to arise as a result of the development.

Foraging Bats

- 4.39 All species of British bat are listed as European Protected Species (EPS) on Schedule 2 of the Conservation Regulations (Annex IV(a) to the Habitats Directive). This affords them strict protection under the Conservation of Habitats and Species (Amendment) Regulations 2016, making it an offence to:
- Deliberately capture, injure or kill a wild animal of an EPS;
 - Deliberately disturb wild animals of an EPS wherever they are occurring, in particular, any disturbance that is likely to impair their ability to survive, to breed or reproduce, or in the case of hibernating or migratory species, to hibernate or migrate or to affect significantly the local distribution or abundance of the species to which they belong;
 - Deliberately take or destroy the eggs of a wild animal of an EPS; or
 - Damage or destroy a breeding site or resting place of a wild animal of an EPS.
- 4.40 Additional protection for bats is also afforded under the Wildlife and Countryside Act 1981 (as amended), making it an offence to intentionally or recklessly disturb bats whilst they are occupying a structure or place which is used for shelter or protection, or to obstruct access to this structure or place.
- 4.41 Any foraging bats close to the Application Site will be associated with the scrub and trees along the access track and impacts on this will be minimal and temporary.
- 4.42 The lighting scheme for the new proposals will not be significantly different to that already employed at the Application Site.
- 4.43 Therefore, a significant beneficial impact upon bats is not anticipated to arise as a result of the development.

Amphibians

- 4.44 Great crested newt is the only native and widespread amphibian species to be protected in the UK and is a European Protected Species (EPS), thereby, receiving protection under the Conservation of Habitats and Species Regulations 2010 as discussed previously in relation to bats.
- 4.45 Additional protection is also afforded to this species under the Wildlife and Countryside Act 1981 (as amended), making it an offence to:
- Deliberately capture, injure or kill a wild animal of an EPS; and
 - Intentionally or recklessly disturb great crested newts whilst they are occupying a structure or place which is used for shelter or protection, or to obstruct access to this structure or place.

- 4.46 This species, together with common toad are also listed as Priority Species under the UK BAP. At a local scale, both common toad and great crested newt are Local Biodiversity Action Plan (LBAP) species alongside smooth and palmate newt.
- 4.47 Any amphibians including great crested newts will be associated to the pond and western edge of the access track.
- 4.48 Therefore, while it is accepted that amphibians including great crested newts are present in the general area, the proposed works would not require a licence and therefore, extensive survey data is not required. A licence is not required because the works do not require the loss of great crested newt habitat and pose negligible risk to individual animals. In the small areas where localised vegetation management is required, the works should be subject to NLMS, which should include an ecological watching brief and the avoidance of undertaking works during frosty weather. Removal of dense vegetation (such as the scrub adjacent to the access track) should also be kept to a minimum.
- 4.49 Great crested newts and other amphibians are notoriously tolerant of pollution, and therefore, impacts from the emissions on the animals themselves are likely to be negligible. In addition, the land surrounding the Application Site is subject to intensive agricultural practices and therefore, comprised of resilient flora. As the emissions will be within the levels required, no impacts on the local habitats are expected, and therefore it is predicted that great crested newts and other amphibians will be unaffected by the operation of the Application Site.
- 4.50 During transportation of the building materials, the access road will be used intermittently use throughout the year. Given the irregular use of the access road and minor sub-optimal habitat present, precautionary efforts can minimise any potential harm to the species. Work should occur outside the breeding season (mid-March to mid-June). If this is not possible, pre-commencement checks and tool box talks will be conducted to site personnel prior to any works taking place.
- 4.51 Subject to these recommendations being fulfilled, no significant impacts upon birds are anticipated to arise as a result of the development.

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Section 5

Summary and Conclusions

- 5.1 EDP's desk and field-based baseline investigations have demonstrated that the habitats and species present within and around the Application Site do not pose a constraint to the proposed development.
- 5.2 There are no further statutory or non-statutory protected nature conservation interests within the Application Site and none nearby that would be impacted by the proposals. Potential impacts as a result of air quality have been assessed using various sources of data and suggest that there will be no significant detrimental impacts.
- 5.3 EDP's survey confirmed that in general, Protected and Notable Species are very unlikely to be affected by the proposals, although, very minor and straightforward measures are proposed to ensure that breeding birds are not harmed during the localised vegetation removal.
- 5.4 On this basis, EDP finds that the scheme is capable of compliance with relevant planning policy for the conservation of the natural environment at all levels. There is therefore no reason, in ecological terms why planning permission should be refused.

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Appendix EDP 1

Habitat Descriptions and Illustrative Photographs

- A1.1 An Extended Phase 1 Habitat Survey¹⁰ was conducted on 04 June 2019. The principal habitats within and around the Application Site are described below, with illustrative photographs provided where appropriate. The following should be read in conjunction with **Plan EDP 1**.
- A1.2 All visible plant species were recorded, and their abundance was estimated with reference to a DAFOR scale with species recorded as Dominant, Abundant, Frequent, Occasional or Rare.
- A1.3 The Application Site consists of a hardstanding compound enclosed by fencing.

Limitations

- A1.4 The timing and conditions during the surveys were in line with those set out in the guidelines and as such were not subject to any constraints.

On-site Habitats

Hard Standing

- A1.5 The access track and compound consist of hardstanding (**Image EDP 1.1**). Birch (*Betula pendula*) saplings, bird's foot trefoil (*Lotus corniculatus*) and bramble (*Rubus fruticosus* Agg.) are present sparsely within the compound which is enclosed by a fence. An industrial estate borders the compound on the western boundary. Multiple trees surround the compound including elder (*Sambucus nigra*), birch (*Betula* sp) and oak (*Quercus robur*).

¹⁰ Joint Nature Conservation Committee (2010) Handbook for Phase 1 Habitat Survey: A Technique for Environmental Audit [Online]. Available from: http://jncc.defra.gov.uk/PDF/pub10_handbookforphase1habitatsurvey.pdf [Accessed 04 June 2019].



Image EDP A1.1: Hardstanding compound with saplings and trees beyond fencing

Off-site Habitats

Plantation Woodland

An area of plantation woodland screens the Application Site. It contains species such as oak and birch. An additional parcel of plantation woodland comprising of oak is located south of the Application Site, adjacent to the hardstanding access track and scrub.

Scrub

- A1.6 Immediately south of the Application Site is a hardstanding access track which has a tree line along the eastern boundary. This comprises of oak and small amounts of scattered scrub. This includes elder, hawthorn (*Crataegus monogyna*), willow (*Salix* sp.) and bramble. This is approximately 2m in width.

Improved Grassland

- A1.7 The hardstanding access track has borders of <1m in width and comprise of improved grassland (**Image EDP A1.2**). Dominant species include Yorkshire fog (*Holcus lanatus*) and cock's-foot (*Dactylis glomerata*). Occasional species include black medic (*Medicago lupulina*), cow parsley (*Anthriscus sylvestris*), common nettle (*Urtica dioica*), vetch and hogweed (*Heracleum sphondylium*).
- A1.8 The field to the east of the access track is agriculturally managed, species poor semi-improved grassland and dominated by Yorkshire fog, cock's foot and meadow grass (*Poa* sp.) with frequent buttercup (*Ranunculus* sp.).



Image EDP A1.2: Hardstanding access track with oak tree line to east and semi-improved grassland to the west

Hedgerows

- A1.9 The field to the west is bound by a species poor hawthorn hedgerow. This is box cut and measures approximately 1m x 1m with occasional mature oak trees.

Ponds

- A1.10 There is a pond (P1) located within the grassland, west of the Application Site. This has 1 - 2m steep banks. The bank is covered with scrub (including bramble and rose (*Rosa sp.*)). It is heavily shaded by trees (ash, willow and oak) and is largely devoid of vegetation (**Image EDP A1.3**).
- A1.11 Two further ponds are located within the quarry (310m south east of the Application Site) which could not be accessed at the time of the survey.

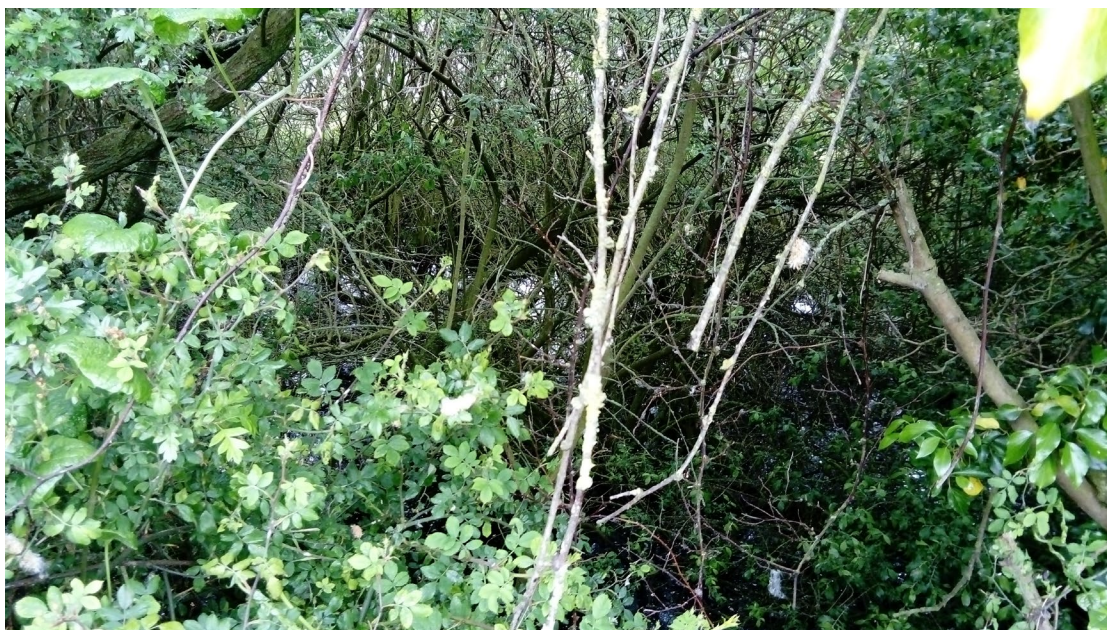


Image EDP A1.3: Pond located west of the Application Site surrounded by scrub (P1)

Appendix EDP 2 Ecological Desk Study

Methodology

- A2.1 The desk study is an important element of undertaking an initial Ecological Appraisal of a site proposed for development, since it enables the initial collation and review of contextual information such as designated sites together with known records of Protected and Priority Species observed within 2009 to 2019.
- A2.2 EDP undertook an ecological desk study for the Application in June 2019 to check for information on designated sites and Protected Species within both areas potential Zol, as measured from the red line boundary.

Results

Statutory Designations

- A2.3 The Application Site itself is not covered by any statutory designations, however, 11 statutory sites occur within the search radius. Many of these designations overlap between an International and National designation status. The sites and further details are given in **Table EDP A2.1**.

Table EDP A2.1: Statutory Sites of Nature Conservation Importance within the Application Site's Potential Zol

Site Name	Designation	Size (ha)	Grid Ref.	Approx. Distance from Site	Interest Feature(s)
Llay Bog	SSSI (Wales)	2	SJ322554	450m South	Botanical Interest - species include: Sphagnum mosses, a variety of sedges, marsh cinquefoil (<i>Potentilla palustris</i>), marsh pennywort (<i>Hydrocotyle vulgaris</i>), alder-birch carr with purple moor grass (<i>Molinia caerulea</i>).
Alyn Waters	Local Nature Reserve	100	SJ319547	830m South	Largest country park in Wrexham with woodland, grassland and riparian habitats. Former country estate with quarrying background.
Chwarel Singret	SSSI (Wales)	<1	SJ345562	2.2km West	Geological Interest

Site Name	Designation	Size (ha)	Grid Ref.	Approx. Distance from Site	Interest Feature(s)
Marford Quarry	SSSI (Wales)	16	SJ357560	3.3km West	Entomological Interest – diverse butterfly and moth assemblage associated to the flora which is indicative of calcareous and gravel substrate.
Coedwig Ffosil Brymbo Fossil Forest	SSSI (Wales)	<1	SJ29585345	3.5km South-west	Geological Interest
Midlands Meres and Mosses Phase 2 <i>Including:</i> Vicarage Moss	Ramsar (Wales & England) SSSI (Wales)	1593 21	SJ359541	 3.8km South-east	Nationally important series of SSSIs which demonstrate open water and peatland sites. Geomorphological and Botanical Interest - largest example of a basin mire in Clwyd, the vegetation being distinctly zoned with sphagnum, sedges and heather.
Coed Talon Marsh	SSSI (Wales)	11	SJ271580	4.8km North-west	Botanical Interest – largest and one of the best examples in Clwyd of southern mesotrophic mire which has a restricted range. Large areas of willow carr, fen vegetation and sedges.
Berwyn A Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains <i>Including:</i> Llandegla Moor	SAC (Wales) SSSI (Wales)	27,221 576	– SJ225535	7.2km South-west	Nationally important series of SSSIs which have blanket bog, base rich scree, crevice dwelling plants, dry heath, dry grassland and quaking bogs. Botanical and Fauna Interest - habitat example of heather (<i>Calluna vulgaris</i>) dominated dwarf-shrub heath.

Site Name	Designation	Size (ha)	Grid Ref.	Approx. Distance from Site	Interest Feature(s)
<i>And</i> Ruabon/Llantysilio Mountains and Minera	SSSI (Wales)	4795	SJ215495		Sphagnum, heather and a large and diverse bird assemblage. Botanical, Fauna & Geological Interest – dry dwarf shrub heath, dominated by heather, disused quarry workings are used by hibernating lesser horseshoe bat and a diverse assemblage of birds noted.
River Dee And Bala Lake/Afon Dyfrdwy A Llyn Tegid <i>Including:</i> Noted as two separate SSSIs: Afon Dyfrdwy (River Dee) and River Dee (England)	SAC (Wales) SSSI (Wales) SSSI (England)	1309 1490	SJ423503 SH930351 – SJ 311695	7.5km East	Cross border area which is designated for bullhead, river lamprey, brook lamprey, floating water plantain, otter, sea lamprey, Atlantic salmon and water crowfoot. Geological, Riparian Habitat Interest – noted for migratory fish, depend upon the whole river ecosystem and above SAC citation.
Deeside and Buckley Newt Sites <i>Including:</i> Buckley Claypits and Commons	SAC (Wales) SSSI (Wales)	208 100	– SJ29106407	8.2km North	Nationally important series of SSSIs which are a strong hold for great crested newt. Fauna and Geological Interest - Largest known breeding populations of the great crested newt in Great Britain. Torch night counts revealed 100+ on several occasions.

Site Name	Designation	Size (ha)	Grid Ref.	Approx. Distance from Site	Interest Feature(s)
Johnstown Newt Sites	SAC (Wales)	SJ298459	70	8.7km South	Nationally important series of SSSIs which are a strong hold for great crested newt.
<i>Including:</i> Stryt Las A'r Hafod	SSSI (Wales)		69		Fauna and Geological Interest - largest known breeding populations of the great crested newt in Great Britain. Torch night counts revealed 250+ on several occasions.

Non-statutory Designations

- A2.4 There are no Wildlife Sites within the Application Site but six occur within 1km. These results are summarised in **Table EDP A2.2**.

Table EDP A2.2: Non-statutory Designations of Nature Conservation Value within the Potential Zol

Site Name	Grid Reference	Hectares (Ha)	Approx. Distance from Site	Interest Feature(s)
Wildlife Sites				
Alyn Waters	SJ323548	116	500m South-west	Regenerating neutral grassland with semi-natural broadleaved woodland. Interesting species include several orchids, yellow rattle and yellow-wort. Breeding skylarks and otter presence.
Blast Road Pond	SJ317555	3	560m South-west	A fishing lake with mare's tail and an unimproved grassland slope with diverse species mix.
Rhydyn Hall Grassland	SJ311569	3	850m North-west	Grassland adjacent to River Alyn with frequent meadowsweet, black knapweed and Yorkshire fog. Some broadleaved woodland and scrub.
Nant-y-Gaer and Llay Valley	SJ337557	12	860m East	Semi-natural woodland mainly sycamore and ash. Semi-improved neutral grassland and grazed oak woodland present.
Sydallt Wood	SJ307557	9	960m West	Riparian woodland with planted beech and oak. Diverse storey levels with semi-improved neutral grassland. Diverse with several uncommon species.
Hope Mountain	SJ292556	129	980m West	Broad leaved woodland, scrub, bracken, neutral, acid

Site Name	Grid Reference	Hectares (Ha)	Approx. Distance from Site	Interest Feature(s)
and Ffrwdd Wood				and calcareous grassland, marshy grassland and swamp. Diverse and abundant mix of flora species including fleabane, field scabious and great knapweed.

Priority Habitats

A2.5 The Application Site does not contain any Priority Habitats, and none occur within 500m.

Protected and Notable Species

A2.6 As per COFNOD, no protected species were returned from within the Application Site, however, there are multiple notable species within 1km as detailed in **Table EDP A2.3**.

Table EDP A2.3: Notable Species Records within the Potential Zol

Scientific Name	Common Name	Grid Ref	Approx. distance from Site	Date	Status
Birds					
56 bird species within 1km (closest record of lapwing at 100m East) Barn owl, barnacle goose, black-headed gull, bullfinch, coal tit, common gull, common sandpiper, cormorant, curlew, dipper, dunlin, dunnock, fieldfare, gadwall, garden warbler, goldcrest, green woodpecker, herring gull, hobby, house martin, house sparrow, kestrel, kingfisher, lapwing, lesser black-backed gull, lesser redpoll, lesser whitethroat, linnet, little ringed plover, long-tailed tit, mallard, marsh tit, meadow pipit, mute swan, oystercatcher, pintail, red kite, redwing, sand martin, shelduck, shoveler, skylark, Slavonian grebe, song thrush, spotted flycatcher, starling, swallow, swift, teal, tree sparrow, tufted duck, wheatear, whitethroat, wigeon, willow warbler, woodcock.				2018 - 2009	WCA S.1 NERC S.41 RSPB Welsh Birds Red & Amber LBAP
Reptiles and Amphibians					
<i>Triturus cristatus</i>	Great crested newt	Multiple records from pond located immediately east of Application Site and stream within wooded area. Nearest record at 15m East.		2018 - 2011	EPS S7 LBAP
<i>Lissotriton helveticus</i>	Palmate newt	Multiple records from pond located immediately east of Application Site and stream within wooded area. Nearest record at 15m East.		2018 - 2011	LBAP

Scientific Name	Common Name	Grid Ref	Approx. distance from Site	Date	Status
<i>Lissotriton vulgaris</i>	Smooth newt	Multiple records from pond located immediately east of Application Site and stream within wooded area. Nearest record at 15m East.		2018 - 2011	LBAP
<i>Natrix helvetica</i>	Grass snake	Multiple records within industrial estate to the north and woodland to the west. Nearest record at 520m North.		2016 - 2010	S7 LBAP
<i>Bufo bufo</i>	Common toad	Multiple records from pond located immediately east of Application Site and stream within wooded area. Nearest record at 15m East.		2018 - 2011	S7 LBAP
Mammals					
<i>Meles meles</i>	Badger	SJ324570 SJ323549	810m North-east 950m South	2014 - 2009	PBA LBAP
<i>Erinaceus europaeus</i>	Hedgehog	SJ331555 SJ3355	940m South-east Within 2km	2013 2012	S7 LBAP
Bats					
No records of bats within the last ten years. Pre-2008 records of common pipistrelle, brown long eared, myotis and soprano pipistrelle within 1km.					EPS S7 LBAP
Flora					
28 flora species within 1km. Predominantly aquatic, marsh, grassland and woodland indicators, all located within non-statutory designated sites, with nearest record at Alyn Waters. Alder buckthorn, alternate-leaved golden-saxifrage, annual pearlwort, bluebell, buckler-fern, butterbur, common broomrape, common cudweed, common water-crowfoot, cranberry, dune helleborine, fly honeysuckle, grass vetchling, intermediate polypody (fern), large bitter-cress, lombardy-poplar, marsh fragrant-orchid, marsh yellow-cress, narrow buckler-fern, red goosefoot, rose, skullcap, slender tufted-sedge, small-flowered crane's-bill, smith's pepperwort, stinking iris, thread-leaved water-crowfoot, viper's-bugloss.				2016 - 2011	WCA S8 Red Data Book Listed Local importance LBAP
Invertebrates					
<i>Bembidion obliquum</i>		SJ314558	640m East	2015	Red Data Book Listed
<i>Lestes sponsa</i>	Emerald damselfly	SJ315560	455m East	2015	LBAP

Scientific Name	Common Name	Grid Ref	Approx. distance from Site	Date	Status
<i>Leucania comma</i>	Shoulder-striped wainscot	SJ325553	590m South	2014	S7 LBAP
<i>Erynnis tages</i>	Dingy skipper	SJ325566	680m North-east	2013	Red Data Book Listed
<i>Coenonympha pamphilus</i>	Small heath	SJ325566	680m North-east	2009	Red Data Book Listed

Note: BoCC = Birds of Conservation Concern, EPS = European Protected Species, S7 = Environment (Wales) Act 2016 (Section 7) (Priority Species), PBA = protection of Badgers Act.

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Appendix EDP 3
DISPERSION MODELLING ASSESSMENT LLAY, WREXHAM
(AQ106411, REC, September 2019)

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DISPERSION MODELLING ASSESSMENT LLAY, WREXHAM

REC REFERENCE: AQ106411

REPORT PREPARED FOR: BIOGAS TECHNOLOGY LIMITED

DATE: SEPTEMBER 2019



**DELIVERING ENVIRONMENTAL
AND RISK MANAGEMENT SOLUTIONS**



Issue/revision	Issue	Revision 1	Revision 2	Revision 3
Remarks	-			
Date	25/09/2019			
Prepared by	Joshua Davies			
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EXECUTIVE SUMMARY

Resource and Environmental Consultants Limited was commissioned by Biogas Technology Limited to undertake a Dispersion Modelling Assessment in support of a Short-Term Operating Reserve Site located at land off Llay Industrial Estate, Llay, Wrexham.

It is understood that a Dispersion Modelling Assessment is required to support a planning application for a proposed gas generator.

Impacts were predicted based on a worst-case assessment with maximum emissions limits considered for the gas generator. As such, predicted concentrations are considered to have been assessed robustly.

Impacts on existing pollutant concentrations were predicted to be **insignificant** at all location within the assessment extents. Nitrogen and acid gas concentrations and deposition rates were also predicted at the relevant ecological sites, the results indicated that impact at these locations could be screened out as **insignificant**.

Based on the predictions and the use of worst-case emissions, it is considered that the overall air quality impacts associated with the installation would be **insignificant**.



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1. INTRODUCTION

1.1 Background

Resource and Environmental Consultants Limited (REC Ltd) was commissioned by Biogas Technology Ltd to undertake a Dispersion Modelling Assessment in support of a Short-Term Operating Reserve (STOR) Site located at land off Llay Industrial Estate, Llay, Wrexham.

1.2 Site Location and Context

The proposed development is located at approximate National Grid Reference (NGR): 331990 356240. The proposed site is located in a predominantly existing industrial area, with a number of commercial and industrial uses adjacent to the site.

Reference should be made to Figure 1 within Appendix I for a map of the proposed generator location, surrounding area, and the modelling domain.

The proposals include the installation of 2 natural gas-powered electricity generators, with an overall output capacity of 3.08MW. Combustion emissions from the selected plants will be released through individually dedicated stacks. These have the potential to increase pollutant concentrations in the vicinity of the site. A Dispersion Modelling Assessment was therefore required to quantify effects at sensitive locations and determine any significant impact upon local air quality. This is detailed in the following report.

1.3 Limitations

This report has been produced in accordance with REC's standard terms of engagement. REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.



2 LEGISLATION AND POLICY

2.1 European Legislation

European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm (PM_{2.5}). The consolidated Directives relevant to the preparation of the assessment include:

- ▶ Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), sulphur dioxide (SO₂), lead and particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- ▶ Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide (CO); and

2.2 UK Legislation

The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 1 presents the AQLVs and AQOs for pollutants considered within this assessment.

Table 1 Air Quality Limit Values and Objectives

Pollutant	Air Quality Limit Value/Objective	
	Concentration (µg/m ³)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
CO	10,000	8-hour running mean

Given that the installation will utilise natural gas inputs, emissions of Particulate Matter (PM₁₀/PM_{2.5}) have not been assessed further in accordance with EA Emission from specified generators guidance². Should PM emissions arise during operation these will be of trace value and have no significant affect upon sensitive locations in proximity to the installation.

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

² EA - Emission from specified generators; Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators.



Table 2 summarises the advice provided in DEFRA guidance Local Air Quality Management Technical Guidance (LAQM TG16)³ and on where the Air Quality Objectives (AQOs) for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
8-hour mean	All locations where the annual mean objective would apply, together with hotels Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

³ Local Air Quality Management Technical Guidance 2016 LAQM (TG16), DEFRA, 2016.



2.3 Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of administration under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 Planning Policy Wales

The Planning Policy Wales (PPW) Edition 10 was published December 2018⁴ and sets out the Welsh Government's core planning policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment:

"Good design can help to ensure high environmental quality. Landscape and green infrastructure considerations are an integral part of the design process. Integrating green infrastructure is not limited to focusing on landscape and ecology, rather, consideration should be given to all features of the natural environment and how these functions together to contribute toward the quality of places. This embraces the principles of 'ecosystems services' and sustainable management of natural resources where multiple benefits solution become an integral part of good design. In a similar manner, addressing environmental risks can make a positive contribution to environmental protection and improvement, addressing land contamination, instability and flood risk and providing for biodiversity, climate protection, improved air quality, soundscape and water resources benefits."

"Green infrastructure can be an effective means of enhancing health and well-being, through linking dwellings, workplaces and community facilities and providing high quality, accessible green spaces. In all development and in public spaces especially, there should be sensitive management of light, and exposure to airborne pollution should be kept as low as reasonably practicable. The compatibility of land uses will be a key factor in addressing air quality and creating appropriate soundscapes which are conducive to, and reflective of, particular social and cultural activities and experiences, particularly in busy central areas of towns and cities. Equally, the provision of quiet, tranquil areas which provide peaceful sanctuaries in otherwise noisy environments can help to reduce general levels of pollution and promote both mental and physical well-being."

"The Welsh Government is committed to reducing reliance on the private car and supporting a modal shift to walking, cycling and public transport. Delivering this objective will make an important contribution to decarbonisation, improving air quality, increasing physical activity, improving the health of the nation and realising the goals of the Well-being of Future Generations Act."

"When considering a scheme of enabling development, planning permission should be granted only where all of the following can be applied:

[...]

⁴ Planning Policies Wales (Edition 10), Welsh Government, 2018



- ▶ *the enabling development does not give rise to significant risks, for example residential development in the floodplain or significantly impact on air quality or soundscape."*

"In proposing new development, planning authorities and developers must, therefore:

- ▶ *address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
- ▶ *not create areas of poor air quality or inappropriate soundscape; and*
- ▶ *seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes."*

"To assist decision making it will be important that the most appropriate level of information is provided and it may be necessary for a technical air quality and noise assessment to be undertaken by a suitably qualified and competent person on behalf of the developer."

[...]

"Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur. In circumstances where impacts are unacceptable, for example where adequate mitigation is unlikely to be sufficient to safeguard local amenity in terms of air quality and the acoustic environment it will be appropriate to refuse permission."

Relevant considerations in making planning decisions for potentially polluting development are likely to include:

[...]

- ▶ *impact on health and amenity;*

[...]

- ▶ *the risk and impact of potential pollution from the development, insofar as this might lead to the creation of, or worsen the situation in, an air quality management area, a noise action planning priority area or an area where there are sensitive receptors"*

The implications of the PPW have been considered throughout this assessment.



3 BASELINE

Existing air quality conditions in the vicinity of the installation were identified in order to provide a baseline for assessment. These are detailed in the following sections.

3.1 Local Air Quality Management

As required by the Environment Act (1995), the North Wales Combined Authority (NWCA) have undertaken Review and Assessment of air quality within the north of Wales. This process has indicated that annual mean concentrations of NO₂ are below the AQO within the area. As such, no AQMAs have been declared and have not been considered further in the preparation of the assessment.

3.2 Background Pollutant Concentrations

The total concentration of a pollutant is comprised of explicit local emission sources (such as roads and industrial sources) and the background component. The background component consists of indeterminate sources which are transported into an area from further away by meteorological conditions. Background pollutant concentrations are therefore the ambient level of pollution that is not affected by local sources of pollution.

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed installation is located in grid square NGR: 331500, 356500. Data for this location was downloaded from the DEFRA website⁹ for the purpose of this assessment and is summarised in Table 3.

Table 3 Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m ³)
NO _x	6.69
NO ₂	8.70
CO	252.00

It should be noted that background concentrations of NO₂, and NO_x were predicted for 2019 in order to represent current conditions at the installation. The background concentration of CO was obtained from the 2001 predictions¹⁰. These are the most recent predictions available from DEFRA and are therefore considered to provide a reasonable representation of background concentrations in the vicinity of the site.

With relation to short-term background concentrations, it was assumed that the short-term concentration of a substance is twice its long-term concentration as suggested within EA risk assessment for your environmental permit guidance¹¹.

⁹ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017>

¹⁰ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2001>

¹¹ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>.



3.3 Sensitive Receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality. These have been defined for human and ecological receptors in the following Sections.

3.3.1 Sensitive Human Receptors

A desk-top study was undertaken in order to identify any sensitive human locations in the vicinity of the site that required specific consideration during the assessment and are summarised in Table 4.

Table 4 Sensitive Human Receptors

Receptor		Height (m)	NGR (m)		Distance from Centre of Site Boundary (m)
			X	Y	
R1	Old Smithy Cottage	332436.3	356036.6	R1	473
R2	Allandale	331647.5	355879.6	R2	490
R3	Hilltop	331717.4	355832.6	R3	480
R4	The Grange	331554.7	355928.9	R4	532
R5	Gwastad Farm	331531.2	356131.6	R5	477
R6	Llay Industrial Estate	332078.3	356129.0	R6	120
R7	Llay Industrial Estate	332046.4	356173.1	R7	66
R8	Llay Industrial Estate	332039.4	356190.3	R8	49
R9	Llay Industrial Estate	332011.0	356245.0	R9	27
R10	Brier Lodge	331351.4	356772.6	R10	852

The sensitive locations identified in Table 4 represent worst-case locations i.e. the locations at which air quality impacts from the proposals are expected to be the greatest. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of atmospheric emissions from the site that have not been individually identified above. Reference should be made to Figure 1 within Appendix I for a graphical representation of sensitive locations.

3.3.2 Sensitive Ecological Receptors

With regard to receptors of ecological sensitivity, the Specified Generator Tranche B Screening Tool¹² states:

"Note that conservation sites need only be considered where they fall within set distances of the activity:

¹² Air Quality Modelling and Assessment Unit (AQMAU), Specified Generator Tranche B Screening Tool, Version 2.1, February 2019



- ▶ *Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 5km of the installation; or*
- ▶ *Sites of Special Scientific Interest (SSSIs) within 2km of the location.*

Furthermore, the EA guidance on MPCD and SG regulations¹³ states the following:

We have reduced the screening distance to 5km to determine when an assessment is required of aerial emissions on Habitat's sites from MCP/SG fired on natural gas or low-sulphur diesel. When using fuels such as biogas and landfill gas the screening distance remains unchanged at 10km.

A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the distances stated above. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service¹⁴ which draws information on key environmental schemes and designations.

The following statutory designated sites of ecological or nature conservation importance are located within the relevant 5km screening distances stated above. As such ecological designations have been considered further with the assessment. All ecological receptors have been assessed at 0m height.

Table 5 Sensitive Ecological Receptors

Receptor		NGR (m)		Distance from stack location(m)
		X	Y	
ER1	Llay Bog (SSSI)	332076.3	355489.9	734
ER2	Llay Bog (SSSI)	332076.3	355489.9	734
ER3	Llay Bog (SSSI)	332244.4	355442.0	815
ER4	Llay Bog (SSSI)	332244.4	355442.0	815
ER5	Midland Meres and Mosses Phase 2 (Ramsar)*	335825.0	353962.3	4442
ER6	Midland Meres and Mosses Phase 2 (Ramsar)*	335892.1	354124.7	4420
ER7	Midland Meres and Mosses Phase 2 (Ramsar)*	335825.0	353962.3	4442
ER8	Midland Meres and Mosses Phase 2 (Ramsar)*	335892.1	354124.7	4420

**Assessed as Vicarage Moss SSSI given absence of appropriate data on the Air Pollution Information System (APIS) website relating to the Midland Meres & Mosses Phase 2 Ramsar Site.*

The sensitive locations identified in Table 5 represent worst-case locations i.e. the locations at which air quality impacts from the proposals are expected to be the greatest. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of atmospheric emissions from the site that have not been individually identified above. Reference should be made to Figure 2 and Figure 3 within Appendix I for a graphical representation of sensitive ecological locations at the Llay Bog (SSSI) and Midland Meres and Mosses Phase 2 (Ramsar) sites.

¹³ <https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/>

¹⁴ Multi-Agency Geographic Information for the Countryside, www.magic.gov.uk.



Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the Air Pollution Information System (APIS) website¹⁵ was undertaken in order to identify the most suitable habitat description and associated critical load for the designations considered within the model. The critical loads for nitrogen deposition are presented in Table 6 and for acid deposition are presented in Table 7.

Table 6 Nitrogen Critical Load

Ecological Designation	Feature	APIS Habitat	Nitrogen Critical Load (kgN/ha/yr)	
			Min	Max
Llay Bog (SSSI)	Raised bogs	Raised and blanket bogs	5	10
Llay Bog (SSSI)	Coniferous woodland	Broadleaved, mixed and yew woodland	5	15
Vicarage Moss (SSSI)	Fen	Valley mires, poor fens and transition mires	10	15
Vicarage Moss (SSSI)	Lowland Mixed Deciduous Woodland	Broadleaved deciduous woodland	10	20

Table 7 Acid Critical Load

Ecological Designation	Feature	Acid Critical Load (kgN/ha/yr)		
		CLMaxs	CLMinN	CLMaxN
Llay Bog (SSSI)	Raised bogs	0.261	0.321	0.582
Llay Bog (SSSI)	Coniferous woodland	1.561	0.142	1.838
Vicarage Moss (SSSI)	Fen	0.46	0.223	0.683
Vicarage Moss (SSSI)	Lowland Mixed Deciduous Woodland	0.975	0.142	1.117

Predicted concentrations from APIS were used to represent their respective background concentrations for the modelling process. Table 8 displays the predicted background concentrations used in the operational phase assessment for the sensitive receptor locations.

Table 8 Predicted Background Concentration at Sensitive Locations

Receptor	Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)
	NO _x
ER1	10.36
ER2	10.36
ER3	10.36

¹⁵ UK Air Pollution Information System, www.apis.ac.uk.



Receptor	Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)
	NO_x
ER4	10.36
ER5	11.43
ER6	11.43
ER7	11.43
ER8	11.43

Background deposition rates at the ecological receptor location were downloaded from the APIS website¹⁵ and are summarised in Table 9.

Table 9 Background Deposition Rates

Receptor	Background Deposition Rate		
	Nitrogen ($\text{kgN}/\text{ha}/\text{yr}$)	Acid ($\text{keq}/\text{ha}/\text{yr}$)	
		Nitrogen	Sulphur
ER1	23.94	1.71	0.31
ER2	39.62	2.83	0.35
ER3	23.94	1.71	0.31
ER4	39.62	2.83	0.35
ER5	25.34	1.81	0.25
ER6	25.34	1.81	0.25
ER7	43.82	3.13	0.29

It should be noted that at all locations Nitrogen and Acid Deposition rates exceed the relevant critical loads as a background condition.



4 METHODOLOGY

Emissions associated with the generators have the potential to cause increases in pollutant concentrations in the vicinity of the site. These have been quantified through dispersion modelling in accordance with the methodology outlined in the following Sections.

An industry standard atmospheric dispersion model software, ADMS-5, was used to model releases of the identified substances. The dispersion modelling procedure was as follows:

- ▶ Information on stack dimensions were provided by Biogas Technology Ltd;
- ▶ Process conditions were obtained from Biogas Technology Ltd;
- ▶ Emission rates were provided by Biogas Technology Ltd based on technical data sheets for the generator specifications;
- ▶ Appropriate data to describe meteorological conditions in the vicinity of the site were obtained from Atmospheric Dispersion Modelling (ADM) Ltd;
- ▶ The above information was entered into the dispersion model;
- ▶ The dispersion model was run to determine pollutant concentrations in the vicinity of the site; and
- ▶ The study results were compared with the relevant assessment criteria.

4.1 Dispersion Model

Dispersion modelling was undertaken using ADMS-5 (v5.2.0.0), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS v5.2 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology, and calculates user-selected long-term and short-term averages. It should be noted the modelling prediction produce by the ADMS-5 are widely accepted within the UK by the EA and DEFRA.

4.2 Modelling Scenarios

The pollutant scenarios considered in the modelling assessment are detailed in Table 10.

Table 10 Dispersion Modelling Scenarios

Pollutant	Modelled As	
	Short Term	Long Term
Nitrogen Dioxide (NO ₂)	99.79th percentile (%ile) 1-hour mean	Annual mean
Oxides of Nitrogen (NO _x)	100th percentile (%ile) 24-hour mean	Annual mean
Carbon Monoxide (CO)	8-hour rolling mean	-

Some short-term air quality criteria are framed in terms of the number of occasions in a calendar year on which the concentration should not be exceeded. As such, the percentiles (%ile) shown in



Table 10 were selected to represent the relationship between the permitted number of exceedances of short-period concentrations and the number of periods within a calendar year.

It is not possible to add short-term peak baseline and process concentrations. This is because the conditions which give rise to peak ground-level concentrations of substances emitted from an elevated source at a particular location and time are likely to be different to the conditions which give rise to peak concentrations due to emissions from other sources. This point is addressed in EA guidance¹², which advises that an estimate of the maximum combined pollutant concentration can be obtained by adding the maximum predicted short-term concentration due to emissions from the source to twice the annual mean baseline concentration. This approach was adopted throughout the assessment.

4.3 Stack Information

Combustion emissions from the proposed gas generator will be emitted from a dedicated stack. For the purpose of the Stack Height Assessment, multiple modelling scenarios have been considered with the proposed stack at different heights to determine the optimum height. Details indicating the modelled stack heights are presented in Table 11.

Table 11 Stack Information

Stack Reference	Stack Location NGR (m)		Height from Ground Floor (m)
	X	Y	
G5316	331985.5	356247.9	8.067
G3520	331990.9	356250.2	8.381

Reference should be made to Figure 1 within Appendix I for a graphical representation of the stack location.

4.4 Process Conditions

The process conditions from the generators were provided through correspondence with Biogas Technology Ltd. In order to consider a robust assessment, the model is based on the generator in operation at 100% load. Process conditions are provided in Table 12.

Table 12 G3516 Process Conditions

Parameter	Unit	Value
Exit diameter	m	0.394
Exit Temperature	°C	520.00
Flue gas efflux velocity	m/s	35.90
Volumetric flow rate	m ³ /h	3573.00
Volumetric flow rate	m ³ /s	4.37



Table 13 G3520 Process Conditions

Parameter	Unit	Value
Exit diameter	m	0.495
Exit Temperature	°C	533.00
Flue gas efflux velocity	m/s	35.50
Volumetric flow rate	Nm ³ /h	5504.00
Volumetric flow rate	m ³ /s	6.84

4.5 Emissions

The emission rates from the gas generator were calculated based on referenced emission concentrations outlined within the technical data sheet, Caterpillar G3516LE and G3520C. It should be noted that the emissions data was based on the generators operating at 100% load and as such, this ensured a robust assessment was undertaken. The mass emissions rate for each generator is shown in Table 14.

Table 14 Mass Emission Rates

G3516		
Pollutant	Emission Maximum (mg/Nm ³) ^a	Emission Rate (g/s)
NO _x	500.00	0.496
CO	1680.00	1.67
G3520		
Pollutant	Emission Maximum (mg/Nm ³) ^a	Emission Rate (g/s)
NO _x	500.00	0.764
CO	1239.00	1.89

Without confirmation on actual and reference moisture content, wet volumetric flows and dry emission concentrations were utilised to ensure a worse case assessment.

4.6 Time Varied Emissions

Emissions were assumed to be constant, with the plant in operation 24-hours per day, 365-days per year, when considering impacts at sensitive receptor locations. As such, this is considered to be a worst-case assessment scenario as plant shut-down or periods of reduced work load are not reflected in the modelled emissions, and thus provides a significant and unrealistic overestimation of potential impacts.



4.7 Assessment Extents

Ambient concentrations were predicted over the following areas, relating to the modelling domain of human and ecological receptor locations, respectively:

- ▶ NGR: 331320, 355680 to 332470, 356830; and
- ▶ NGR: 331470, 355280 to 332600, 356410

One Cartesian grid with a resolution of 10m and a height of 1.5m and 0.0m, to assume average breathing height and ground level was included in the model. Results were subsequently used to produce contour plots within the Surfer 15 software package.

4.8 Meteorological Data

Meteorological data used in this assessment was taken from Hawarden meteorological station over the period 1st January 2013 to 31st December 2017 (inclusive). Hawarden meteorological station is located at approximate NGR: 381745, 383960, which is approximately 15km north of the proposed development site.

As previously stated, maximum emissions across the five years of meteorological data were utilised to ensure a worse case assessment. Hourly sequential formats were used with the dispersion modelling.

All meteorological data used in the assessment was provided by ADM Ltd, which is an established distributor of meteorological data within the UK. Reference should be made to Figure 2 within Appendix I for wind roses of utilised meteorological data.

4.8.1 Roughness Length

A roughness length (z_0) of 0.3m was considered appropriate for the surface characteristics of the assessment area land use and meteorological station. This value is suggested within ADMS 5 as being suitable for 'agricultural areas (max)'.

4.8.2 Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 10m was used in the dispersion modelling study. This value is considered appropriate for the nature of the assessment area and meteorological station. The value is suggested within ADMS 5 as being suitable for small towns <50,000'.

4.9 Background Concentrations

A review of existing data in the vicinity of the site was undertaken in Section 3 of this report in order to define background pollutant levels. These were subsequently utilised in the assessment to represent existing concentrations in the vicinity of the site.

It should also be noted that the sensitive human receptor locations used in the assessment are located in several DEFRA grid squares. As such, predicted concentrations from their respective grid squares were utilised to represent their respective background concentrations for the modelling process. These are summarised in Table 15.



Table 15 Predicted Background Pollutant Concentrations for Human Receptors

DEFRA Grid Square	Receptors	Pollutant	Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)
332500, 356500	R1, R6 to R9	NO _x	12.89
		NO ₂	9.58
		CO	262.00
331500, 355500	R2 to R4	NO _x	9.62
		NO ₂	7.35
		CO	261.00
331500, 356500	R5 and R10	NO _x	8.70
		NO ₂	6.69
		CO	261.00

It should be noted that background concentrations for NO_x and NO₂ were predicted for 2019, whilst CO was predicted for 2001. These are the most recent predictions available from DEFRA. As mentioned earlier, background concentrations for short-term concentrations were represented by twice the annual mean background concentrations in line with the EA guidance¹².

4.10 Terrain Data

Ordnance Survey Landform Panorama terrain data was included for the site and surrounding area in order to take account of the specific flow field produced by variations in ground height throughout the assessment extents. This was pre-processed using the dedicated function within ADMS 5 and covers a 10km x 10km area extending from the centre of the proposed site.

4.11 Building Effects

The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission point. Structures can interrupt the wind flows and cause significantly higher ground-level concentrations close to base of buildings than would arise in the absence of the buildings. Only indicative heights for the development site buildings were available at the time of writing the report. Building input geometries are shown in Table 16.

Table 16 Building Geometries

Building		NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
1	Llay Industrial Estate 1	332015.0	356247.0	5.5	16.6	9.8	158.6
2	Llay Industrial Estate 2	332028.0	356253.8	5.5	23.4	9.1	140.0
3	Llay Industrial Estate 3	332046.1	356243.0	5.5	4.9	4.1	143.2
4	Llay Industrial Estate 4	332031.9	356223.3	5.5	37.9	15.2	146.3



Building		NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
5	Llay Industrial Estate 5	332039.0	356200.3	5.5	27.7	11.1	143.4
6	G3516 Container	331989.4	356251.1	4.2	11.0	2.7	157.2
7	G3520 Container	331984.1	356248.8	4.2	11.0	2.6	157.4

Reference should be made to Figure 1 within Appendix I for a graphical representation of the modelled building layout and the ADMS 5 model input.

4.12 NO_x to NO₂ Conversion

Emissions of NO_x from combustion processes are predominantly in the form of NO. Excess oxygen in the combustion gases and further atmospheric reactions cause the oxidation of NO to NO₂.

Ground level NO_x concentrations were predicted through dispersion modelling. NO₂ concentrations reported in the results section assume 70% conversion from NO_x to NO₂ for long term concentrations and 35% conversion for short-term concentrations, based upon EA guidance².

4.13 Significance of Predicted Impacts

Predicted pollutant concentrations are summarised in the following formats:

- ▶ *Process contribution (PC) - Predicted pollutant concentration as a result of emissions from the site only; and*
- ▶ *Predicted environmental concentration (PEC) - Total predicted pollutant concentration as a result of emissions from the site and existing baseline levels.*

The significance of predicted impact has been assessed in accordance with EA criteria¹⁶ and through consideration of likely effects as a result of the proposals. EA guidance¹⁶ states that process contributions can be considered insignificant if:

- ▶ *the short-term PC is less than 10% of the short-term environmental standard; and*
- ▶ *the long-term PC is less than 1% of the long-term environmental standard.*

If you meet both of these criteria you don't need to do any further assessment of the substance.

If these criteria are not met then a second stage of screening to determine the impact of the PEC is required.

- ▶ *The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and*
- ▶ *The long-term PEC is less than 70% of the long-term environmental standards.*

If the predicted long-term PC is greater than 1% and the PEC is less than 70% of the long-term environmental standard, the emissions can be considered insignificant. Should the predicted PEC be greater than 70% of the long-term environmental standard, a detailed dispersion modelling is

¹⁶ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>.



required. For short-term environmental standards, impact can be screened out if the short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration.

In the case in which PCs and PECs cannot be screened as insignificant, detailed modelling is required. Currently there are no accepted criteria to determine whether PCs are significant, or if PECs are insignificant or significant. As such the EA guidance¹⁷ suggests that significance should be judged on site specific circumstances.

4.14 Modelling Uncertainty

Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- ▶ *Model uncertainty* - due to model limitations;
- ▶ *Data uncertainty* - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and
- ▶ *Variability* - randomness of measurements used.

Potential uncertainties in model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- ▶ *Choice of model* - ADMS 5 is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- ▶ *Meteorological data* - Modelling was undertaken using five meteorological data sets from the closest observation site to the facility to take account of worst-case conditions;
- ▶ *Plant operating conditions* - Operational parameters were supplied by Biogas Technology Ltd. As such, these are considered to be representative of likely operating conditions;
- ▶ *Emission rates* - were derived from the relevant ELVs and therefore represent the maximum potential emissions with the plant operating within the conditions of statutory guidance. Emissions were also assumed to be constant throughout the modelling period, which does not allow for plant shut down or reduced load. These assumptions are likely to overestimate actual emissions and therefore result in a worst-case assessment.
- ▶ *Background concentrations* - Obtained from the DEFRA mapping study for human receptors. Although these may underestimate actual concentrations in the vicinity of pollutant sources, such as roads, they are considered suitable for an assessment of this nature;
- ▶ *Receptor locations* - A Cartesian Grid at a height of 1.5m, to replicate breathing height, was included in the model in order to predict concentrations throughout the assessment extents. Specified Receptor points were also included at sensitive locations to provide additional consideration of these areas, varied heights were included to represent the window elevations of each associated building; and
- ▶ *Variability* - All model inputs are as accurate as possible and worst-case conditions have been considered where necessary in order to ensure a robust assessment of potential pollutant concentrations.

Results were considered in the context of the relevant EQS. It is considered that the use of the stated measures to reduce uncertainty and the use of worst-case assumptions when necessary has resulted in model accuracy of an acceptable level.

¹⁷ <https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports#carry-out-impact-assessment>



5 RESULTS

Dispersion modelling was undertaken with the inputs described in Section 4. Based on the findings of the Stack Height Assessment, the optimum stack height to ensure that air quality impacts are considered **not significant** is 9m. As such, the results outlined below are based on the height of the stack at 9m above ground level. More detail on the Stack Height Assessment is provided within Section 1.

Reference should be made to Figure 5 to Figure 7 within Appendix I for graphical representations of predicted pollutant concentrations throughout the assessment extents.

The emission concentrations were predicted separately for 5 assessment years and then processed to ensure that the maximum concentration was analysed.

5.1 Human Sensitive Receptors

5.1.1 Nitrogen Dioxide - Annual Mean

Predicted annual mean NO₂ concentrations inclusive of baseline levels are summarised in Table 17. It should be noted that only residential receptors were considered for predicted changes in annual mean NO₂ concentrations as they are considered sensitive to annual mean concentrations in accordance with the LAQM (TG16) guidance³.

Table 17 Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Residential - Old Smithy Cottage	0.67	10.25	2	26
R2	Residential - Allandale	0.24	7.59	1	19
R3	Residential - Hilltop	0.20	7.55	1	19
R4	Residential - The Grange	0.20	7.55	1	19
R5	Residential - Gwastad Farm	0.22	6.91	1	17
R10	Residential - Brier Lodge	0.41	7.10	1	18

Note: Predicted concentrations were assessed against the relevant EQSs: Annual mean AQO of 40µg/m³.

As indicated in Table 17, predicted NO₂ concentrations were below the relevant EQS at all sensitive receptor locations for all meteorological data sets. A maximum PEC of 10.25µg/m³ as predicted at sensitive location R1 (Old Smithy Cottage), is equivalent to 25.6% of the EQS and provides sufficient headroom in relation potential exceedances of the relevant EQS.

The PC proportion of the EQS is above 1% at 1 receptor location (R1) and as such, impacts on annual mean NO₂ PC concentrations cannot be screened as **insignificant** according to the first stage of the EA screening criteria. Critically, during the secondary stage of assessment the PEC proportion of the AQO is predicted to be below 70% at all relevant receptor locations and can be consider as **insignificant**



As such, impacts on annual mean NO₂ concentrations at all receptor locations can be screened out as **insignificant** according to the EA guidance¹¹.

5.1.2 Nitrogen Dioxide – 1-Hour Mean

Predicted 99.79%ile 1-hour mean NO₂ concentrations are summarised in Table 18.

Table 18 Predicted 99.79%ile 1-hour Mean NO₂ Concentrations

Receptor		Predicted 99.79%ile 1-hour Mean NO ₂ Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Residential - Old Smithy Cottage	5.01	24.17	3	3
R2	Residential - Allandale	6.38	21.08	3	3
R3	Residential - Hilltop	5.55	20.26	3	3
R4	Residential - The Grange	4.87	19.58	2	3
R5	Residential - Gwastad Farm	5.49	18.86	3	3
R6	Place of Work - Llay Industrial Estate	21.50	40.66	11	12
R7	Place of Work - Llay Industrial Estate	33.50	52.66	17	19
R8	Place of Work - Llay Industrial Estate	39.00	58.17	20	22
R9	Place of Work - Llay Industrial Estate	45.72	64.88	23	25
R10	Residential - Brier Lodge	4.49	17.86	2	2

Note: Predicted concentrations were assessed against the relevant EQSs: 99.79%ile 1-hour mean AQO of 200µg/m³.

As indicated in Table 18, predicted 99.79%ile 1-hour mean NO₂ concentrations were below the relevant EQS at all sensitive receptor locations. A maximum PEC of 64.88µg/m³ as predicted at sensitive location R9 (Llay Industrial Estate), is equivalent to 32.4% of the EQS and provides sufficient headroom in relation potential exceedances of the relevant EQS.

The PC proportion of the EQS is above 10% at 4 sensitive receptor locations (R6 to R9) and as such, impacts on 1-hour mean NO₂ PC concentrations cannot be screened as **insignificant** according to the first stage of the EA screening criteria. During the secondary stage of assessment, the PC proportion of the EQS is predicted to be above 20% of the EQS minus twice the long-term background concentration at 2 sensitive receptor locations (R8 to R9). As such, impacts on annual mean NO₂ concentrations at all receptor locations cannot be screened out as **insignificant** according to the EA guidance¹².

Critically, PECs at all locations are well below the annual mean EQS (200µg/m³) and as such no significant risk to exposure is apparent. Furthermore, the emissions associated with the Emissions were assumed to be constant, with the plant in operation 24-hours per day, 365-days per year. This is considered an absolute worst-case assessment scenario as plant shut-down or periods of reduced work load are not reflected in the modelled emissions



Based on the predicted EQS headroom and maximum loadings it has been judged that overall impacts on 1-hour mean NO₂ concentrations can be considered **insignificant**.

5.1.3 Carbon Monoxide

Predicted 8-hour rolling mean CO concentrations are summarised in Table 19.

Table 19 Predicted 8-hour Rolling Mean CO Concentrations

Receptor		Predicted 8-hour Rolling Mean CO Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Commercial Unit	40.21	302.21	0.4	0.4
R2	Industrial Unit	45.52	306.52	0.5	0.5
R2a	Industrial Unit	59.66	320.66	0.6	0.6
R3	Commercial Unit	35.26	296.26	0.4	0.4
R4	Industrial Unit	35.19	287.19	0.4	0.4
R4a	Industrial Unit	169.27	431.27	1.7	1.7
R5	Industrial Unit	260.32	522.32	2.6	2.7
R5a	Industrial Unit	314.61	576.61	3.1	3.2
R6	Industrial Unit	369.23	631.23	3.7	3.8
R7	Industrial Unit	38.36	290.36	0.4	0.4

Note: Predicted concentrations were assessed against the relevant EQSs: 8-hour rolling mean AQO of 10,000 µg/m³.

As indicated in Table 19, predicted 8-hour rolling mean CO concentrations were below the relevant EQS at all sensitive receptor locations.

The PC proportion of the EQS is less than 10% at all sensitive locations and as such, impacts on 8-hour rolling mean CO concentrations are considered to be **insignificant** according to EA screening criteria.



5.2 Sensitive Ecological Receptors

5.2.1 Oxides of Nitrogen -Annual Mean

Predicted annual mean NO_x concentrations at sensitive ecological receptors are summarised in Table 20.

Table 20 Predicted Annual Mean NO_x Concentrations

Receptor		Predicted Annual Mean NO _x Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Llay Bog (SSSI)	0.18	10.54	1	35
ER2	Llay Bog (SSSI)	0.18	10.54	1	35
ER3	Llay Bog (SSSI)	0.27	10.63	1	35
ER4	Llay Bog (SSSI)	0.27	10.63	1	35
ER5	Vicarage Moss (SSSI)	0.05	11.48	0	38
ER6	Vicarage Moss (SSSI)	0.05	11.48	0	38
ER7	Vicarage Moss (SSSI)	0.05	11.48	0	38
ER8	Vicarage Moss (SSSI)	0.05	11.48	0	38

As indicated in Table 20, the PC proportion of the EQS is below the relevant threshold at all ecological receptor locations. Additionally, the PEC proportion of the EQS is predicted to be less than 70% at all ecological receptor locations and therefore, impacts on annual mean NO_x concentrations can be considered as **insignificant** according to EA screening criteria.

5.2.2 Oxides of Nitrogen - 24-Hour Mean

Predicted 24-hour mean NO_x concentrations are summarised in Table 21.

Table 21 Predicted 24-hour Mean NO_x Concentrations

Receptor		Predicted 24-hour Mean NO _x Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Llay Bog (SSSI)	2.95	23.67	4	31.6
ER2	Llay Bog (SSSI)	2.95	23.67	4	31.6
ER3	Llay Bog (SSSI)	3.95	24.67	5	32.9
ER4	Llay Bog (SSSI)	3.95	24.67	5	32.9
ER5	Vicarage Moss (SSSI)	0.48	23.34	1	31.1
ER6	Vicarage Moss (SSSI)	0.45	23.31	1	31.1



Receptor		Predicted 24-hour Mean NO _x Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER7	Vicarage Moss (SSSI)	0.48	23.34	1	31.1
ER8	Vicarage Moss (SSSI)	0.45	23.31	1	31.1

As indicated in Table 21, the PC proportion of the EQS is less than 10% at all receptor locations. As such, impacts on 24-hour mean NO_x concentrations are considered to be **insignificant** in accordance with the EA screening criteria.

5.2.3 Nitrogen Deposition

Predicted annual mean nitrogen deposition rates are summarised in Table 22.

Table 22 Predicted Annual Mean Nitrogen Deposition Rates

Receptor		Predicted Annual Mean Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of EQS (%)			
				Low EQS		High EQS	
		PC	PEC	PC	PEC	PC	PEC
ER1	Llay Bog (SSSI)	0.03	23.97	1	479	0	240
ER2	Llay Bog (SSSI)	0.05	39.67	1	397	0	198
ER3	Llay Bog (SSSI)	0.04	23.98	1	480	0	240
ER4	Llay Bog (SSSI)	0.08	39.70	1	397	0	198
ER5	Vicarage Moss (SSSI)	0.01	25.35	0	253	0	169
ER6	Vicarage Moss (SSSI)	0.01	25.35	0	254	0	127
ER7	Vicarage Moss (SSSI)	0.01	43.83	0	438	0	292
ER8	Vicarage Moss (SSSI)	0.01	43.83	0	438	0	219

The PC proportions of the both the Low and High EQS are below the relevant thresholds at all receptor locations. As such, impacts on annual mean nitrogen deposition rates are considered to be **insignificant** in accordance with the EA screening criteria.

5.2.4 Acid Deposition

Predicted annual mean acid deposition rates are summarised in Table 23. In accordance with the EA Guidance, the APIS site relevant critical load tool was used to determine whether there is an exceedance of the CL function for acid deposition. It should be noted that only the ecological receptors sensitive to acid deposition were considered.



Table 23 Predicted Annual Mean Acid Deposition Rates

Receptor	Predicted Annual Mean Acid Deposition Rate (keq/ha/yr)	Proportion of EQS (%)		Exceedance of CL Function (keq/ha/yr)
	N	PC	PEC	
ER1	0.002	0	347	No Exceedance
ER2	0.004	0	173	No Exceedance
ER3	0.003	0	348	No Exceedance
ER4	0.006	0	173	No Exceedance
ER5	0.001	0	302	No Exceedance
ER6	0.001	0	302	No Exceedance
ER7	0.001	0	306	No Exceedance
ER8	0.001	0	306	No Exceedance

As shown in Table 23, the PC proportion of the EQS is less than 1% at all sensitive receptor locations. Furthermore, the APIS site relevant critical load tool indicated that no receptors exceeded the CL function for acid deposition.



6 CONCLUSION

REC Ltd was commissioned by Biogas Technology Ltd to undertake a Dispersion Modelling Assessment in support of the proposed STOR site at land off Llay Industrial Estate, Llay, Wrexham.

Dispersion modelling of a number of pollutants was undertaken using ADMS 5 (v5.2). Impacts at sensitive receptors were quantified and the results compared with the relevant EQSs.

Impacts were based on a worst-case assessment where maximum concentrations for 5 assessment years was taken and maximum emissions limits considered for the gas generator. Additionally, emissions were assumed to be constant, with the plant in operation 24-hours per day, 365-days per year. As such a significant overestimation of operational hours was considered during the assessment.

Predicted impacts on existing pollutant concentrations on human sensitive receptors from the proposed operations could be screened out as **insignificant** in accordance with the EA screening criteria.

Nitrogen and acid gas concentrations and deposition rates were also predicted at the relevant ecological sites. Results indicated that emissions from the proposed operations could be screened out as **insignificant** in accordance with the EA screening criteria.

Based on the predictions and the use of worst-case emissions, it is considered that the overall air quality impacts of the development would be **insignificant**.

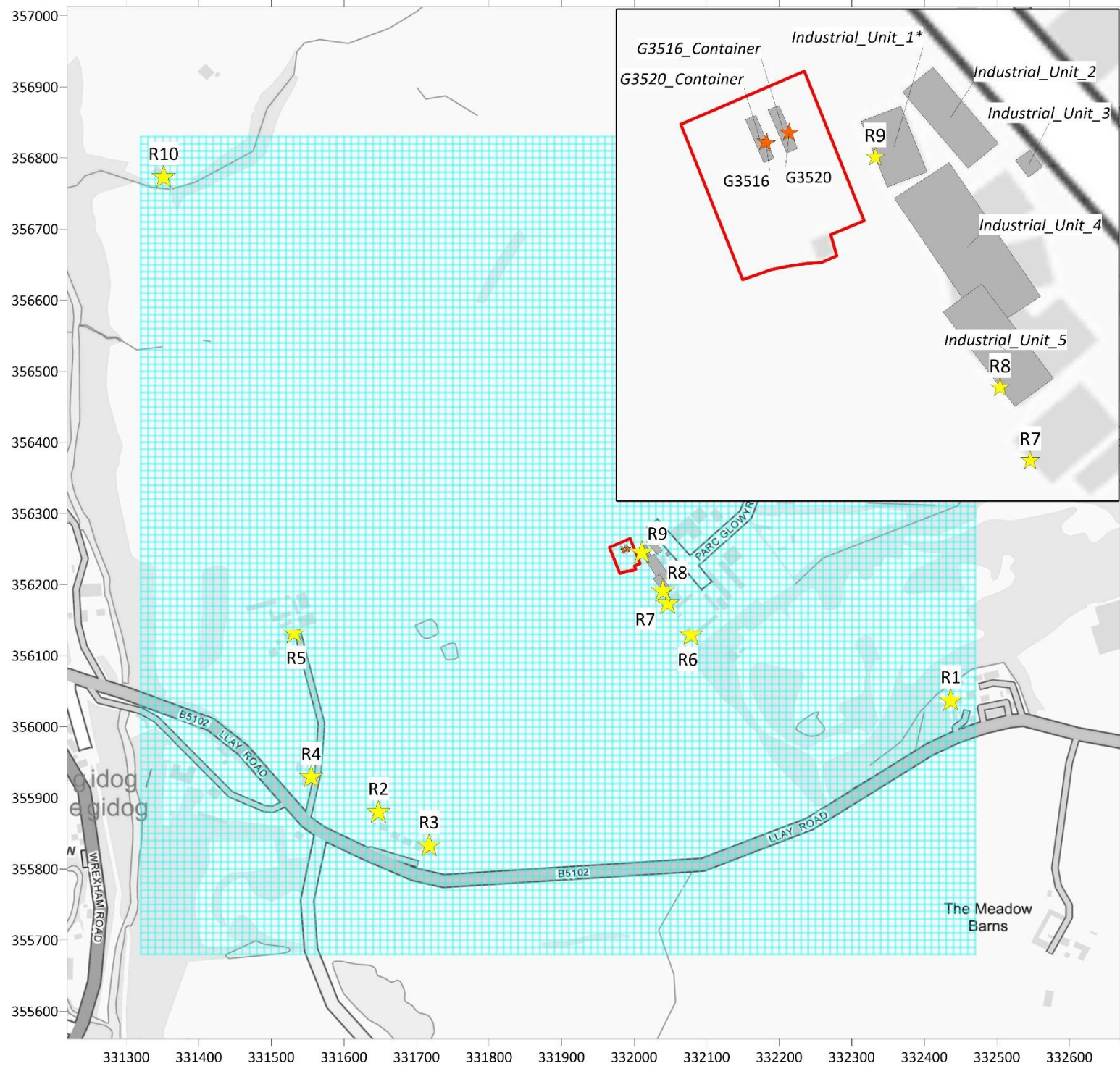


7 ABBREVIATIONS

ADM	Atmospheric Dispersion Modelling
APIS	Air Pollution Information System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
CO	Carbon monoxide
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ELV	Emission Limit Value
EQS	Environmental Quality Standard
LA	Local Authority
LAQM	Local Air Quality Management
NGR	National Grid Reference
NO	Nitrogen oxide
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NWCA	North Wales Combined Authority
MAGIC	Multi-Agency Geographic Information for the Countryside
PC	Process contribution
PEC	Predicted environmental concentration
PM _{2.5}	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
PPW	Planning Policy Wales
REC	Resource and Environmental Consultants
SAC	Special Areas of Conservation
SPA	Special Protection Area
SSSI	Site of Specific Scientific Interest
STOR	Short Term Operating Reserve
Z ₀	Roughness length



APPENDIX I FIGURES



Legend

- Site Boundary
- Modelled Building Layout
- Human Receptor Locations
- Modelled Point Source
- Cartesian Grid

Title

Figure 1
Site Location and ADMS-5 Inputs

Project

Air Quality Dispersion Modelling
Llay, Wrexham

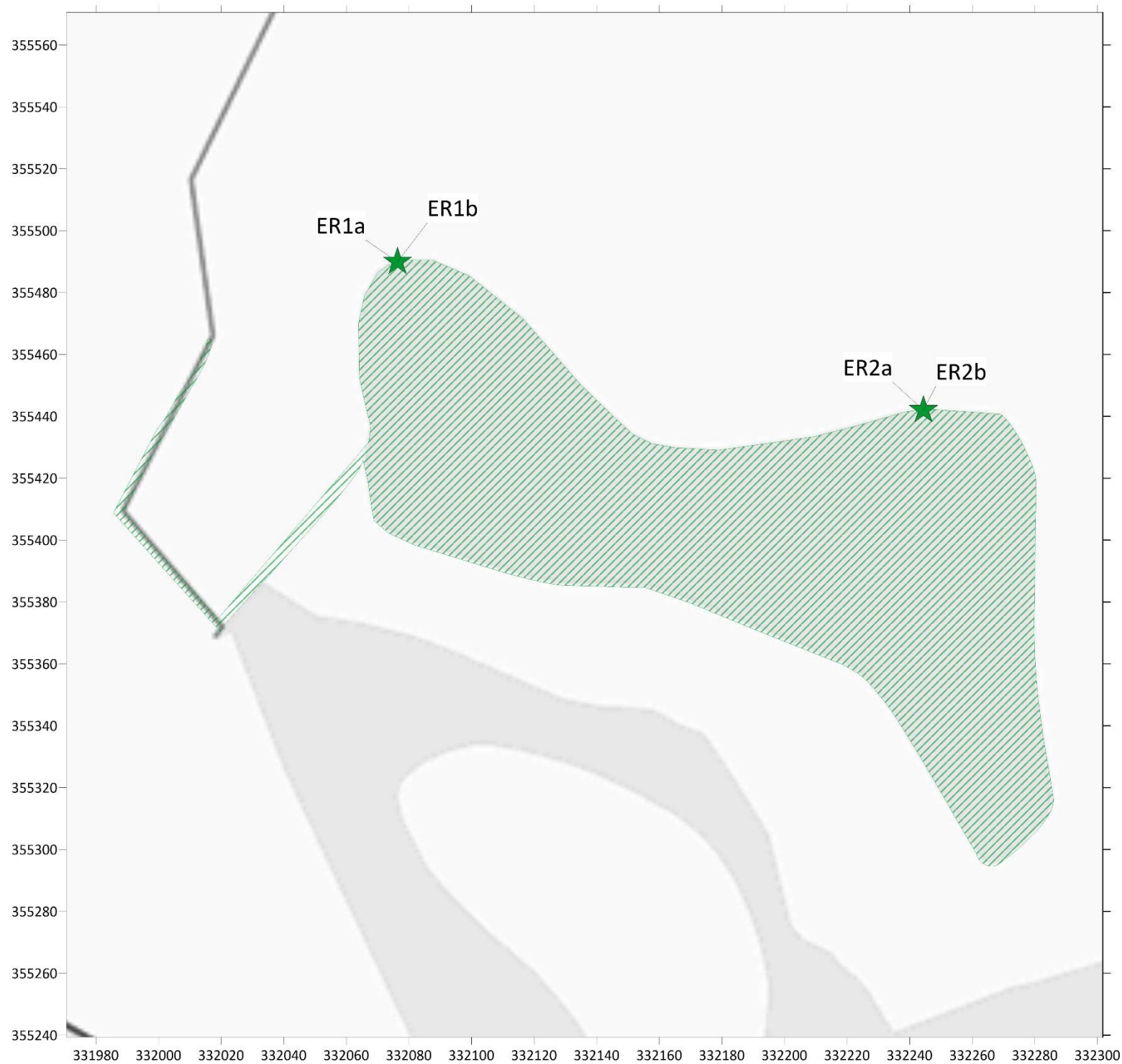
Project Number

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Client

Biogas Technology Limited

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Legend

-  Site Boundary
-  Llay Bog SSSI
-  Ecological Receptor Locations

Title

Figure 2
Llay Bog (SSSI)

Project

Air Quality Dispersion Modelling
Llay, Wrexham

Project Number

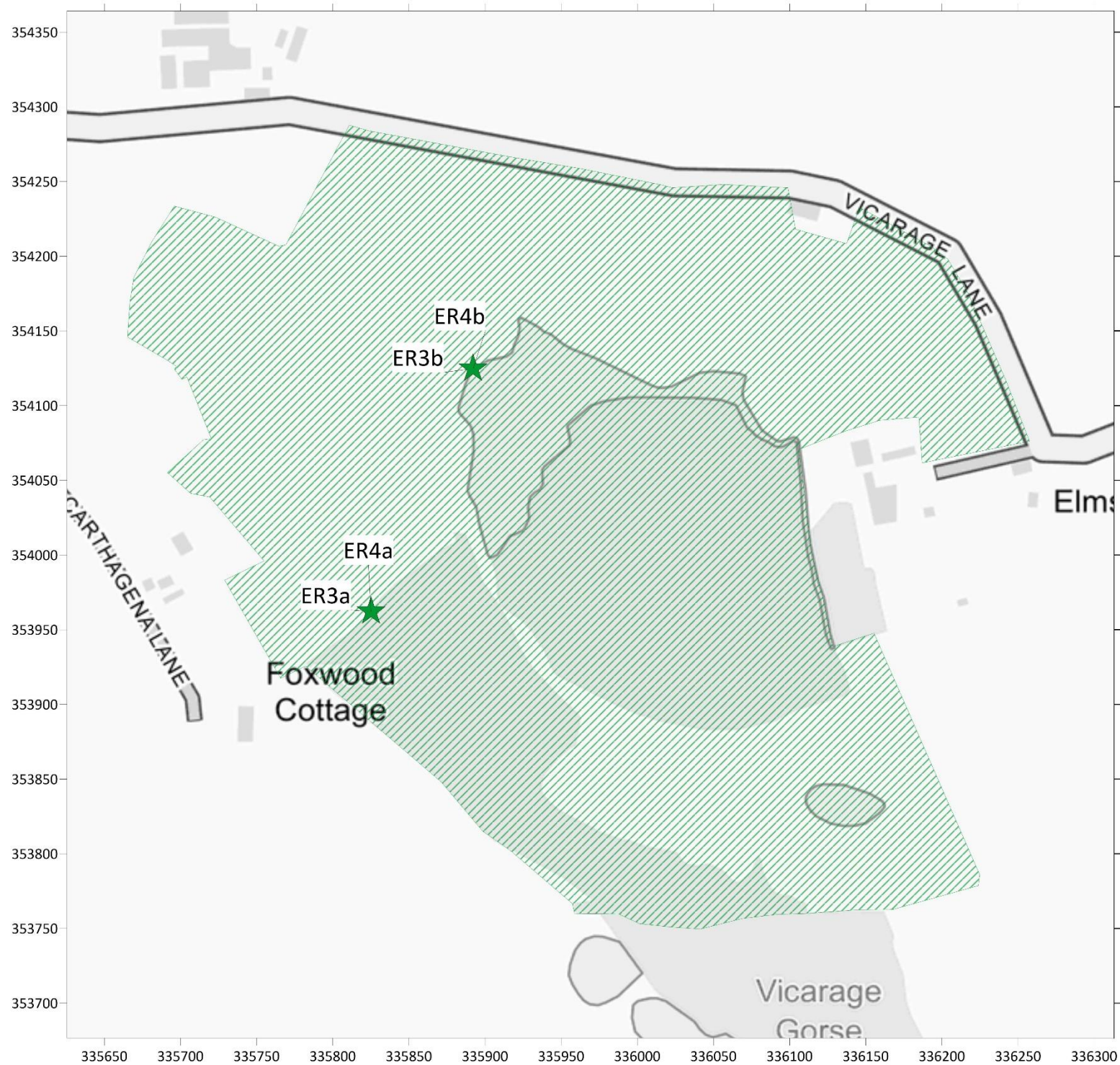
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Tel – 0161 868 1300 Fax – 0161 868 1301
www.rectd.co.uk



Legend

-  Site Boundary
-  Midland Meres and Mosses Phase 2 (Ramsar)
-  Ecological Receptor Locations

Title

Figure 3
Midland Meres and Mosses Phase 2
(Ramsar)*

Project

Air Quality Dispersion Modelling
Llay, Wrexham

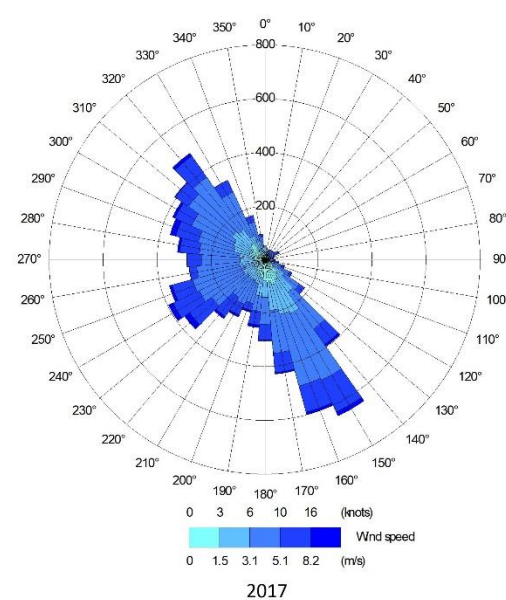
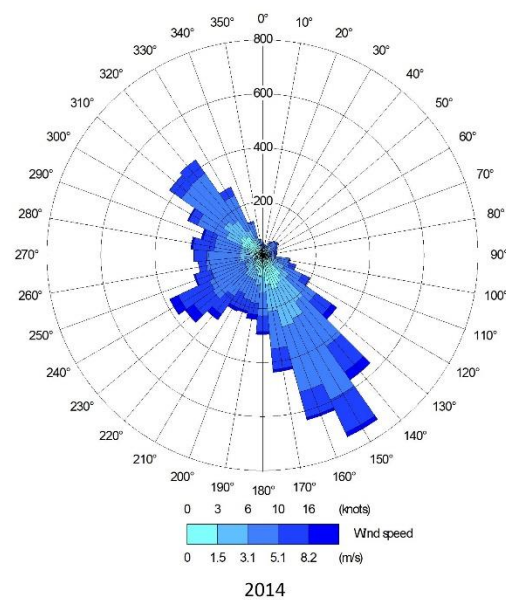
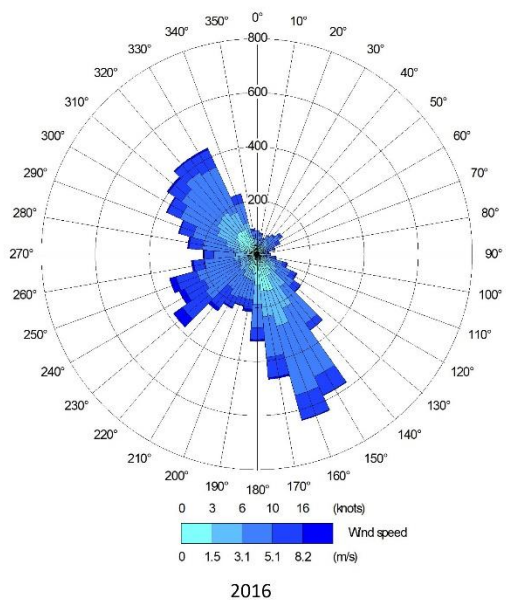
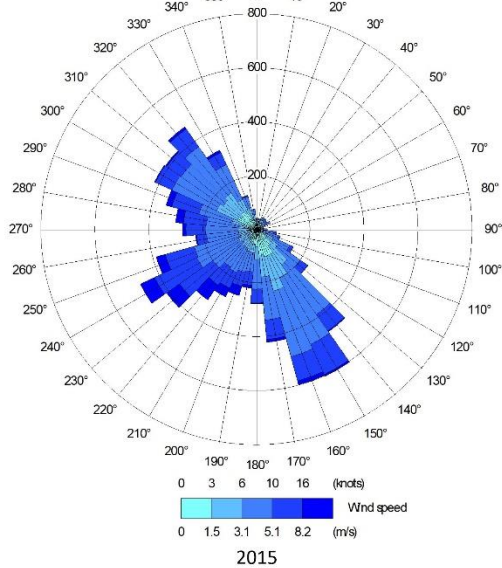
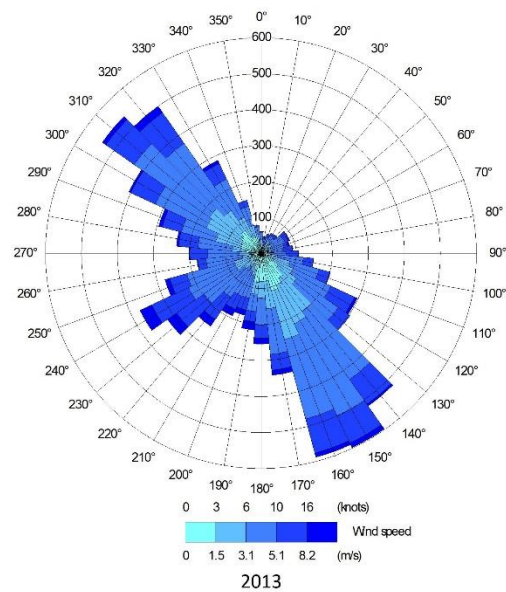
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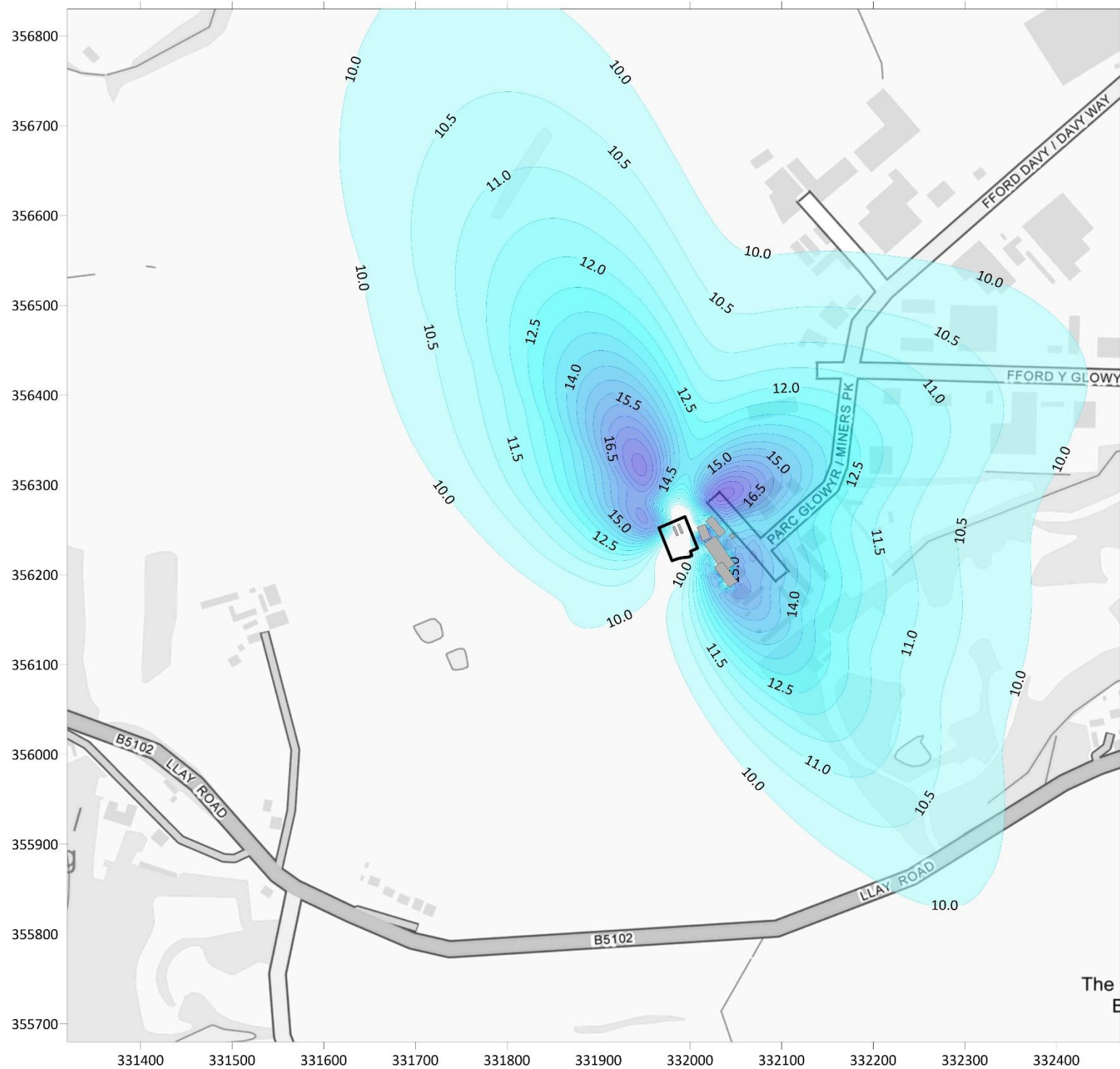


Title
Figure 4
Wind Rose
Hawarden Meteorological Station
2013 to 2017

Project
Air Quality Dispersion Modelling
Llay, Wrexham

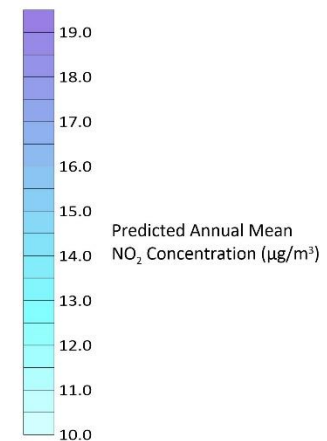
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Legend

 Site Boundary



Title

Figure 5
Predicted 5-Year Maximum Average Annual
Mean NO₂ Concentrations (µg/m³)

z = 1.5m

Project

Air Quality Dispersion Modelling
Llay, Wrexham

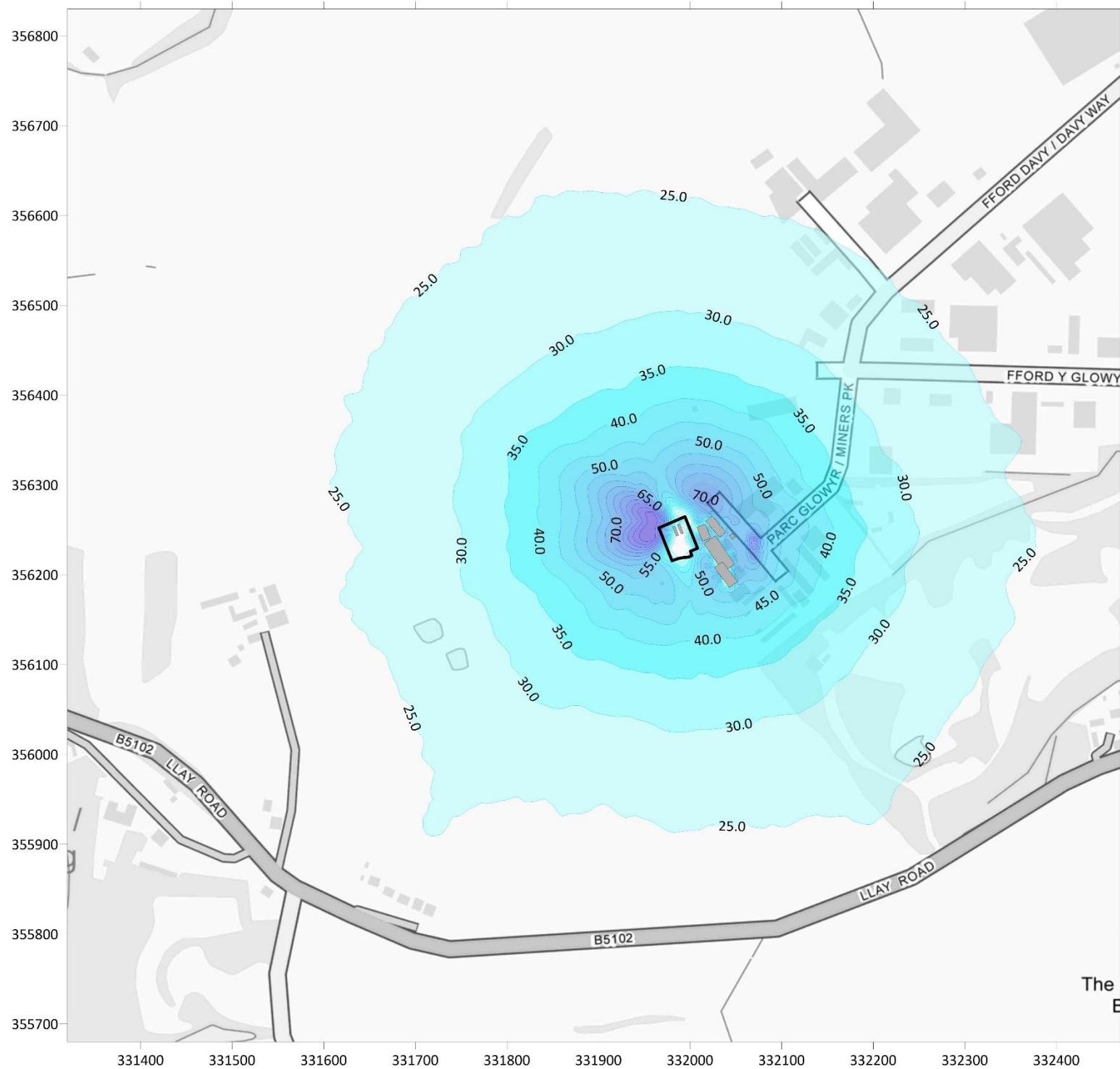
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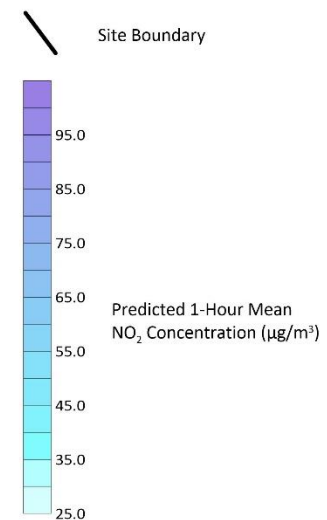
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Legend



Title

Figure 6
Predicted 5-Year Maximum 1-Hour
Mean NO₂ Concentrations (µg/m³)

z = 1.5m

Project

Air Quality Dispersion Modelling
Llay, Wrexham

Project Number

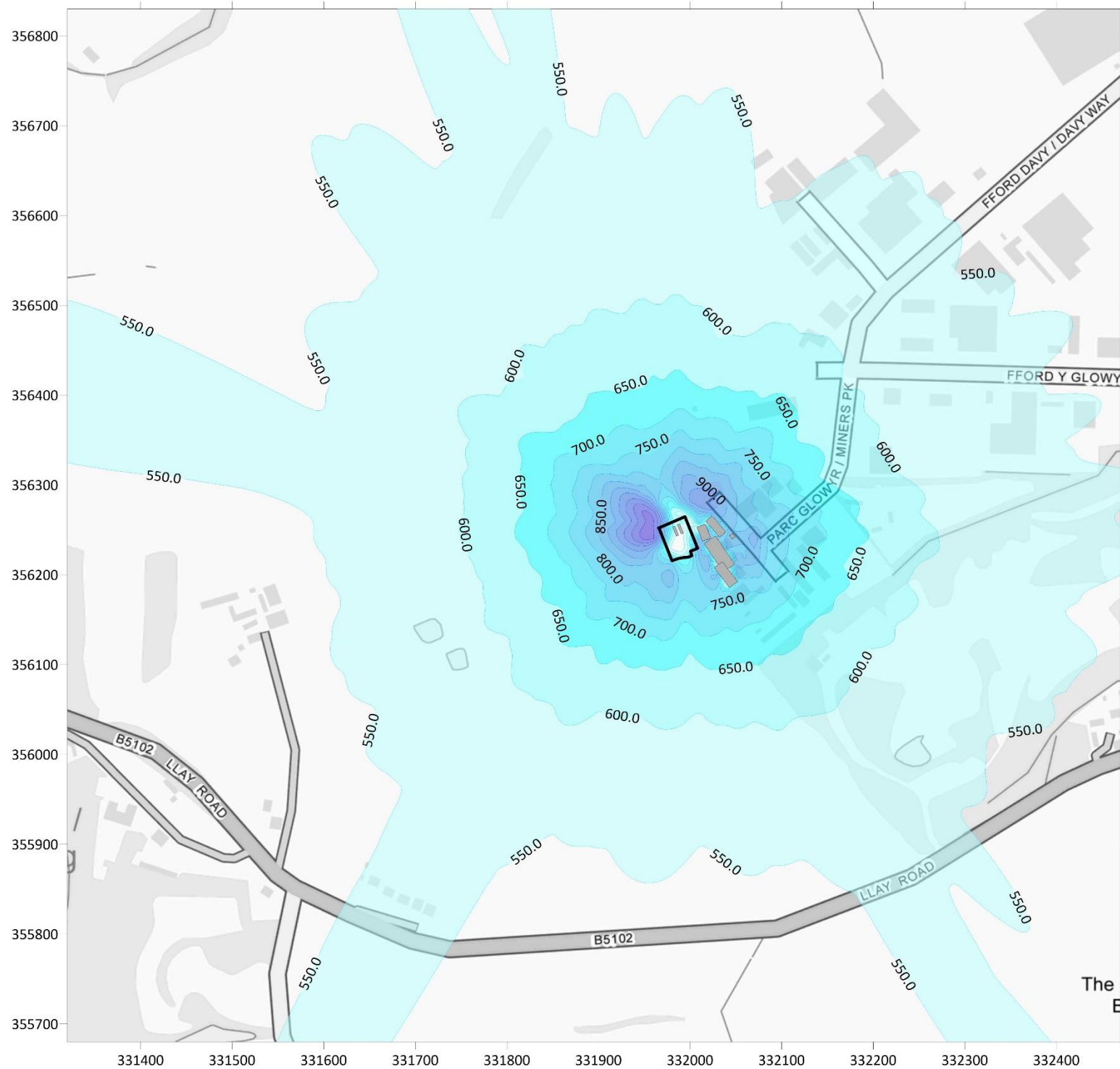
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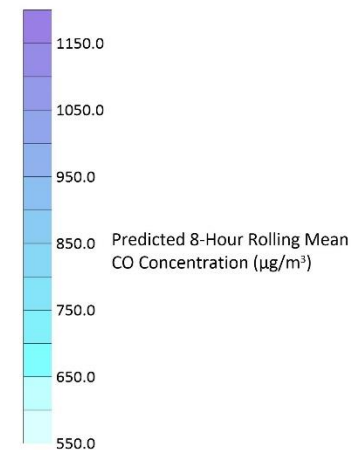
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Legend

Site Boundary



Title

Figure 7

Predicted 5-Year Maximum 8-Hour Rolling Mean CO Concentrations ($\mu\text{g}/\text{m}^3$)

$z = 1.5\text{m}$

Project

Air Quality Dispersion Modelling
Llay, Wrexham

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Dispersion Modelling Assessment
Llay, Wrexham
September 2019
AQ106411

APPENDIX II ASSESSOR'S CURRICULUM VITAE



CONAL KEARNEY

Head of Noise and Air

BEng(Hons), MSc, MIAQM, MIEEnvSc

KEY EXPERIENCE:

Conal is Head of Noise and Air with specialist experience in the air quality and odour sector. His key capabilities include:

- ▶ Advanced atmospheric air dispersion modelling of road vehicle and industrial emissions using ADMS-ROADS and AIRVIRO.
- ▶ Preparation of factual and interpretative Air Quality Assessment reports and Air Quality Environmental Statement chapters in the vicinity of proposed schemes and developments in accordance with DEFRA, Environment Agency and Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) methodologies.
- ▶ Management and delivery of project work on key, land development and urban regeneration projects.
- ▶ Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- ▶ Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- ▶ Dust and Odour impact assessments from minerals and waste sites
- ▶ Representing clients at public enquiries and planning hearings.

QUALIFICATIONS:

- ▶ Bachelor of Engineering
- ▶ Master of Science
- ▶ Member of Institute of Air Quality Management
- ▶ Member of the Institute of Environmental Science (IES)

SELECT PROJECTS SUMMARY:

Industrial Developments

Buck Park, Denholme - AQA and dust assessment for proposed mineral extraction and site restoration project.

Messingham Quarry, North Lincolnshire - AQA and dust impacts for proposed new sand extraction site.

Granta Park, Oxfordshire. Assessment of VOC fume emissions.

University of Birmingham. Permit application for CHP scheme.

Arbroath Road, Carnoustie. Odour and AQA for biogas CHP scheme Coopers Moss, St Helens AQA and dust assessment for materials import and site restoration.

Clayton Hall Landfill, Chorley - AQA and odour assessment for proposed landfill extension and mineral extraction.

Highways Developments

Alderley Edge Bypass, Cheshire - AQA for major new road scheme.

South Heywood – EIA for new link road and mixed use joint development

Residential Developments

Beck's Mill, Silsden – AQA and emissions calculation for proposed residential development

Bredbury Curve, Stockport - AQA assessment for proposed residential development in AQMA.

Hollin Lane, Middlewich – AQA for large scale residential development.

Friars School, Southwark, London. School development for mixed use education and residential building in AQMA.

Abbotsford House, Bearsden, Scotland – AQA and dust assessment for residential development

Kelvedon Street, Newport, South Wales – AQA for new housing development

Westcraig, Edinburgh - EIA for residential development

Public Sector

Technical advisor on Manchester Airport Consultative Committee - advise members on environmental technical matters in relation to the airport's operations.

Cheshire County Council - compile AQ chapters for Local Transport Plan

Cheshire East Council - specialist AQ advice on highways, minerals and waste projects

Local Air Quality Management

Broughton Gyratory, Chester - dispersion model for City Centre detailed assessment report

Congleton town centre - dispersion modelling assessment for detailed and further assessment reports.

Disley - dispersion modelling assessment for detailed and further assessments

Holmes Chapel - dispersion modelling assessment for detailed and further assessment reports for road and rail sources.

Crewe - town centre dispersion modelling for detailed and further assessment reports.

Commercial Developments

Granta Park Daycare Centre, Oxfordshire. AQA for new build daycare centre adjacent to major road.

Curzon Cinema, Colchester. Air quality assessment for town centre new build cinema.

Newfoundland Circus, Bristol - AQA for hotel development in city centre

Salesians School, Chertsey - AQA for school extension near M25

Cathedral Street and Thistle Street, Glasgow. University energy generation emission assessments.

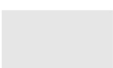
Plan

Plan EDP 1

Extended Phase 1 Habitat Plan
(edp5748_d001b 05 July 2019 AG/ZH/CR)

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-  Site Boundary
-  Scattered Trees (Broad-leaved)
-  Intact Species-poor Hedgerow and Trees
-  Quarry
-  Broad-leaved Plantation Woodland
-  Improved Grassland
-  Dense Continuous Scrub
-  Ponds
-  Hardstanding
-  Buildings

client			
Biogas Technology Limited			
project title			
Land at Llay Hall Farm, Wrexham			
drawing title			
Plan EDP 1: Extended Phase 1 Habitat Plan			
date	05 JULY 2019	drawn by	AG
drawing number	edp5748_d001b	checked	ZH
scale	1:2,000 @ A3	QA	CR



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