Proposed Anaerobic Digestion Facility - Land at Coursers Farm, Colney Heath, Hertfordshire

Extended Phase 1 Habitat Survey

Prepared by:
The Environmental Dimension Partnership (EDP)

On behalf of:
Agrivert Ltd

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THE ENVIRONMENTAL DIMENSION PARTNERSHIP

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Plan

Plan EDP 1 Extended Phase 1 Habitat Plan
(EDP1421/01a 3 August 2011 TB/RS)

Section 1
Introduction

1.1 The Environmental Dimension Partnership (EDP) have been instructed by Agrivert Ltd to undertake an extended Phase 1 Habitat Survey on land at Coursers Farm in Hertfordshire with regards to the proposals (as set out in sections 1.5-1.7 below). The site is located approximately 2km north of junction 22 of the M25 motorway and is centered at Ordnance Survey Grid Reference (OSGR) TL 203 044. The site covers an area of approximately 3.8 hectares (ha). The site is located within the administrative area of Hertsmere Borough Council (HBC).

1.2 The findings of this survey have been reviewed in light of relevant legislation, planning policy and biodiversity contextual information. The key findings and recommendations are set out in **Section 4**.

The Site

1.3 The site is in use as two grazed fields, one horse paddock and pond within a further horse paddock, adjacent to the main buildings of Coursers Farm, which comprises farm buildings and equestrian paddocks. It is currently used as livestock grazing and for the storage of inert material in the form of screening bunds. Within the proposed site there is a pond near the access with Coursers Road, and Tyttenhanger Stream is located along the southern boundary of the grazing field in which the site is located. The site is situated within a landscape dominated by pasture and arable fields, with a good network of hedgerows. Tyttenhanger Quarry is immediately adjacent to the west of the site, and is in use as a gravel extraction facility, operated by Lafarge Aggregates.

1.4 A Phase 1 Habitat survey in support of an application in January 2007 has been undertaken on the adjacent quarry site, which confirmed the presence of great crested newts (*Triturus cristatus*). There is currently permanent newt exclusion fencing surrounding the north eastern corner of the quarry which borders the Coursers Farm site.

The Proposals

1.5 The site is proposed for a development scheme which involves the construction of five storage tanks, three digestion tanks, a site office and reception building and ancillary development including an internal access road from Coursers Farm site (see Site Plan & Indicative Landscaping at **Appendix EDP 1**).

1.6 The proposed development will share the current vehicular access onto Coursers Road, however the traffic survey has identified that a length of hedgerow along the northern boundary of the site will require removal in order to improve visibility splays. This vegetation removal is also likely to include two trees.

1.7 The proposed development falls within the requirements of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 as a Schedule 2 project. However, a Screening Opinion adopted by Hertfordshire County Council (HCC) concluded that the scheme is not considered an EIA development. This report therefore does not constitute a full ecological 'environmental impact assessment' of the proposed development of the site.

Section 2
Methodology

Desk Study

2.1 A desk study was undertaken which involved searching the Multi-Agency Geographic Information for the Countryside (MAGIC) website[1] and contacting Hertfordshire Biological Records Centre (HBRC). Information on the following was requested from HBRC:

- Internationally designated sites within 5km;
- National and county-level designated sites within 2km;
- Notable/ protected species within 1km; and
- UK Biodiversity Action plan (BAP) habitats within 500m.

2.2 The London, Essex and Hertfordshire Amphibian and Reptile Trust were also contacted as records for great crested newt were known to exist for the adjacent quarry site.

2.3 Following the completion of the extended Phase 1 Habitat Survey, Dr Jenny Jones the County Recorder for Mammals was contacted regarding water vole (*Arvicola terrestris)* records.

Field Survey

2.4 The extended Phase 1 Habitat Survey was completed on the 8th March 2011. The weather conditions during the survey were sunny and dry, with a light breeze. The ambient temperature was approximately 14°C. The survey was undertaken with reference to published guidelines (JNCC, 2003) and included observations with respect to protected species and an assessment of the potential for the study area to support such species including breeding birds, badgers, bats and great crested newts. The vegetation was mapped and Target Notes were prepared on features of particular ecological interest.

2.5 Late March/early April is considered to be the start of the optimal season for undertaking this type of survey, and as such the list of species generated from the survey should not be taken as a comprehensive inventory for the study area. However, due to the management of the fields and nature of the habitats mapped, it is not considered that the survey date is a constraint on the information gathered for this report.

[1] www.magic.gov.uk

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Section 3
Summary of Findings

Desk Study

Statutory Designated Sites for Nature Conservation

3.1 The proposed development site is not covered by any statutory nature conservation designations. There are no internationally designated sites present within 5km, however there are two statutorily designated sites within a 2km radius. These are summarised below, and a map illustrating their distribution in relation to the site is located in **Appendix EDP 2** of this report:

- Redwell Wood Site of Special Scientific Interest (SSSI) is a broadleaved, mixed and yew woodland situated within 2km of the site; and

- Colney Heath Local Nature Reserve (LNR) contains a remnant of the heath vegetation community that used to be extensive in Hertfordshire, and is located within 0.5km of the site boundary.

3.2 No other statutory designated sites found within the 5km search radius.

Non-statutory Designated Sites for Nature Conservation

3.3 The desk study has identified 28 Local Wildlife Sites within a 2km radius of the site. The sites are summarised in **Table EDP 1**; and full descriptions with a distribution map are contained within the HBRC data within **Appendix EDP 2**.

Name	Grid Reference	Description
Smallford Pit	TL195068	An infilled former gravel pit with well developed secondary grassland, areas of standing water, a pond and fishing lake.
Knight's Wood	TL185055	Ancient semi-natural woodland, dominated by Pedunculate Oak (*Quercus robur)*.
Tyttenhanger Gravel Pits	TL190050	Sand and gravel pits, many of which have been flooded and are an important area for breeding waders.
St. Mark's Churchyard and Graveyard	TL197061	Churchyard and graveyard supporting unimproved neutral to acid grassland.
River Colne,	TL194055	A section of the River Colne which is important for

SW of Colney Heath		invertebrates.
St. Mark's Close, London	TL19-06-	Buildings and environs important for protected species.
Colney Heath Common	TL203058	A mosaic of neutral, acid and marshy grasslands, plus heathland, scrub, and riverine habitats.
Colney Heath Farm Meadows	TL207055	Unimproved neutral to acid grasslands along the River Colne.
Sleapshyde Gravel Pit	TL203064	A gravel pit which has been restored to an amenity/ wildlife park and now supports a mosaic of habitats, including open water, wet neutral grassland, tall herb, scattered scrub and plantation.
Bush Wood	TL224054	Ancient semi-natural woodland, dominated by Pedunculate Oak and Hornbeam (*Carpinus betulus)*.
Tollgate Wood	TL216055	Broadleaved woodland dominated by Pedunculate Oak and Ash (*Fraxinus excelsior)*.
Frederick's Wood	TL207051	Mosaic site of secondary woodland and remnant heath/ acid grassland.
Coppice Wood	TL184048	Ancient semi-natural Pedunculate Oak/ Hornbeam coppice-with-standards woodland.
The New Plantation	TL199047	Old woodland with Pedunculate Oak and Ash canopy.
River Colne by Bowmansgreen Farm	TL186040	Section of the River Colne with well vegetated banks and good communities of emergent aquatic vegetation.
Walsingham Wood	TL215039	Part ancient semi-natural Pedunculate Oak/ Hornbeam woodland.
Cobs Ash	TL213032	Ancient semi-natural Pedunculate Oak/ Hornbeam coppice woodland.
Cangsley Grove	TL218034	Ancient semi-natural Pedunculate Oak/ Hornbeam woodland.
Round Wood	TL211031	Ancient semi-natural Pedunculate Oak/ Hornbeam woodland.
Scrubby grassland by Frederick's Wood	TL207048	Unimproved acid grassland with scattered Hawthorn (*Crataegus monogyna)* patches.
Shenley Lodge Farm Wood	TL201024	Ancient semi-natural woodland of Pedunculate Oak/ Ash with Hazel (*Coryllus avellana)* coppice.
Potwells	TL216030	Wet acidic grassland and scrub
North Mymms Park	TL217047	Parkland of semi-improved neutral grassland with frequent planted trees.
North Mymms Churchyard	TL221044	Churchyard with old neutral grassland and scattered ornamental trees.

North Mymms	TL21-04-	Buildings and environs important for protected species.

Park Area		
North Mymms Icehouse	TL21-03-	Icehouse and environs important for protected species.
Coursers Farm Area	TL20-04-	Buildings and environs important for protected species.
Coursers Road Gravel Pit	TL20-03-	Hedgerow and ditch on Coursers farm important for breeding Tree Sparrow (*Passer montanus)*, a Local Biodiversity Action Plan Species

Table EDP 1: Non-statutory Designations within 2km of the site.

3.4 An Ancient Woodland Inventory site also lies within 300m of the Coursers Farm site boundary.

Protected/Notable Species

Bats

3.5 A number of bat records were returned by HBRC as within 1km of the site. Species recorded include brown long-eared (*Plecotus auritus)*, Natterer's (*Myotis nattereri)* and pipistrelle species (*Pipistrellus* sp.).

Other Mammals

3.6 There are records of badger (*Meles meles)* and water vole within 1km of the site. Dormice (*Muscardinus avellanarius)* have been recorded within 2km of the site.

Birds

3.7 There are several records of tree sparrow in the vicinity of Coursers Farm. This species has a Local Biodiversity Action Plan and in addition an important breeding area has been identified for tree sparrows located at Coursers Gravel Pit. The tree sparrow is listed as having the highest conservation concern, being categorised as a Red List Species within the UK.

Amphibians and Reptiles

3.8 There are records for common lizard (*Lacerta vivipara)* and grass snake (*Natrix natrix)* within 1km of the site, and whilst HBRC and the London, Essex and Hertfordshire Amphibian and Reptile Trust hold no records of great crested newts within 1km, several have been recorded within 5km of the proposed development. However, it is understood that this species has been recorded on the adjacent site managed by Lafarge Aggregates.

3.9 No existing records of protected or notable species were located within the site.

Field Survey

Habitats

3.10 The distribution of the key habitats is illustrated on the Habitat Features Plan (**EDP 1421/01**), which accompanies this report, and this should be read in conjunction with the following habitat descriptions.

Improved grassland

3.11 The majority of the site is dominated by improved grassland (Target Note 9 **Appendix EDP 3**). The larger field making up the site is sheep grazed and found to contain a close cropped sward with low species diversity. A horse paddock (Target Note 11 **Appendix EDP 3**) to the east of the site within Coursers Farm was also noted as supporting improved grassland.

Species-poor semi-improved grassland

3.12 The field (Target Note 4 **Appendix EDP 3**) located in the northern section of the site was found to be slightly less improved and more rank in it's nature.

Amenity grassland

3.13 Small areas of amenity grassland (Target Note 5 **Appendix EDP 3**) were noted within the site boundary at the entrance to the Coursers Farm complex. These were found to be well mown and contained a short sward with a limited number of forb species.

Hedgerow

3.14 A species-poor short hedgerow (Target Note 3 **Appendix EDP 3**) dominated by hawthorn and blackthorn was mapped along the northern boundary of the site adjacent to Coursers Road. This feature was noted to be gappy in places and in poor condition.

Open Water (Ponds)

3.15 The survey noted two ponds within the site boundary. One pond (Target Note 7 **Appendix EDP 3**) is located adjacent to the entrance of the farm access road. This is the larger of the two ponds. It supported a wide band of marginal planting (mostly variegated reed canary-grass (*Phalaris arundinaceavariagata*), and appeared to be a well established habitat.

3.16 The smaller pond (Target Note 8 **Appendix EDP 3**) was found to support little in the way of either aquatic or marginal vegetation and appeared to be a relatively recently created feature.

3.17 Three further ponds (Target Notes 15 **Appendix EDP 3**) were noted following the completion of the extended Phase 1 Habitat survey. The first was a small pond located in the corner of the field opposite the site, across Coursers Road. A further two ponds were found to the east of the site within the farm complex.

Running Water (wet ditch)

3.18 The ditches that run along the western and southern boundaries were found to be a mixture of dry and wet habitats. The northern end of the western boundary ditch was found to be dry and supported rank grasses along with limited forb species. At the southern end the ditch was wet containing approximately 5-10cm of water. Plant species within the inundated length were similar to those in the northern section.

3.19 Located to the south of the site, Tittenhanger Stream (Target Note 14 **Appendix EDP 3**) drains from west to east. At the time of the survey the water within this ditch reached a maximum depth of approximately 10cm. The ditch was confined by tall, steep grassy banks.

Scattered Scrub

3.20 A small area of scattered scrub (Target Note 2 **Appendix EDP 3**) dominated by bramble and hawthorn was mapped in the north west corner of the site.

Mature trees

3.21 No mature trees were mapped within the site boundary; however, two large oak trees (one at Target Note 6 and one close to Target Note 1 **Appendix EDP 3**) were noted adjacent to either side of the northern section of the site. No further trees were mapped.

Buildings

3.22 No buildings are present within the site boundary, however there are numerous large agricultural sheds (Target Note 12 **Appendix EDP 3**) located adjacent to the site within the Coursers Farm complex. In addition at least two residential properties are located within 150m of the eastern boundary of the site.

Hardstanding

3.23 Coursers Road to the north and the access road into Coursers Farm are located along the northern and eastern boundaries respectively. There are also numerous tarmac roads, hardstanding access tracks and yards which are located within the Coursers Farm complex (Target Note 13 **Appendix EDP 3**).

Arable

3.24 A large arable field was mapped to the south of Tittenhanger Stream.

Protected/Notable Species

Bats

3.25 As the site consists of open fields it does not support any opportunities for roosting bats. It offers limited opportunities for both foraging and commuting bats, as no significant boundary hedgerows or lines of vegetation are present.

Badgers

3.26 A single hole (close to Target Note 3) was identified within the base of the hedgerow adjacent to the main road along the northern boundary of the site. The hole showed no signs of occupation by badgers, and was surrounded by a number of active rabbit holes. No other evidence of badger field signs were noted within the survey. However the initial survey noted this as a potential single hole non-active badger sett.

Water voles

3.27 The ditches along the western boundary and to the south of the site were noted as having limited potential for water vole. At the time of the survey the majority of the western ditch was found to be dry, and therefore unsuitable for this species. However, water was noted to be flowing slowly within the ditch on to the south (Tyttenhanger Stream), at a depth of up to approximately 10cm.

3.28 A small number of mammal footprints were noted within the mud adjacent to this water course. These were not fresh, but at the time of survey were assessed as possible water vole field signs. Numerous holes were also noted within the ditch banks in this area. No other sign (such as feeding stations, droppings etc) of water vole were noted.

Dormice

3.29 Although the wider countryside contains suitable habitats (such as woodland and a good hedgerow network), the site itself has limited opportunities for this species. The species poor roadside hedgerow on the northern boundary of the site is the only habitat which offers anything close to suitable dormouse habitat.

Breeding Birds

3.30 Due to the lack of nesting opportunities, the site is unlikely to support a significant number or diversity of breeding birds. The roadside hedgerow is likely to provide the only opportunity for breeding birds within the site.

Amphibians and Reptiles

3.31 The pond located within the site (Target Note 8 **Appendix EDP 3**) supported little aquatic or marginal vegetation, and appeared to offer only limited opportunities for breeding great crested newts. However, the larger pond within the site located adjacent to the site (Target Note 7 **Appendix EDP 3**) close to the current farm access road, showed significant amounts of both aquatic and marginal vegetation, and as such appeared to offer a close to optimal conditions for breeding great crested newts.

3.32 Ongoing surveys have identified that all five ponds support great crested newts. These surveys are scheduled to be completed by mid-June 2011.

3.33 Due to the current grazing management of the fields, the site does not currently offer any suitable habitat for reptiles. However, the adjacent ditches along the western boundary and to the south of the site may offer useful foraging habitat and connection corridors for grass snakes.

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Section 4
Discussion and Recommendations

4.1 This section discusses the findings as set out in **Section 3** in relation to relevant planning policy and legislative considerations and sets out our recommendations in relation to these findings and the scheme.

The Proposals

4.2 It is understood that the proposals for the site include the following:

- The recontouring of the site and removal of the small field pond within the improved grassland; and
- The construction of five storage tanks, three digestion tanks a site office and reception building and ancillary development.

Legislation and Policy

4.3 Hertsmere Borough Council has set out in its revised 2010 Core Strategy 'Hertsmere Local Development Plan Document' a number of policies that are aimed to guide development within the Borough. Policy CS12 Protection and enhancement of the natural environment is the most relevant policy for ecology. This policy states that..."*All development proposals must conserve and enhance the natural environment of the Borough, including biodiversity, protected trees, landscape character and sites of ecological and geological value, in order to maintain and improve environmental quality. Proposals should provide opportunities for habitat creation and enhancement throughout the life of a development*."

Assessment

Designated Sites

4.4 The Local Wildlife Sites in closest proximity of the proposed development site include Frederick's Wood, which is an area of secondary woodland; the scrubby grassland site adjacent to it; and also The New Plantation, an area of old oak and ash woodland.

4.5 Due to the reasons for their designation and the fact that the proposed development will not result in the increased recreational use of these sites, it is not expected that they will suffer any significant adverse impact through the development proposals.

Protected and Notable Species

Bats

4.6 The site holds limited opportunities for foraging or commuting bats. There are no features that offer roosting opportunities for bats within the site. It is therefore considered that the proposed development of the site will not have an adverse effect on the local bat population.

Badgers

4.7 As a potential badger sett has been noted on the northern boundary of the site, it is recommended that this is investigated further. A survey should be conducted to establish the use of this single hole and therefore what effect the proposed development may have on the local badger population.

Water voles

4.8 Limited habitat for water vole was noted on the boundaries of the site. Several small mammal footprints were recorded in the ditch to the south of the site. As such it is recommended that a water vole survey of these areas is conducted by a suitability experienced ecologist, to establish whether this species will experience any adverse effects through the development proposals.

Dormice

4.9 Due to the general unsuitability of the habitat on site no further survey is recommended for dormice.

Birds

4.10 Breeding birds, their nests, eggs and young are protected under the Wildlife and Countryside Act 1981 (as amended).

4.11 The site was assessed as containing limited habitat that was suitable for nesting birds. As a general recommendation, features with potential for supporting breeding birds should not be removed between February to August, inclusive, unless breeding birds are confirmed absent by a suitably qualified ecologist within five working days of the works commencing.

4.12 Should breeding birds, their nests, eggs and/or young be found during this period, no works will commence until the breeding has ceased. This is normally defined as when the young have fledged and are no longer dependent on the nest.

4.13 With respect to enhancement opportunities, it is recommended that any new landscape planting should include medium to long-term opportunities for nesting sites (e.g. the inclusion of hedge and shrub planting) and should include a high diversity of native fruit and nut bearing trees and shrubs within the planting schedule (see Landscape Assessment report).

Amphibians and Reptiles

4.14 Great crested newts and their places of refuge are subject to protection under the Wildlife and Countryside Act 1981, as amended, the Conservation (Natural Habitats &c.) Regulations 2010, and the Countryside and Rights of Way Act 2000. They are considered to be European Protected Species, which is the highest level of protection afforded to species in the United Kingdom.

4.15 A detailed schedule of surveys have been undertaken which have identified great crested newts within the pond on site. The information from these surveys will give an estimated population class for the great crested newts present on site. The current proposals indicate that the pond is to be lost and a replacement pond constructed. Due to the low quality habitat the current pond offers great crested newts, it is likely that the proposed pond can be created to include a much more beneficial habitat for the newt population within and around the site. Detailed recommendations are given in the separate great crested newt report **EDP1421_03b**.

4.16 All species of reptile are protected from intentional or reckless harm under the Wildlife and Countryside Act (1981, as amended). In addition, certain species of reptile receive a higher level of protection and/or are subject to specific action through the UK BAP.

4.17 No potential reptile habitat was identified on site. The potential for the ditches to support grass snakes has been highlighted, however the development proposals will not have a direct effect on these areas and therefore if reptiles are indeed present, it is unlikely that they will be subject to any adverse impacts through the implementation of the development proposals.

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Section 5
Summary and Conclusions

5.1 EDP has been commissioned by Agrivert Ltd to undertake an extended Phase 1 Habitat Survey of a site at Coursers Farm, Hertfordshire. A detailed field survey was undertaken by an appropriately experienced Ecologist on 8th March 2011.

5.2 The development proposals are not likely to have an adverse impact on any of the designated sites identified within the desk study. The survey found no notable habitats within the site. The presence of great crested newts has been confirmed in the two ponds within the site. The site has limited potential to support breeding birds within the scrub and hedgerow. No other protected or notable species are likely to be affected by the development proposals.

5.3 Once the great crested newt surveys have been completed a suitable mitigation strategy will be drawn up in order to ensure that the proposals have minimal affect on this species.

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Appendix EDP 1
Site Plan & Indicative Landscaping

Notes.

1. Reproduced from the Ordnance Survey Map with the permission of the Controller of Her Majesty's Stationary Office, Crown Copyright, Licence Number 100020449.
2. All bunds shown on this plan are for indicative purposes only.
3. Material finishes are indicative only.

Legend

- Indicative Grass Planting
- Indicative Shrub Planting
- Indicative Bund Contours
- Indicative Tree Planting
- Existing Trees
- Proposed Hardstanding
- Proposed Hedgerow

Rev	Description	Date	By

AGRIVERT
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Client

Project
Anaerobic Digestion Facility
Coursers Farm
Colney Heath

Title
Site Plan & Indicative Landscaping

Scale @ A3	Drawn by/Checked by	Date
1:1250	JM/JI	16.12.11

Job no.	Dwg No.	Revision
COU001	P300	1

NORTH

Coursers Farm Stables
Pond
OH
Existing Pond
Proposed Pond
Storage 2
Storage 3
Pump Room
Storage 4
Storage 5
Site Office
Visitor & overflow parking
Reception Building
Entrance
Exit
Control Room
Biofilter
Wet Scrubber
Weighbridges with control kiosk
Oil Tank
Gas Engine Associated Equipment
Flare
3n° Gas Engine Units
Storage 1
Secondary Digester 1
Pumping Containers
Primary Digester 1
Primary Digester 2
Crop Feeder
Transformer
Electricity Board Service Distribution Panel
Farm access to Silage Clamp
Drain
Attenuation Pond
Silage Clamp
El Sub Sta
COURSERS ROAD
Pond

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Appendix EDP 2
Desk Study Data

KEY INTERNATIONAL, NATIONAL & LOCAL SITE DESIGNATIONS

Statutory designations

RAMSAR
Ramsar sites are designated under the Convention on Wetlands of International Importance especially as Waterfowl Habitat. Wetlands are designated, protected and promoted in order to stem the progressive encroachment on and loss of wetlands, which are broadly defined to include marsh, fen, peatland and water.
There is 1 Ramsar site in Hertfordshire. All designated Ramsar sites are SSSIs.

Special Area of Conservation (SAC)
Special Areas of Conservation are sites designated by Member States under the EC Habitats Directive. The aim is to establish a European network of important high quality conservation sites that will make a significant contribution to conserving habitats and species considered to be most in need of conservation at a European level.
There are 2 SAC sites in Hertfordshire.

Special Protection Area (SPA)
Special Protection Areas are designated under the EC Birds Directive, to conserve the habitat of certain rare or vulnerable birds and regularly occurring migratory birds. Any significant pollution or disturbance to or deterioration of these sites has to be avoided.
There is 1 SPA site in Hertfordshire, All designated SPAs are SSSIs.

National Nature Reserve (NNR)
National Nature Reserves are statutory reserves established for the nation under the Wildlife and Countryside Act, 1981. NNRs may be owned by relevant national body (e.g. Natural England in England) or established by agreement; a few are owned and managed by non-statutory bodies. NNRs cover a selection of the most important sites for nature conservation in the UK. There is 1 NNR in Hertfordshire.

Site of Special Scientific Interest (SSSI)
Sites of Special Scientific Interest are areas notified under the Wildlife and Countryside Act, 1981, as being of 'special interest for nature conservation'. They represent the finest sites for wildlife and natural features in Great Britain supporting many characteristic, rare and endangered species, habitats and natural features. Notification as a SSSI is primarily a legal mechanism organised by Natural England and selected according to specific criteria. The *Guidelines for the Selection of Biological SSSIs*, published in 1989 by the Joint Nature Conservancy Council, set down the selection criteria for both biological and geological SSSIs.
There are 43 SSSIs in Hertfordshire.

Area of Outstanding Natural Beauty (AONB)
AONBs are nationally important landscapes that are not National Parks, designated by the Countryside Agency to aid their protection and management. An AONB cannot be included in a simplified planning zone and it is not promoted for active recreation such as a National Parks. The AONB in Hertfordshire has an associated body concerned with the area's conservation.
There is 1 AONB in Hertfordshire.

Local Nature Reserve (LNR)
Land owned, leased or managed by Local Authorities and designated under the National Parks and Access to the Countryside Act. A site of some nature conservation value managed for educational objectives - no need for SSSI status. Some reserves are managed by a non-statutory body. Local authorities have the power to pass bylaws controlling (e.g.) access, special protection measures. There are 36 LNRs in Hertfordshire.

Non-statutory Site designations

Local Wildlife Site / Wildlife Sites
Local Wildlife Sites are non-statutory sites designated at a county level as being of conservation importance and often recognised in Local authority development plans. The aim of this identification is to protect such sites from land management changes, which may lessen their nature conservation interest, and to encourage sensitive management to maintain and enhance their importance. Although WS have no statutory protection they need to be considered in the planning process through Planning Policy Guidance like PPG9 which refers to the Town & Country Planning Act 1990 Section 30. This states that nature conservation issues should be included in the surveys of local authority areas to ensure that the plans are based on fully adequate information about local species, habitats, geology and landform. Plans should be concerned not only with designated areas but also with other land of conservation value and the possible provision of new habitats.
There are 1954 Local Wildlife Sites in Hertfordshire (December 2009)

Regionally Important Geological / Geomorphological Site (RIGS)
Regionally Important Geological/Geomorphological Sites are non-statutory earth science sites. The RIGS networks are locally based voluntary groups drawing on both professional and interest groups identifying sites using a methodical and rational approach. RIGS are analogous to non-statutory biological sites - they are not a second tier but sites of regionally or local importance in their own right. There are 21 RIGS in Hertfordshire.

Ancient woodland
Ancient Woodland is land that has had a continuous woodland cover since at least 1600 AD and has only been cleared for underwood or timber production. It can be placed in two categories:
Ancient Semi-natural Woodland (ASNW) – woodland that retains a native tree and shrub cover that has not been planted, although it may have been managed by coppicing or felling and allowed to regenerate naturally. This covers all stands of ancient woodland which do not obviously originate from planting.
Ancient replanted Woodland (AWS - ancient woodland site or PAWS - plantation on ancient woodland site) – woodland where the original tree cover has been felled and replaced by planting, often with conifers and usually this century.
There are 657 ASNW, AWS and PAWS in Hertfordshire.

Ecology Database Site (EDS) / Ecosites
These sites are considered to be of significance for their wildlife and/or geological features in at least a local context. They are sites with some semi-natural habitat features and/or species interest and are supported by data held in the Hertfordshire Biological Records Centre database. There are about 3000 Ecosites in Hertfordshire (Dec 2009).

HBRC, January 2011

Statutory sites

STATUS	NAME	GRID	AREA (ha)	SITE REFERENCE
LNR	Colney Heath	TL202058	22.603	69/001
SSSI	Redwell Wood	TL212025	52.601	78/011

HERTFORDSHIRE SPECIES RECORDS

5km_search

International designation

- Dormouse
- Otter
- Great Crested Newt
- Water Vole
- Bat

Produced by

HERTFORDSHIRE BIOLOGICAL RECORDS CENTRE

It should be noted that the species dots do not represent the exact location but general area of the species recorded. Many of these records have been exported from a 1km, 2km or even 10km data source. These plans have been supplied for information purposes only. No copying, in whole or part, is permitted. Please observe copyright restrictions.

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
68/003	Smallford Pit	TL195068	61.35	1997	A largely infilled former gravel pit supporting well developed secondary grassland along with some former old acid/neutral grassland remnants. Additional habitats include numerous hollows supporting seasonal and more permanent areas of standing water, a pond and a fishing lake. A small brook also runs through the site. The majority of the grassland has developed naturally on the site and is rough and relatively species-poor. Perennial Rye-grass (Lolium perenne) occurs in the sward in places where attempts were made to restore the site. However, overall, a reasonably diverse grassland flora has been recorded, though many of these are ruderal species. Species recorded include Bird's-foot Trefoil (Lotus corniculatus), Lesser Stitchwort (Stellaria graminea), Meadow Buttercup (Ranunculus acris), Common Sorrel (Rumex acetosa), Germander Speedwell (Veronica chamaedrys) and Oxeye Daisy (Leucanthemum vulgare). Pyramidal Orchid (Anacamptis pyramidalis) and Bee Orchid (Ophrys apifera) have been recorded in the north of the site. Remnants of old undisturbed acid/neutral grassland survive to the perimeter of the site and support species such as Red Fescue (Festuca rubra), Common Bent (Agrostis capillaris), Common Sorrel, Agrimony (Agrimonia eupatoria), Meadow Buttercup, Common Knapweed (Centaurea nigra), Sheep's Sorrel (Rumex acetosella) and Lady's Bedstraw (Galium verum). Within the ephemeral/open water habitats a wide range of aquatic/wetland flora has been recorded, including several uncommon species, such as Fan-leaved Water Crowfoot (Ranunculus circinatus), Spiked Water-milfoil (Myriophyllum spicatum), Horned Pondweed (Zannichellia palustris), Lesser Bulrush (Typha angustifolia), Lesser Spearwort (Ranunculus flammula), Common Spike-rush (Eleocharis palustris) and Water-plantain (Alisma plantago-aquatica). There is a good variety of self sown and planted trees and shrubs, particularly around the periphery of the site. The site is important for invertebrates, such as butterflies and dragonflies, birds, reptiles and also amphibians, with records for Great Crested Newts (Triturus cristatus). Wildlife Site criteria: Grassland indicators.
68/021	Knight's Wood	TL185055	2.11	1997	Ancient semi-natural woodland with Pedunculate Oak (Quercus robur) dominant in the canopy plus occasional Ash (Fraxinus excelsior) and Wild Cherry (Prunus avium). The canopy also contains small amounts of other species including Holly

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
					(Ilex aquifolium), Field Maple (Acer campestre), Hornbeam (Carpinus betulus), Silver Birch (Betula pendula) and Crab Apple (Malus sylvestris). Old Hazel (Corylus avellana) coppice is dominant in the shrub layer. The ground flora is dominated by Bluebell (Hyacinthoides non-scripta) and Bramble (Rubus fruticosus agg.). Other species recorded include Broad Buckler-fern (Dryopteris dilatata), Wood Millet (Milium effusum) and Wood Meadow-grass (Poa nemoralis). Remnant ditches and hedge banks are present around the wood margin and there is a small pond in the north-east corner. Wildlife Site criteria: Ancient Woodland Inventory site; woodland indicators.
68/022	Tyttenhanger Gravel Pits	TL190050	61.93	1997	Former agricultural and park land adjacent to the River Colne supporting an area of sand and gravel pits, many of which are flooded. It is a complex site which has been partly restored. The range of habitats include large lakes, exposed sand banks, semi-natural neutral grassland, areas of unimproved acid grassland which may be remnants of the original heathland, scrub and broadleaf woodland. The sand pits form the largest and most important site for sandy ground bees and wasps in Hertfordshire with several nationally notable/rare species recorded. The site is also important for other invertebrates including species of spider unknown elsewhere in Hertfordshire. The flooded pits are regarded as a prime regional site for breeding waders and the site generally is very important for birds. The site also supports protected mammal and reptile species. Wildlife Site criteria: Species.
68/050	St. Mark's Churchyard & Graveyard	TL197061	0.41	1997	Churchyard and graveyard supporting old unimproved neutral to somewhat acid grassland with species recorded including Red Fescue (Festuca rubra), Meadow Foxtail (Alopecurus pratensis), Field Wood-rush (Luzula campestris), Common Knapweed (Centaurea nigra), Pignut (Conopodium majus), Sheep's Sorrel (Rumex acetosella), Common Sorrel (Rumex acetosa), Oxeye Daisy (Leucanthemum vulgare), Lady's Smock (Cardamine pratensis), Meadow Buttercup (Ranunculus acris) and Betony (Betonica officinalis). Hedgerows and trees surrounds the two areas, with Bluebell (Hyacinthoides non-scripta) recorded beneath the trees along the eastern boundary of the churchyard. Wildlife Site criteria: Grassland indicators.
68/070	River Colne, SW of Colney Heath	TL194055	0.98	2000	Section of the River Colne important for invertebrates, supporting a range of dragonflies. Wildlife Site criteria: Species.

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
68/097	St. Mark's Close, London Colney	TL19-06-	0	2003	Building and environs important for protected species. Wildlife Site criteria: Species.
69/001	Colney Heath Common	TL203058	23.32	1997	Colney Heath common and a stretch of the River Colne. The common is of special interest supporting a remnant of Hertfordshire's once extensive heathland. Its mosaic of neutral, acid and marshy grasslands, heathland, scrub and riverine habitats collectively support a diverse flora, including several species scarce or locally distributed in the county. Plant species recorded, which are of particular note, include Heath Spotted-orchid (Dactylorhiza maculate), Southern Marsh Orchid, (Dactylorhiza praetermissa), Bird's-foot (Cornithopus perpusillus), Blinks (Montia Fontana), Petty Whin (Genista anglica), Dwarf Gorse (Ulex minor) and, in the River Colne, Opposite-leaved Pondweed (Groenlandia densa). The site is important for invertebrates with a good diversity of butterflies and dragonflies recorded. The open heath is also important for vertebrates, providing an important feeding ground for a variety of birds. Common Lizard (Lacerta vivipara), Grass Snake (Natrix natrix) and Water Vole (Arvicola amphibius) have been recorded from the site. Wildlife Site criteria: Grassland criteria; Species.
69/002	Colney Heath Farm Meadows	TL207055	4.95	1997	A mosaic of old unimproved neutral to acid grasslands along the River Colne, which forms part of a larger complex of heathland/wetland sites in the area. Plant species recorded include Sweet Vernal-grass (Anthoxanthum odoratum), Common Knapweed (Centaurea nigra), Pignut (Conopodium majus), Lady's Bedstraw (Galium verum), Meadow Vetchling (Lathyrus pratensis), Oxeye Daisy (Leucanthemum vulgare), Field Wood-rush (Luzula campestris), Meadow Buttercup (Ranunculus acris), Common Sorrel (Rumex acetosa), Sheep's Sorrel (Rumex acetosella), Bird's-foot Trefoil (Lotus corniculatus), Salad Burnet (Sanguisorba minor) and Common Lady's-mantle (Alchemilla filicaulis spp. vestita) - a scarce species in Hertfordshire. The lower lying areas are dominated by tall grasses typical of damp ground and the habitat supports a range of wetland species. A pond is also present in one of the fields surrounded by Alder (Alnus glutinosa) and willow (Salix sp.). Other habitats include a scrub-lined ditch, an Alder plantation along the River Colne and a hedge dominated by Hawthorn (Crataegus monogyna) and elm (Ulmus sp.). Wildlife Site criteria: Grassland

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
					indicators.
69/003	Sleapshyde Gravel Pit	TL203064	24.16	1997	Former gravel pit restored to an amenity/wildlife park. The area supports a mosaic of habitats with open water, wet neutral grassland, tall herbs, scattered scrub and plantation. Species recorded in the grassland include Common Knapweed (Centaurea nigra), Red Fescue (Festuca rubra), Meadow Buttercup (Ranunculus acris), Bulbous Buttercup (Ranunculus bulbosus), Common Sorrel (Rumex acetosa), Common Spotted-orchid (Dactylorhiza fuchsii) and Oxeye Daisy (Leucanthemum vulgare). A flooded pit and connecting stream support bank side trees and scrub, including Hawthorn (Crataegus monogyna), Goat Willow (Salix caprea) and White Willow (Salix alba). Species such as Remote Sedge (Carex remota), Lesser Pond-sedge (Carex acutiformis), Meadowsweet (Filipendula ulmaria), Gypsywort (Lycopus europaeus), Water Mint (Mentha aquatica) and Yellow Water-lily (Nuphar lutea) have been recorded along the margins and in the open water. The site has ornithological interest and a good diversity of dragonflies has been noted. Wildlife Site criteria: Grassland indicators; fen and swamp indicators.
69/009	Bush Wood	TL224054	14.02	2000	Ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) woodland composed of Hornbeam coppice throughout with some Pedunculate Oak, Ash (Fraxinus excelsior) and Hornbeam standards. Areas with Hazel (Corylus avellana), Field Maple (Acer campestre) and Ash coppice are also present. The south-west corner is mainly Pedunculate Oak and Silver Birch (Betula pendula) scrub. The ground flora is mostly Bramble (Rubus fruticosus agg.) mixed with grasses. Indicator species recorded include Bluebell (Hyacinthoides non-scripta), Dog's Mercury (Mercurialis perennis), Remote Sedge (Carex remota), Wood Sorrel (Oxalis acetosella), Wood Millet (Milium effusum) and Broad Buckler-fern (Dryopteris dilatata). Remnant boundary hedge banks and ditches, ponds and wide rides add to the habitat diversity. Wildlife Site criteria: Ancient Woodland Inventory site; woodland indicators.
69/019	Tollgate Wood	TL216055	4.47	2000	Old, probably secondary, broadleaved woodland supporting a high canopy of principally Pedunculate Oak (Quercus robur) and Ash (Fraxinus excelsior) with the occasional coppiced Hazel (Corylus avellana), Hornbeam (Carpinus betulus) and

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
					Field Maple (Acer campestre) plus Birch (Betula spp.), Hawthorn (Crataegus monogyna) and Blackthorn (Prunus spinosa). Grasses, mainly Yorkshire Fog (Holcus lanatus) and Creeping Soft-grass (Holcus mollis), are dominant below but several woodland indicators have been recorded such as Bluebell (Hyacinthoides non-scripta), Broad Buckler-fern (Dryopteris dilatata), Remote Sedge (Carex remota), Dog's Mercury (Mercurialis perennis) and Three-nerved Sandwort (Moehringia trinervia). A pond remnant is present in the east and rough clearings below power lines. Wildlife Site criteria: Old secondary woodland with a semi-natural canopy and varied structure; wood present on Bryant (1822); >2 ha; woodland indicators.
69/043	Frederick's Wood	TL207051	10.22	1997	Mature plantation on old heathland/acid grassland with Scots Pine (Pinus sylvestris) in the north and Ash (Fraxinus excelsior) with Sweet Chestnut (Castanea sativa) in the south plus locally dominant Silver Birch (Betula pendula) and Sycamore (Acer pseudoplatanus). The conifer plantation is generally very open below with scattered acid indicators on the ground. The broadleaved part is very scrubby below with Elder (Sambucus nigra) and Hawthorn (Crataegus monogyna) and Sycamore saplings. The ground flora supports woodland indicators such as Bluebell (Hyacinthoides non-scripta), Broad Buckler-fern (Dryopteris dilatata), Dog's Mercury (Mercurialis perennis), Dog's Mercury and Wood Sage (Teucrium scorodonia). A bank and ditch feature along the west boundary supports Pedunculate Oak (Quercus robur) standards with Hornbeam (Carpinus betulus), Hazel (Corylus avellana) and Hawthorn. Indicators of acid conditions include Bracken (Pteridium aquilinum), Heath Bedstraw (Galium saxatile) and Sheep's Sorrel (Rumex acetosella). Rides and clearings in the wood add further habitat diversity. Wildlife Site criteria: Mosaic site of secondary woodland with woodland indicators and remnant heathland/acid grassland.
77/005	Coppice Wood	TL184048	7.98	1997	Ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) coppice-with-standards woodland with frequent Hornbeam and Hazel (Corylus avellana) coppice plus Wild Cherry (Prunus avium) and some Ash (Fraxinus excelsior). The shrub layer is very scattered. Bluebell (Hyacinthoides non-scripta) is abundant in the ground layer which is moderately species diverse.

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
					Other woodland indicators recorded include Wood Anemone (Anemone nemorosa), Broad Buckler-fern (Dryopteris dilatata), Wood Melick (Melica uniflora), Wood Sorrel (Oxalis acetosella) and Wood Meadow-grass (Poa nemoralis). Banks with remnant of old laid hedges, including Hornbeam, are present to the boundary and several dells and small ponds add to the habitat diversity. Wildlife Site criteria: Ancient Woodland Inventory site; woodland indicators.
77/043	The New Plantation	TL199047	4.95	1997	Old woodland with a canopy typically of tall Pedunculate Oak (Quercus robur) standards with Ash (Fraxinus excelsior) and the occasional Hornbeam (Carpinus betulus) (mainly standards), most frequent around the perimeter, and planted Sweet Chestnut (Castanea sativa). A small section in the south has been replanted with Wild Cherry (Prunus avium) and a few Ash. The ground flora supports frequent Bluebell (Hyacinthoides non-scripta) and Wood Meadow-grass (Poa nemoralis) plus Pill Sedge (Carex pilulifera), a plant of heathy soils, has also been recorded. The wood is surrounded by hedges with some old laid Hornbeam. Wildlife Site criteria: Old secondary woodland with a semi-natural canopy and varied structure; part (south) shown on Bryant (1822); >2 ha.
77/053	River Colne by Bowmansgreen Farm	TL186040	0.99	1997	Section of the River Colne supporting well vegetated banks and good communities of emergent aquatic vegetation. Water Voles (Arvicola amphibius) have been recorded on this stretch of river. Wildlife Site criteria: Species.
78/008	Walsingham Wood	TL215039	36.71	1997	Part ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) woodland with areas cleared and replanted with conifer and broadleaf species. Hornbeam is present throughout the semi-natural canopy as coppice or as standards. Other trees present include Pedunculate Oak (Quercus robur), Ash (Fraxinus excelsior), Silver Birch (Betula pendula), Beech (Fagus sylvatica) and Wild Cherry (Prunus avium). Some Hazel (Corylus avellana) coppice is also present. The ground flora supports woodland indicators including abundant Bluebell (Hyacinthoides non-scripta). Other species recorded include Wood Sorrel (Oxalis acetosella), Broad Buckler-fern (Dryopteris dilatata) and Yellow Pimpernel (Lysimachia nemorum). The northern part of the site is part felled secondary woodland with much Sycamore (Acer pseudoplatanus) or mixed plantation and Nettle-leaved Bellflower (Campanula trachelium) and Common Twayblade (Neottia

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
					ovata) have been recorded here. Wildlife Site criteria: Part Ancient Woodland Inventory site with restorable elements of its previous semi-natural character including some semi-natural canopy and ancient features; woodland indicators.
78/009	Cobs Ash	TL213032	18.69	1997	Ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) coppice woodland with some mixed plantation in the south, of Red Oak (Quercus rubra) and Norway Spruce (Picea abies). There is also some Hazel (Corylus avellana) coppice. The ground is recorded as wet with abundant mosses, Bramble (Rubus fruticosus agg.) and Bracken (Pteridium aquilinum) and several woodland indicators including Bluebell (Hyacinthoides non-scripta), Broad Buckler-fern (Dryopteris dilatata), Wood Sage (Teucrium scorodonia) (Circaea lutetiana) and Enchanter's Nightshade. Wildlife Site criteria: Ancient Woodland Inventory site.
78/010	Cangsley Grove	TL218034	16.44	1997	Ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) woodland with Hornbeam coppice dominant within the main part of the wood. Pedunculate Oak standards, included some planting, are frequent. Silver Birch (Betula pendula), Ash (Fraxinus excelsior) and coppiced Hazel (Corylus avellana) are also present. A largely clear felled area to the north-west supports regenerating/replanted trees. The ground flora supports mainly Bramble (Rubus fruticosus agg.), Bracken (Pteridium aquilinum) and Bluebell (Hyacinthoides non-scripta). Other species recorded include Dog's Mercury (Mercurialis perennis), Enchanter's Nightshade (Circaea lutetiana) and Wood Sage (Teucrium scorodonia). Wildlife Site criteria: Ancient Woodland Inventory site.
78/017	Round Wood	TL211031	2.53	1997	Ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) woodland of mainly Hornbeam coppice with Oak standards. A little Hazel (Corylus avellana) coppice is also present. Midland Hawthorn (Crataegus laevigata) occurs along the wood margin. The ground flora is dominated by Bluebell (Hyacinthoides non-scripta). A bank and ditch is present to the south-west and east facing boundaries and supports Hawthorn (Crataegus monogyna) and Blackthorn (Prunus spinosa) hedges with some mature Pedunculate Oak. Wildlife Site criteria: Ancient Woodland Inventory site.
78/031	Scrubby Grassland	TL207048	2.04	1997	Area of unimproved acid grassland with some scattered to dense patches of

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
	by Frederick's Wood				Hawthorn (Crataegus monogyna). The acid grassland supports a good mix of grasses and herbs including Sweet Vernal-grass (Anthoxanthum odoratum), Common Bent (Agrostis capillaris), Red Fescue (Festuca rubra), Sheep's Sorrel (Rumex acetosella), Lady's Bedstraw (Galium verum), Lesser Stitchwort (Stellaria graminea) and Bird's-foot Trefoil (Lotus corniculatus). Wildlife Site criteria: Grassland indicators.
78/033	Shenley Lodge Farm Wood	TL201024	4.24	1997	Ancient semi-natural woodland of Pedunculate Oak (Quercus robur)/Ash (Fraxinus excelsior) with Hazel (Corylus avellana) coppice. There is abundant Wych Elm (Ulmus glabra) in the understorey and significant Sycamore (Acer pseudoplatanus) invasion, particularly in the northern extension of the wood. The ground flora supports woodland indicators, predominantly Bluebell (Hyacinthoides non-scripta) and Dog's Mercury (Mercurialis perennis). Other species recorded include Wood Anemone (Anemone nemorosa), Giant Fescue (Festuca gigantea) and Yellow Archangel (Lamiastrum galeobdolon). The north part of the wood is a linear hollow. Wildlife Site criteria: Ancient woodland with a semi-natural canopy and field evidence suggesting an ancient origin; shown on Bryant (1822); woodland indicators.
78/043	Potwells	TL216030	20.61	1997	Secondary wet acidic grassland (set-aside) and scrub on former acid grassland. There are also patches of plant species associated with calcareous soils. The site is crossed by Bramble (Rubus fruticosus agg.) lined ditches and there is a swallow hole in the east. Wild Service-tree (Sorbus torminalis) and Hares (Lepus europaeus) has been recorded from the site along with a good diversity of butterflies and birds. Wildlife Site criteria: Grassland indicators, Species.
78/079	North Mymms Park	TL217047	24.67	1997	Parkland of semi-improved neutral grassland with frequent planted trees, either as singles or in clumps. The sward varies somewhat in species mix and diversity and is of most interest in the north-central area. Species recorded include Sweet Vernal-grass (Anthoxanthum odoratum), Lady's Bedstraw (Galium verum), Pignut (Conopodium majus), Field Wood-rush (Luzula campestris), Bulbous Buttercup (Ranunculus bulbosus) and Bird's-foot Trefoil (Lotus corniculatus). There are small ponds along the north-eastern edge. Wildlife Site criteria: Grassland indicators.
78/082	North Mymms	TL221044	0.62	2000	Churchyard with old neutral grassland supporting a good diversity of grasses and

Wildlife Sites Report					
SITE REFERENCE	**NAME**	**GRID REFERENCE**	**AREA(ha)**	**RATIFIED**	**DESCRIPTION**
	Churchyard				herbs with some scattered ornamental trees. Species recorded in the sward include Sweet Vernal-grass (Anthoxanthum odoratum), Meadow Foxtail (Alopecurus pratensis), Red Fescue (Festuca rubra), Common Knapweed (Centaurea nigra), Bird's-foot Trefoil (Lotus corniculatus), Field Wood-rush (Luzula campestris), Common Sorrel (Rumex acetosa), Burnet-saxifrage (Pimpinella saxifraga) and Lady's Bedstraw (Galium verum). Other species of note recorded on the site include Spring Beauty (Claytonia perfoliata) and Wall Rue (Asplenium ruta-muraria). Wildlife Site criteria: Grassland indicators.
78/084	North Mymms Park Area	TL21-04-	0	1997	Buildings and environs important for protected species. Wildlife Site criteria: Species.
78/086	North Mymms Icehouse	TL21-03-	0	1997	Icehouse and environs important for protected species. Wildlife Site criteria: Species.
78/104	Coursers Farm Area	TL20-04-	0	2002	Building and environs important for protected species. Wildlife Site criteria: Species.
78/108	Coursers Road Gravel Pit	TL20-03-	0	2006	Hedgerow and ditch on Coursers Farm important for breeding Tree Sparrow (Passer montanus), a Local Biodiversity Action Plan species. Wildlife Site criteria: Species.

Ancient Woodland Inventory sites

NAME	WOOD TYPE	AREA (ha)
Bush Wood, North Mymms	Ancient Semi-natural Woodland	13.80
Cangsley Grove	Ancient Semi-natural Woodland	14.63
Cangsley Grove (replanted)	Ancient Replanted Woodland	1.54
Cobs Ash	Ancient Semi-natural Woodland	17.41
Cobs Ash (replanted)	Ancient Replanted Woodland	3.59
Coppice Wood	Ancient Semi-natural Woodland	7.82
Hawkshead Wood (replanted)	Ancient Replanted Woodland	98.60
Knight's Wood	Ancient Semi-natural Woodland	1.88
Walsingham Wood	Ancient Semi-natural Woodland	12.36
Walsingham Wood (replanted)	Ancient Replanted Woodland	8.49

HERTFORDSHIRE NON-STATUTORY SITE RECORDS

68/003
69/003
68/097
68/050
68/070
69/001
68/021
68/022
69/002
69/019
69/009
69/043
77/005
77/053
77/043
78/031
78/104
78/079
78/082
78/084
78/008
78/086
78/108
78/010
78/009
78/017
78/043
78/033

Colney Heath
Roestock
London Colney
RIDGE CP

2km_search
Wildlife Site

Produced by

HERTFORDSHIRE BIOLOGICAL RECORDS CENTRE

Species records with international designations

SPECIES	YEAR	GRID	1 Km	SITE	PROTECTED	BAP	LBAP
Brown Long-Eared Bat	1997		TL1505	Sopwell Mill Hotel Area	1	1	0
Brown Long-Eared Bat	1997		TL1505	Sopwell Mill Hotel Area	1	1	0
Brown Long-Eared Bat	1998		TL1607	Verulam School	1	1	0
Brown Long-Eared Bat	1998		TL1607	Verulam School	1	1	0
Brown Long-Eared Bat	2002		TL1808	Coopers Green Lane	1	1	0
Brown Long-Eared Bat	2002		TL1808	St Albans, Cooper Lane	1	1	0
Brown Long-Eared Bat	2003		TL1801	Shenleybury	1	1	0
Brown Long-Eared Bat	2003		TL1906	St Marks Close, Colney Heath	1	1	0
Brown Long-Eared Bat	1988		TL2104	North Mymms Park	1	1	0
Brown Long-Eared Bat	1997		TL2007	Smallford, Pope Field Farm Area	1	1	0
Brown Long-Eared Bat	1997		TL2007	Smallford, Pope Field Farm Area	1	1	0
Brown Long-Eared Bat	1992		TL2002	Shenley Lodge Area	1	1	0
Brown Long-Eared Bat	1995		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1996		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1997		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1998		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1993		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1993		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1994		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1992		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1991		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	2001		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	2002		TL2001	Shenley Quarry and Ponds	1	1	0
Brown Long-Eared Bat	1999		TL2006	Sleapshyde Farm Area	1	1	0
Brown Long-Eared Bat	2002		TL2004	Coursers Farm Area	1	1	0
Brown Long-Eared Bat	2002		TL2004	Coursers Farm Area	1	1	0
Brown Long-Eared Bat	1995		TL2000	Ravenscroft Farm Area	1	1	0
Brown Long-Eared Bat	1996		TL2104	North Mymms Park Area	1	1	0
Brown Long-Eared Bat	1996		TL2104	North Mymms Park Area	1	1	0
Brown Long-Eared Bat	1996		TL2104	North Mymms Park Area	1	1	0
Brown Long-Eared Bat	1996		TL2104	North Mymms Park Area	1	1	0
Brown Long-Eared Bat	1989		TL2207	Chantry Lane Wood and Dene Hole	1	1	0
Brown Long-Eared Bat	1989		TL2207	Chantry Lane Wood and Dene Hole	1	1	0

Brown Long-Eared Bat	1996	TL2207	Hatfield, Foxglove Close	1	1	0
Brown Long-Eared Bat	2002	TL2208	Howe Dell School	1	1	0
Brown Long-Eared Bat	2002	TL2208	Howe Dell School	1	1	0
Brown Long-Eared Bat	2003	TL2208	Howe Dell School	1	1	0
Brown Long-Eared Bat	1994	TL2308	Hatfield House Area	1	1	0
Brown Long-Eared Bat	1994	TL2308	Hatfield House Area	1	1	0
Brown Long-Eared Bat	1994	TL2308	Hatfield House Area	1	1	0
Brown Long-Eared Bat	1994	TL2308	Hatfield House Area	1	1	0
Brown Long-Eared Bat	1994	TL2308	Hatfield House Area	1	1	0
Brown Long-Eared Bat	1993	TL2308	Hatfield House Area	1	1	0
Brown Long-Eared Bat	1993	TL2308	Hatfield House Area	1	1	0
Brown Long-Eared Bat	1992	TL2403	Bluebridge Avenue, Brookmans Park	1	1	0
Brown Long-Eared Bat	1996	TL2403	Gobions Wood	1	1	0
Brown Long-Eared Bat	2000	TL2205	Dellsome Lane	1	1	0
Brown Long-Eared Bat	2000	TL2205	Dellsome Lane	1	1	0
Chiroptera (Bat)	2001	TL1606	St Albans, Guildford Road	1	0	0
Chiroptera (Bat)	1998	TL1705	Tyttenhanger, Highfield Lane	1	0	0
Chiroptera (Bat)	2000	TL1907	Oaklands College, East Drive	1	0	0
Chiroptera (Bat)	2001	TL1900	Mimms Lane, Shenley	1	0	0
Chiroptera (Bat)	1992	TL1906	Colney Heath Church Area	1	0	0
Chiroptera (Bat)	1994	TL2000	TL20A	1	0	0
Chiroptera (Bat)	2000	TL2002	Shenley Lodge Area	1	0	0
Chiroptera (Bat)	2000	TL2002	Shenley Manor Lodge School	1	0	0
Chiroptera (Bat)	1998	TL2001	Shenley Quarry and Ponds	1	0	0
Chiroptera (Bat)	1995	TL2001	Shenley Quarry and Ponds	1	0	0
Chiroptera (Bat)	1995	TL2001	Shenley Quarry and Ponds	1	0	0
Chiroptera (Bat)	1996	TL2001	Shenley Quarry and Ponds	1	0	0
Chiroptera (Bat)	2002	TL2001	Shenley Quarry and Ponds	1	0	0
Chiroptera (Bat)	1989	TL2103	North Mymms Area	1	0	0
Chiroptera (Bat)	1996	TL2100	Clair Hall Manor Area	1	0	0
Chiroptera (Bat)	2000	TL2207	Hatfield, Bulrush Close	1	0	0
Chiroptera (Bat)	1997	TL2207	Hatfield, Bullrush Close	1	0	0
Chiroptera (Bat)	2002	TL2208	Hatfield, Link Walk	1	0	0
Chiroptera (Bat)	2001	TL2205	Welham Green, Welham Manor	1	0	0
Chiroptera (Bat)	2002	TL2305	Welham Green, Huggins Lane	1	0	0
Daubenton Bat	1998	TL2001	Shenley Quarry and Ponds	1	0	0

Daubenton Bat	1991	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1993	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1994	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1990	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1992	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1990	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1995	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1996	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1996	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1997	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1993	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	1993	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	2004	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	2004	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	2002	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	2001	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	2003	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	2002	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	2003	TL2001	Shenley Quarry and Ponds	1	0	0
Daubenton Bat	2002	TL2403	Gobions Wood	1	0	0
Daubenton Bat	2004	TL2403	Gobions Wood	1	0	0
Daubenton Bat	2001	TL2403	Gobions Wood	1	0	0
Daubenton Bat	2002	TL2403	Gobions Wood	1	0	0
Daubenton Bat	2004	TL2403	Gobions Wood	1	0	0
Daubenton Bat	2001	TL2403	Gobions Wood	1	0	0
Daubenton Bat	2003	TL2403	Gobions Wood	1	0	0
Daubenton Bat	1998	TL2403	Gobions Wood	1	0	0
Daubenton Bat	1995	TL2403	Gobions Wood	1	0	0
Daubenton Bat	2000	TL2403	Gobions Wood	1	0	0
Daubenton Bat	1996	TL2403	Gobions Wood	1	0	0
Daubenton Bat	2003	TL2403	Gobions Wood	1	0	0
Daubenton Bat	1992	TL2403	Gobions Wood	1	0	0
Natterer's Bat	2001	TL1907	Smallford Station Road	1	0	1
Natterer's Bat	1994	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1991	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1992	TL2001	Shenley Quarry and Ponds	1	0	1

Natterer's Bat	1996	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1993	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1995	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1996	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1993	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1990	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1998	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1991	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1992	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1997	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	2004	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	2002	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	2003	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	2003	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	2001	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	2002	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	2004	TL2001	Shenley Quarry and Ponds	1	0	1
Natterer's Bat	1999	TL2006	Sleapshyde Farm Area	1	0	1
Natterer's Bat	2004	TL2403	Gobions Wood	1	0	1
Natterer's Bat	2001	TL2403	Gobions Wood	1	0	1
Natterer's Bat	2001	TL2403	Gobions Wood	1	0	1
Natterer's Bat	1996	TL2403	Gobions Wood	1	0	1
Natterer's Bat	2003	TL2403	Gobions Wood	1	0	1
Natterer's Bat	2003	TL2403	Gobions Wood	1	0	1
Noctule Bat	2002	TL2204	Home Farm Area, North Mymms	1	1	0
Pipistrelle 45 Khz Bat	2002	TL2008	Hatfield, Bramble Road	1	1	0
Pipistrelle 45 Khz Bat	2002	TL2204	Home Farm, North Mymms	1	1	0
Pipistrelle 45 Khz Bat	2002	TL2208	Howe Dell School	1	1	0
Pipistrelle 55 Khz Bat	1998	TL2303	Warrengate Road	1	0	0
Pipistrelle 55 Khz Bat	1998	TL2303	Warrengate Road	1	0	0
Pipistrelle Bat	1996	TL1506	St Albans, Cunningham Avenue	1	0	0
Pipistrelle Bat	1996	TL1506	St Albans, Cunningham Avenue	1	0	0
Pipistrelle Bat	1997	TL1505	Sopwell Mill Hotel Areas	1	0	0
Pipistrelle Bat	1997	TL1505	Sopwell Mill Hotel Areas	1	0	0
Pipistrelle Bat	1996	TL1506	St Albans, Cunningham Avenue	1	0	0
Pipistrelle Bat	1996	TL1506	St Albans, Cunningham Avenue	1	0	0

Pipistrelle Bat	1988	TL1506	St Albans, Cunningham Avenue	1	0	0
Pipistrelle Bat	1998	TL1706	Highfield Park, Hill End Hospital	1	0	0
Pipistrelle Bat	2002	TL1706	Hixberry Lane, Butterwick Centre	1	0	0
Pipistrelle Bat	2002	TL1706	Hixberry Lane, Butterwick Centre	1	0	0
Pipistrelle Bat	1988	TL1707	Gresford Close, St Albans	1	0	0
Pipistrelle Bat	1989	TL1707	St Albans	1	0	0
Pipistrelle Bat	1986	TL1806	Colney Heath Lane, St Albans	1	0	0
Pipistrelle Bat	2003	TL1906	St Marks Close, Colney Heath	1	0	0
Pipistrelle Bat	1999	TL2000	Catherine Bourne Farm Area	1	0	0
Pipistrelle Bat	1997	TL2001	Shenley Quarry and Ponds	1	0	0
Pipistrelle Bat	1999	TL2006	Sleapshyde Farm Area	1	0	0
Pipistrelle Bat	1997	TL2005	Colney Heath, Hall Gardens	1	0	0
Pipistrelle Bat	1990	TL2005	Hall Gardens, Colney Heath	1	0	0
Pipistrelle Bat	1990	TL2005	Hall Gardens, Colney Heath	1	0	0
Pipistrelle Bat	1989	TL2005	Colney Heath, Hall Gardens	1	0	0
Pipistrelle Bat	1998	TL2102	Blackhorse Lane	1	0	0
Pipistrelle Bat	1998	TL2102	Blackhorse Lane	1	0	0
Pipistrelle Bat	1993	TL2106	Robins Way, Hatfield	1	0	0
Pipistrelle Bat	1993	TL2106	Robins Way, Hatfield	1	0	0
Pipistrelle Bat	1996	TL2208	Hatfield, Brior Wood	1	0	0
Pipistrelle Bat	1994	TL2207	Hatfield, 10 Cheviots	1	0	0
Pipistrelle Bat	1994	TL2207	Chantry Lane Wood and Dene Hole	1	0	0
Pipistrelle Bat	1989	TL2207	Chantry Lane Wood and Dene Hole	1	0	0
Pipistrelle Bat	1989	TL2207	Chantry Lane Wood and Dene Hole	1	0	0
Pipistrelle Bat	2001	TL2207	Hatfield, Thrush Avenue	1	0	0
Pipistrelle Bat	2002	TL2208	Howe Dell School	1	0	0
Pipistrelle Bat	1995	TL2204	North Mimms	1	0	0
Pipistrelle Bat	1995	TL2205	North Mimms, Dixons Hill Close	1	0	0
Pipistrelle Bat	1998	TL2303	Mimmshall Brook, Water End	1	0	0
Pipistrelle Bat	1998	TL2303	Mimmshall Brook, Water End	1	0	0
Pipistrelle Bat	2002	TL2306	North Mymms Marshmoor Works	1	0	0
Pipistrelle Bat	1994	TL2308	Hatfield House Area	1	0	0
Pipistrelle Bat	1994	TL2308	Hatfield House Area	1	0	0
Pipistrelle Bat	1994	TL2308	Hatfield House Area	1	0	0
Pipistrelle Bat	1993	TL2308	Hatfield House Area	1	0	0
Pipistrelle Bat	1991	TL2303	Hawkshead Lane, North Mymms	1	0	0

Pipistrelle Bat	1995		TL2404	Brookmans Park, Moffats Lane	1	0	0
Pipistrelle Bat	1991		TL2404	Peplins Way, Brookmans Park	1	0	0
Pipistrelle Bat	1994		TL2404	Brookmans Park, Bradmore Way	1	0	0
Pipistrelle Bat	1997		TL2404	Brookmans Park, Bradmore Way	1	0	0
Pipistrelle Bat	1998		TL2404	Brookmans Park, Brookmans Avenue	1	0	0
Pipistrelle Bat	1998		TL1607	Verulam School	1	0	0
Serotine Bat	1993		TL2308	Hatfield House Area	1	0	0
Unidentified Bat	2001		TL2001	Shenley Quarry and Ponds	1	0	0
Unidentified Bat	2004		TL2001	Shenley Quarry and Ponds	1	0	0
Unidentified Bat	2001		TL2403	Gobions Wood	1	0	0
Whiskered Bat	1998		TL2303	Mimmshall Brook, Water End	1	0	0
Water Vole	1977	TL203058	TL2005	Colney Heath	1	1	1
Water Vole	1987	TL240080	TL2408	TL20P	1	1	1
Water Vole	1989	TL231021	TL2302	Mimmshall Brook by Mimms Hall	1	1	1
Water Vole	1992	TL186042	TL1804	River Colne by Bowmansgreen Farm	1	1	1
Water Vole	1993	TL186042	TL1804	River Colne by Bowmansgreen Farm	1	1	1
Water Vole	1996	TL186040	TL1804	River Colne by Bowmansgreen Farm	1	1	1
Water Vole	1996	TL231021	TL2302	Mimmshall Brook by Mimms Hall	1	1	1
Water Vole	1997	TL182037	TL1803	River Colne NE of Nature Reserve	1	1	1
Water Vole	1997	TL186040	TL1804	River Colne by Bowmansgreen Farm	1	1	1
Water Vole	1997	TL197058	TL1905	TL10X	1	1	1
Water Vole	1998	TL200058	TL2005	Colney Heath	1	1	1
Great Crested Newt	1986	TL194072	TL1907	Land near Smallford Nurseries	1	1	1
Great Crested Newt	1986	TL181050	TL1805	Tyttenhanger Lane Copse and Pond	1	1	1
Great Crested Newt	1983	TL195068	TL1906	Smallford Gravel Pits	1	1	1
Great Crested Newt	1986	TL195068	TL1906	Smallford Gravel Pits	1	1	1
Great Crested Newt	1986	TL190003	TL1900	Twin Pines, Shenley	1	1	1
Great Crested Newt	1986	TL179053	TL1705	Highfield Hall Ponds	1	1	1
Great Crested Newt	1986	TL183060	TL1806	Tyttenhanger Lane Pond	1	1	1
Great Crested Newt	1986	TL227064	TL2206	Travellers Lane Grassland and Ponds	1	1	1
Great Crested Newt	1988	TL168058	TL1605	Francis Bacon School	1	1	1
Great Crested Newt	1997	TL187083	TL1808	small pond, Oaklands Gravel Pit	1	1	1
Great Crested Newt	1998		TL2206	Travellers Lane Grassland and Ponds	1	1	1
Great Crested Newt	1998		TL1705	Highfield Hall Area	1	1	1
Great Crested Newt	1998		TL1805	Hill End Farm Area	1	1	1
Great Crested Newt	1998		TL1805	Barley Mo Lane	1	1	1

Great Crested Newt	1998		TL1602	Harper Lane Gravel Pit	1	1	1
Great Crested Newt	1973	TL203013	TL2001	Dovers Green, Shenley Quarry	1	1	1
Great Crested Newt	1977	TL229083	TL2208	Howe Dell School	1	1	1
Great Crested Newt	2001	TL242045	TL2404	Piplins Way, Brookmans Park	1	1	1
Great Crested Newt	2002		TL2208	Howe Dell School	1	1	1
Great Crested Newt	2001		TL2206	New Barnfield Meadow	1	1	1
Great Crested Newt	1993	TL164026	TL1602	Old Parkbury Fishing Lakes	1	1	1
Otter	1967	TL20P	TL2000		1	1	1
Otter	2004	TL177034	TL1703		1	1	1
Otter	2004	TL181035	TL1803	Colne Broad Colney	1	1	1
Dormouse	1994	TL218034	TL2103	Cangsley Grove	1	1	1
Dormouse	1975	TL213077	TL2107	Hatfield, Watery Lane	1	1	1

Species records with National and Local designations

SPECIES	YEAR	GRID	1 Km	SITE	PROTECTED	BAP	LBAP
Badger	1995		TL1804	Tyttenhanger Gravel Pit	1	0	0
Badger	1986		TL2003	Small Wood N.W. of Redwell	1	0	0
Grass Snake	1997	TL190050	TL1905	Tyttenhanger Gravel Pit - central causeway	1	1	0
Grass Snake	1985	TL200060	TL2006	TL20D	1	1	0
Grass Snake	1998	TL203057	TL2005	Colney Heath - River Colne section	1	1	0
Grass Snake	1998	TL203057	TL2005	Colney Heath - River Colne section	1	1	0
Grass Snake	1999	TL203058	TL2005	Colney Heath	1	1	0
Grass Snake	1985	TL203058	TL2005	Colney Heath	1	1	0
Grass Snake	2004	TL203058	TL2005	Colney Heath - The Warren	1	1	0
Lizard	1988	TL203058	TL2005	Colney Heath	1	1	0
Lizard	1988	TL203058	TL2005	Colney Heath	1	1	0
Palmate Newt	1999	TL186055	TL1805	pond, Knights Wood	0	0	0
Cornflower	1887	TL200060	TL2006	Between Roe Green & Roe Stock., TL20D	0	1	1
Cornflower	1999	TL203058	TL2005	disturbed pipeline, Colney Heath	0	1	1
Cornflower	1989	TL200060	TL2006	Johnsons Spring Field, TL20D	0	1	1
Tree Sparrow	2004	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	2006	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	2007	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	2008	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	2008	TL1904	TL1904	Tyttenhanger Farm Area	0	1	1
Tree Sparrow	2007	TL1904	TL1904	Tyttenhanger Farm Area	0	1	1
Tree Sparrow	2006	TL1904	TL1904	Tyttenhanger Farm Area	0	1	1
Tree Sparrow	2005	TL1904	TL1904	Tyttenhanger Farm Area	0	1	1
Tree Sparrow	2004	TL1904	TL1904	Tyttenhanger Farm Area	0	1	1
Tree Sparrow	2003	TL1904	TL1904	Tyttenhanger Farm Area	0	1	1
Tree Sparrow	2002	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	2005	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	2003	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	2001	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	2000	TL2003	TL2003	Coursers Farm Area	0	1	1
Tree Sparrow	1999	TL2003	TL2003	Coursers Farm Area	0	1	1

Veteran & Mature Tree records

SPECIES	SURVEY DATE	GIRTH (cm)	SITE	ADDRESS	CONTEXT	EASTING	NORTHING	RECORD NUMBER
Oak	30/08/2000	405	North Mimms Park	North Mimms	PL, Parkland	522080	204250	720
Hornbeam	30/08/2000	330	North Mimms Park	Walsingham Wood, North Mimms	WL, Woodland	521500	203770	721
Sweet chestnut	30/08/2000	480	North Mimms Park	North Mimms	WL, Woodland	521400	204400	722
Beech	30/08/2000	480	North Mimms Park	North Mimms	PL, Parkland	521500	204400	723
Oak	30/08/2000	440	North Mimms Park	North Mimms	PL, Parkland	521580	204440	724
Oak	05/09/2000	480	North Mimms Park	North Mimms	WE, Wood Edge	521750	203750	725
Oak	05/09/2000	580	North Mimms Park	North Mimms	X, Other	521650	203600	726
Oak	05/09/2000	440	North Mimms Park	North Mimms	PL, Parkland	522100	204300	727
Oak	05/09/2000	476	North Mimms Park	North Mimms	PL, Parkland	522050	204200	728
Oak	05/09/2000	490	North Mimms Park	North Mimms	PL, Parkland	521990	204190	729
Oak	05/09/2000	580	North Mimms Park	North Mimms	PL, Parkland	521950	204300	730
Holly	30/08/2000	150	North Mimms Park	Walsingham Wood, North Mimms	WL, Woodland	521200	204200	732
Lime species	05/09/2000	480	North Mimms Park	North Mimms	PL, Parkland	522020	204400	731

HERTFORDSHIRE SPECIES RECORDS

2km_search

Veteran & mature tree

National & Local designations

Tree Sparrow

Cornflower

Palmate Newt

Lizard

Grass Snake

Badger

Produced by

HERTFORDSHIRE BIOLOGICAL RECORDS CENTRE

It should be noted that the species dots do not represent the exact location but general area of the species recorded. Many of these records have been exported from a 1km, 2km or even 10km data source. These plans have been supplied for information purposes only. No copying, in whole or part, is permitted. Please observe copyright restrictions.

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Appendix EDP 3
Extended Phase 1 Habitat Survey Target Notes

1. Large soil bunds in adjacent land managed by Lafarge Aggregates.
2. Small area of scrub surrounding electricity sub-station dominated by bramble and hawthorn.
3. A species-poor short hedgerow dominated by hawthorn and blackthorn is located along the northern boundary of the site adjacent to Coursers Road. This feature was noted to be gappy in places and in poor condition.
4. A field supporting species-poor semi-improved grassland, used as a paddock for horses.
5. Small areas of amenity grassland located at the entrance to the Coursers Farm complex. These were found to be well mown and contained a short sward with a limited number of forb species.
6. Mature oak tree located outside of the site boundary.
7. An off-site pond was noted adjacent to the entrance of the farm access road. This pond supported a wide band of marginal planting which is dominated by variegated reed canary-grass, and appeared to be a well-established habitat.
8. Small pond located within the site boundary supporting little in the way of either aquatic or marginal vegetation. This pond appeared to be a relatively recently created feature.
9. The majority of the site is dominated by improved grassland. The larger field making up the site was found to be sheep grazed and supported a close cropped sward with low species diversity.
10. An open area of sparsely vegetated land located adjacent to the site boundary on the land managed by Lafarge Aggregates.
11. A horse paddock to the east of the site located within Coursers Farm (but outside of the site boundary) was also noted as containing improved grassland.
12. Large agricultural sheds within the Coursers Farm complex located adjacent to the site.
13. Hardstanding yard located adjacent to the site, used for equipment storage.
14. The ditches located along the western and southern boundaries were found to be a mixture of dry and wet habitats. The northern end of the western boundary ditch was found to be dry and supported rank grasses along with limited forb species. At its southern end the ditch was wet but contained approximately 5-10cm of water. Plant species within the inundated length were similar to those in the northern section. Along the southern boundary of the site, Tittenhanger Stream flows from west to east. At the time of the survey the stream contained a maximum of approximately 10cm of water. The stream was confined by tall, steep grassy banks and a number of holes were noted that had the potential to have been excavated by water voles.
15. Three further ponds were noted following the completion of the extended Phase 1 Habitat survey. The first was a small pond located in the corner of the field opposite the site, across Coursers Road. A further two ponds were found to the east of the site within the farm complex. These ponds will be described fully in the separate great crested newt report.

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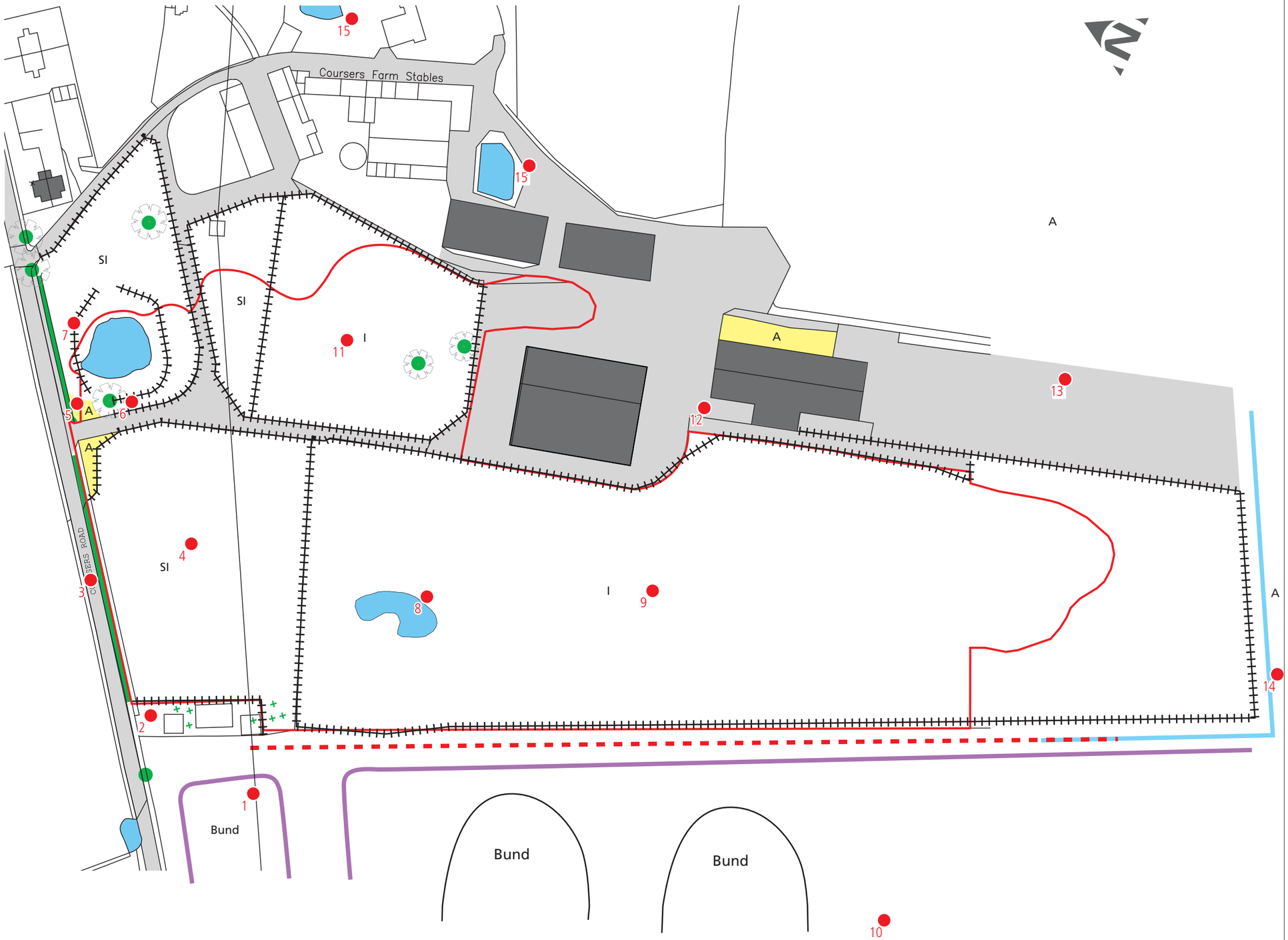
Plan

Plan EDP 1 Extended Phase 1 Habitat Plan
(EDP1421/01a 3 August 2011 TB/RS)



Site Boundary

Amphibian/reptile fencing

Dry ditch

Wet ditch

A — Amenity grassland

Open water

SI — Species poor semi-improved grassland

I — Improved grassland

A — Arable

Hedgerow

Scattered scrub

Mature tree

Fence

Building

Hard standing

1 — Target note

THE ENVIRONMENTAL DIMENSION PARTNERSHIP
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client

Agrivert Ltd

project title

Coursers Farm, Hertfordshire

drawing title

Extended Phase 1 Habitat Plan

date	3 AUGUST 2011	drawn by	TB
drawing number	EDP 1421/01a	checked	RS
scale	nts		

REC
Resource & Environmental Consultants Ltd

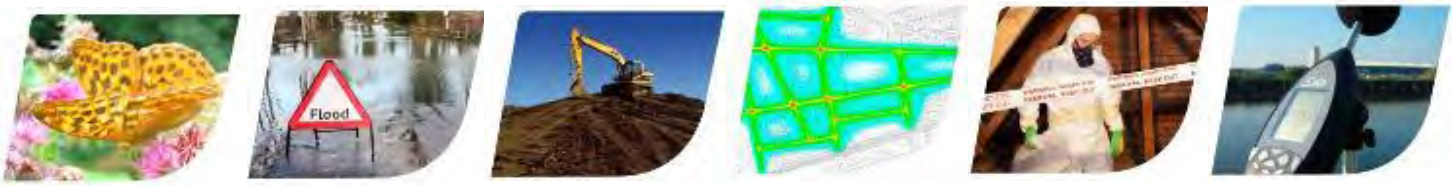
National Consultancy, Locally Delivered

AIR QUALITY ASSESSMENT
COURSERS FARM ANAEROBIC DIGESTION PLANT

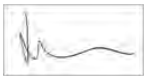
REC REFERENCE: AQ100410R2

REPORT PREPARED FOR: AGRIVERT LTD

DATE: 18TH FEBRUARY 2016



REPORT ISSUE

Issue/revision	Issue 1	Revision 2	Revision 3
Remarks	Draft for Comments		
Date	17/11/2016	18/02/2016	
Prepared by	Joshua Tee	Gabor Antony	
Signature			
Position	Graduate Air Quality Consultant	Principle Air Quality Consultant	
Checked by	Jethro Redmore	Charlotte Smith	
Signature			
Position	External Air Quality Consultant	Air Quality Consultant	
Verified by	Sarah Naylor	Gabor Antony	
Signature			
Position	Principal Air Quality Consultant	Principle Air Quality Consultant	
Project number	AQ100410r1	AQ100410r2	

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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Agrivert Ltd to undertake a Dispersion Modelling Assessment of potential atmospheric emissions from an anaerobic digestion facility on land at Coursers Farm, St Albans.

Atmospheric emissions associated with the facility have the potential to cause increases in ground level pollutant concentrations and deposition rates. As such, an Air Quality Assessment was required to assess impacts at human and ecological designations in the vicinity of the site.

Predicted concentrations of all pollutants were below the relevant standards at all locations representative of human exposure within the assessment extents for all modelling scenarios. Impacts on baseline concentrations at sensitive receptor locations were not considered to be significant.

Nitrogen and acid gas deposition rates, as well as oxides of nitrogen and sulphur dioxide concentrations, were predicted at ecological sites within the vicinity of the proposed facility. The results indicated exceedences oxides of nitrogen concentrations at an ecological designation. Sulphur dioxide concentrations were below the relevant environmental quality standards at all designations for all modelling scenarios.

The assessment indicated exceedences of the relevant critical loads for nitrogen and acid deposition at an ecological designation as a baseline condition. The contribution of emissions from the proposed facility to deposition rates at some locations was also predicted to be above the Environment Agency criteria for insignificant impacts. This was partly due to the very low critical loads, as well as the high baseline levels and the geographical location of the site in close proximity to the designation.

Further discussion was undertaken to assess impacts as a result of varying emission profiles, as well as to provide consideration of likely impacts at the relevant habitat types in the vicinity of the site. The results of the assessment indicated that although exceedences of the relevant criteria were predicted in all scenarios, effects on the integrity of the designation were unlikely to be significant.

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APPENDICES

Appendix I Figures

1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Agrivert Ltd to undertake a Dispersion Modelling Assessment of potential atmospheric emissions from an anaerobic digestion (AD) plant on land at Coursers Farm, St Albans.

Atmospheric emissions associated with the AD plant have the potential to cause increases in ground level pollutant concentrations. As such, an Air Quality Assessment was required to quantify impacts in the vicinity of the site.

1.2 Site Location and Context

The proposed AD plant is located on land at Coursers Farm, St Albans, at approximate National Grid Reference (NGR): 520350, 204550. Reference should be made to Figure 1 for a map of the site and surrounding area and Figure 2 for a layout plan.

It is proposed to construct and operate an AD plant that will be fuelled by food waste. Biogas produced by the AD process will be combusted to generate electricity for export to the National Grid. The process can be briefly described as:

- **Feedstock** - The site will operate using biodegradable organic waste feedstock in the form of solid and liquid food waste. The feedstock will be delivered to site and weighed before unloading within an enclosed reception building. This will be kept at negative pressure and vented air will be treated by a bio filter to minimise the potential for odour release;
- **Operation** - The feedstock will be digested within the plant in completely sealed tanks. The biogas produced (a mixture of methane (CH_4) and carbon dioxide (CO_2)) will be stored in the digesters and storage tanks prior to use in two Combined Heat and Power (CHP) engines where it will be combusted for the generation of electricity. Exhaust gases will be released through two dedicated stacks; and,
- **Digestate** - The process will create digestate which can be used as a high quality fertiliser. Sealed tankers will be used to transport the material off-site for final utilisation.

A flare is also included at the plant for emergency venting of biogas during abnormal operation.

The activities associated with the proposed plant are controlled under the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments. As such, the operator will be required to obtain an Environmental Permit from the Environment Agency (EA) as the appropriate regulator prior to operation. This will ensure the plant is managed and operated in accordance with good practice guidance and reduce the potential for environmental impacts.

The operation of the plant may result in atmospheric emissions from the combustion of biogas. These have the potential to cause impacts at sensitive locations within the vicinity of the site and have therefore been quantified within this 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.

2.0 LEGISLATION AND POLICY

2.1 European Legislation

European Union (EU) air quality legislation is consolidated under 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. The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for nitrogen dioxide (NO_2), oxides of nitrogen (NO_x), sulphur dioxide (SO_2), lead and particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene (C_6H_6) and carbon monoxide (CO); and,
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

The Air Quality Standards Regulations (2010) came into force on 11th June 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 5 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 2007[1]. 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 exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

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

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

Table 1 Air Quality Objectives

Pollutant	Air Quality Objectives	
	Concentration (µg/m³)	**Averaging Period**
NO_2	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
SO_2	125	24-hour mean; not to be exceeded more than 3 times a year
	350	1-hour mean; not to be exceeded more than 24 times a year
	266	15-minute mean; not to be exceeded more than 35 times a year
C_6H_6	5	Annual Mean
CO	10,000	8-hour running mean

Table 2 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

Table 2 Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration (µg/m³)	**Averaging Period**
NO_x	30	Annual mean
	75	24-hour mean
SO_2	20	Annual mean

Table 3 summarises the advice provided in DEFRA guidance LAQM.TG(09) on where the AQOs for pollutants considered within this report apply.

Table 3 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
24-hour and 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 and 8-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
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15-minutes or longer	

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 jurisdiction 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 locations of

relevant exposure (normally residential properties) 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, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 National Planning Policy

The National Planning Policy Framework[2] (NPPF) was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment:

> "The planning system should contribute to and enhance the natural and local environment by: […]
>
> Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability"
>
> "Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

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

2.5 National Planning Practice Guidance

The National Planning Practice Guidance[3] (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. Why should planning be concerned about air quality?
2. What is the role of Local Plans with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality be relevant to a planning decision?
6. Where to start if bringing forward a proposal where air quality could be a concern?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?
9. How do considerations about air quality fit into the development management process?

These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

---

2 National Planning Policy Framework, Department for Communities and Local Government, 2012.
3 http://planningguidance.planningportal.gov.uk.

2.6 Critical Loads and Levels

A critical load is defined by the UK Air Pollution Information System[4] (APIS) as:

> "A quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The exceedence of a critical load is defined as the atmospheric deposition of the pollutant above the critical load."

A critical level is defined as:

> "Threshold for direct effects of pollutant concentrations according to current knowledge. Exceedence of a critical level is defined as the atmospheric concentration of the pollutant above the critical level."

A critical load refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).

When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the exceedence. A larger exceedence is often considered to represent a greater risk of damage.

Maps of critical loads and levels and their exceedences have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is seen as means for preventing the risk of damage. However, even a decrease in the exceedence may infer that less damage will occur.

Critical loads have been designated within the UK based on the sensitivity of the receiving habitat and have been reviewed for the purpose of this assessment.

[4] UK Air Pollution Information System, www.apis.ac.uk.

3.0 BASELINE

Existing air quality conditions in the vicinity of the proposed development site 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), Hertsmere District Council (HDC) has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO_2 are above the annual mean AQO at a number of locations across the region. As such, six AQMAs have been declared which are described as:

> "Hertsmere AQMA No. 1 - An area comprising the domestic properties 23-27 Dove Lane and caravan site off A1000 Barnet Road."
>
> "Hertsmere AQMA No. 2 - An area comprising the domestic property known as Charleston Paddocks, St Albans Road, South Mimms, Potters Bar."
>
> "Hertsmere AQMA No. 3 - An area comprising the domestic properties 31-39 Blanche Lane, South Mimms."
>
> "Hertsmere AQMA No. 4 - An area comprising the domestic properties 12 Grove Place, Hartspring Lane, Aldenham and caravans numbered 1, 2, 3, 4, 7, 8, 55, 56, 57, 58, 59, 60 within Winfield Caravan site, Hartspring Lane."
>
> "Hertsmere AQMA No. 5 - An area encompassing a number of houses on the eastern side of Watling Street, either side of the junction with Barnet Road."
>
> "Hertsmere AQMA No. 6 - An area encompassing a number of domestic properties on the east side of the High Street, opposite the Potters Bar bus station."

The closest AQMA to the site is the Hertsmere AQMA No. 3, located 4.4km to the north-west. Due to the distance between the facility and the AQMA, it is not anticipated that the proposals would result in air quality impacts at this location. As such, this AQMA has not been considered further in the context of the assessment.

HDC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated.

3.2 Air Quality Monitoring

HDC utilise passive diffusion tubes to monitor NO_2 concentrations throughout the district. There is one tube located in the vicinity of the site and recent monitoring results are shown in Table 4.

Table 4 NO_2 Diffusion Tube Monitoring Results

Site ID	Location	Predicted Background Concentration (µg/m³)		
		2011	2012	2013
HM60	Bell Lane London Colney	-	35	33

As indicated in Table 4, the annual mean AQO for NO_2 was not exceeded at the diffusion tube in recent years. Reference should be made to Figure 3 for a graphical representation of the diffusion tube monitoring location.

3.3 Background Pollutant Concentrations

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 development site is located in grid square NGR: 520500, 204500. Data for this location was downloaded from the DEFRA website[5] for the purpose of this assessment and is summarised in Table 5.

Table 5 Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m³)
NO_2	16.160
NO_x	23.790
SO_2	3.670
CO	375.000
C_6H_6	0.385

It should be noted that the background concentrations of NO_2 and NO_x were predicted for 2015, C_6H_6 for 2010 and SO_2 and CO for 2001. These were 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.

3.4 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 receptors in the following Sections.

3.4.1 Sensitive Human Receptors

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

[5] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html.

in Table 6. Each receptor was modelled at 1.5m and 4.5m to represent exposure at ground and first floor level.

Table 6 Sensitive Receptors

Receptor		NGR (m)		Height (m)
		X	Y	
R1	Coursers Farm Ground (Residential)	520496.2	204690.5	1.5
R2	Coursers Farm First (Residential)	520496.2	204690.5	4.5
R3	3 Coursers Road Ground (Residential)	520566.7	204906.5	1.5
R4	3 Coursers Road First (Residential)	520566.7	204906.5	4.5
R5	5 Coursers Road Ground (Residential)	520424.7	204808.8	1.5
R6	5 Coursers Road First (Residential)	520424.7	204808.8	4.5
R7	2 Coursers Road Ground (Residential)	520384.7	204780.1	1.5
R8	2 Coursers Road First (Residential)	520384.7	204780.1	4.5

The sensitive receptors identified in Table 6 represent worst-case locations. 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 facility that have not been individually identified above. Reference should be made to Figure 4 for a graphical representation of human sensitive receptor locations.

3.4.2 Sensitive Ecological Receptors

Atmospheric emissions from the facility have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service[6] which draws information on key environmental schemes and designations.

The Colney Heath Local Nature Reserve (LNR) was identified in close proximity to the proposed development. The site consists of acid grassland and lowland dry acid grassland. Review of the APIS website[7] indicated that this is sensitive to nitrogen deposition and acid deposition.

The Redwell Wood Site of Special Scientific Interest (SSSI) was also identified in close proximity to the proposed development. The site consists of broadleaved, mixed and yew woodland. Review of the APIS website[8] indicated that this is sensitive to nitrogen deposition and acid deposition.

A summary of the receptors is provided in Table 7. Reference should be made to Figure 4 for a

6 Multi-Agency Geographic Information for the Countryside, www.magic.gov.uk.
7 UK Air Pollution Information System, www.apis.ac.uk.
8 UK Air Pollution Information System, www.apis.ac.uk.

graphical representation of the ecological designation locations.

Table 7 Ecological Receptors

Ecological Receptor		NGR (m)	
		X	Y
E1	Colney Heath (LNR)	520550.0	204959.0
E2	Redwell Wood (SSSI)	521159.0	202977.0

Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS website[9] 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 8.

Table 8 Nitrogen Critical Load

Ecological Designation	Feature	APIS Habitat	Nitrogen Critical Load (kgN/ha/yr)	
			Min	Max
Colney Heath (LNR)	Non-Mediterranean dry acid and neutral closed grassland	Acid grassland	10	15
Redwell Wood (SSSI)	Acidophilus Quercus-dominated woodland	Broadleaved, Mixed and Yew Woodland	10	15

It should be noted that the information shown in Table 8 represents the most sensitive habitat within the LNR and SSSI for nitrogen deposition.

Table 9 shows the relevant critical load for acid deposition.

Table 9 Acid Critical Load

Ecological Designation	Feature	APIS Habitat	Critical Load (ke/ha/yr)		
			CLmaxS	CLmaxN	CLminN
Colney Heath (LNR)	Non-Mediterranean dry acid and neutral closed grassland	Acid grassland	0.87	1.09	0.22
Redwell Wood (SSSI)	Acidophilus Quercus-dominated woodland	Broadleaved, Mixed and Yew Woodland	2.64	3.00	0.36

Background deposition rates at the ecological receptor locations were downloaded from the APIS

[9] UK Air Pollution Information System, www.apis.ac.uk.

website[10] and are summarised in Table 10.

Table 10 Background Deposition Rates

Ecological Receptor	Background Deposition Rate		
	Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)	
		Sulphur	Nitrogen
Colney Heath (LNR)	16.10	0.24	1.15
Redwell Wood (SSSI)	30.24	0.30	2.16

[10] UK Air Pollution Information System, www.apis.ac.uk.

4.0 METHODOLOGY

Emissions associated with the combustion of biogas within the proposed engines and flare have the potential to cause increases in pollutant concentrations and deposition rates 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, ADMS 5, was used to model releases of the identified substances. The dispersion modelling procedure was as follows:

- Information on stack dimensions and position were obtained via plans from Agrivert Ltd, the waste management consultants for the development;
- Information on process parameters and emission rates were obtained from Agrivert Ltd;
- Appropriate meteorological data was obtained from Atmospheric Dispersion Modelling (ADM) Ltd;
- Potentially sensitive locations were identified in the vicinity of the installation using digital mapping;
- Background air quality data was determined from background mapping and other sources;
- The above information was entered into the dispersion model;
- The dispersion model was run to determine ground level pollutant concentrations, which were added to background levels of these substances or converted into deposition rates;
- The interpretation of the results was based on the highest modelled value at any location on the receptor grid or appropriate specified receptor locations; and,
- The study results were compared with the relevant AQOs, critical levels or critical loads.

4.1 Dispersion Model

Dispersion modelling was undertaken using ADMS 5 (v5.1), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS 5 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to the 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.

4.2 Modelling Scenarios

The scenarios considered in the modelling assessment are summarised in Table 11.

Table 11 Dispersion Modelling Scenarios

Parameter	Modelled As	
	Short Term	Long Term
NO_2	99.8th percentile (%ile) 1-hour mean	Annual mean

Parameter	Modelled As	
	Short Term	Long Term
NO_x	24-hour mean	Annual mean
SO_2	99.9%ile 15-minute mean	Annual mean
	99.73%ile 1-hour mean	
	99.18%ile 24-hour mean	
Total volatile organic compounds (VOCs) as C_6H_6	-	Annual mean
CO	8-hour rolling mean	-
Nitrogen deposition	-	Annual deposition
Acid deposition	-	Annual deposition

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 shown in Table 11 were selected to represent the relationship between the permitted number of exceedences of short-period concentrations and the number of periods within a calendar year.

The flare will only be operated during abnormal conditions. As such, emissions from this source were only included within the short-term model scenarios. It should be noted that it is unlikely that the flare and CHP units will be operational concurrently. Modelling of all three sources is therefore considered to provide conservative short-term pollutant concentration predictions.

4.3 Process Conditions

Process conditions were provided through correspondence with Agrivert Ltd. Reference should be made to Table 12 for dispersion modelling inputs.

Table 12 Process Conditions

Condition	Unit	CHP 1	CHP 2	Flare
Stack location	NGR	520312.4, 204581.7	520317.1, 204578.3	520303.8, 204613.9
Stack diameter	m	0.30	0.30	1.36
Stack height	m	10.5	10.5	10.0
Flue gas volumetric flow rate	m^3/hr	14,025.0	14,025.0	76,701.3
Flue gas efflux velocity	m/s	55.11	55.11	14.67
Temperature	˚C	421.0	421.0	850.0

4.4 Emissions

The AD plant is required to comply with the relevant Emission Limit Values (ELVs) for exhaust gas pollutant concentrations for biogas engines. These are shown in Table 13. Emission concentrations for the flare were provided by Agrivert Ltd. As such, these are considered to provide a reasonable estimation of emissions from the flare.

Table 13 Pollutants and Emission Rates

Parameter	CHP Engine Emission Concentration (mg/m^3)	Flare Emission Concentration (mg/m^3)
NO_x	500	72
SO_2	350	-
VOCs	1,000	2.6
CO	1,400	1.8

The pollutant mass emission rates for use in the assessment were derived from the concentrations shown in Table 13 and are summarised in Table 14. This represents a conservative assessment approach with emissions from the engines assumed to be the maximum permitted.

Table 14 Mass Emission Rates

Parameter	Mass Emission Rate (g/s)		
	CHP 1	CHP 2	Flare
NO_x	0.766	0.766	0.373
SO_2	0.536	0.536	-
VOCs	1.533	1.533	0.013
CO	2.146	2.146	0.009

The ELV for organic carbon is stated as total VOC. However, for the purposes of dispersion modelling it was considered that the entire VOC emission consisted of only C_6H_6. This allowed the maximum ground level impacts to be assessed with respect to the AQO. Actual plant emissions of VOC are unlikely to only consist of one species, resulting in a worst-case assessment. It should be noted that emissions were modelled as total organic carbon and results factored to C_6H_6 using the relevant atomic mass to carbon ratio.

Emissions were assumed to be constant, with the plant in operation 24-hours per day, 365-days per year. 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.

4.5 Assessment Extents

Ambient concentrations were predicted over the area NGR: 519500, 202800 to 522000, 205300.

One Cartesian grid was used within the model to provide data suitable for plotting within the Surfer software package.

Discrete receptor points were included in the model as outlined in Table 6 and Table 7.

4.6 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.

4.7 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 the source than would arise in the absence of the buildings.

Analysis of the site layout indicated that a number of buildings should be included within the model in order to take account of effects on pollutant dispersion. Input geometries are shown in Table 15.

Table 15 Building Geometries

Building	NGR (m)		Height (m)	Diameter/ Length (m)	Width (m)	Angle (º)
	X	Y				
Reception	520337.7	204539.9	13.0	44.1	34.2	232.7
CHP 1	520314.9	204586.6	2.6	2.9	12.2	233.4
CHP 2	520319.5	204583.2	2.6	3.0	12.2	233.9
Biofilter	520365.3	204559.8	3.0	11.0	14.8	253.7
Office	520293.1	204589.0	6.0	19.6	3.7	234.6
Meeting Room	520290.5	204599.0	6.0	3.6	9.7	235.6
Tank 1	520402.2	204425.9	13.5	32.0	-	-
Tank 2	520401.7	204462.9	13.5	32.0	-	-
Tank 3	520379.6	204492.0	13.5	32.0	-	-
Tank 4	520357.4	204448.7	13.5	32.0	-	-
Tank 5	520336.6	204478.9	13.5	32.0	-	-

Reference should be made to Figure 5 for the building locations.

4.8 Meteorological Data

Meteorological data used in this assessment was taken from Heathrow Airport meteorological station, over the period 1st January 2010 to 31st December 2014 (inclusive). Heathrow Airport meteorological station is located at NGR: 506947, 176515, which is approximately 29km south-west of the proposed facility. LAQM.TG(09)[11] recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling. Although it is acknowledged this project was not undertaken in support of Local Air Quality Management (LAQM) reporting, it is considered the guidance provided on dispersion modelling is valid for all assessment purposes.

All meteorological data used in the assessment was provided by at the relevant ADM Ltd, which is an established distributor of meteorological data within the UK.

Reference should be made to Figure 6 for wind roses of the utilised meteorological data.

4.9 Roughness Length

A roughness length (z_0) of 0.3m was used in the dispersion modelling study. This value of z_0 is considered appropriate for the morphology of the assessment area and meteorological station location and is suggested within ADMS 5 as being suitable for 'agricultural areas (max)'.

4.10 Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A 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 is suggested within ADMS 5 as being suitable for 'small towns < 50,000'.

A Monin-Obukhov length of 30m was used to describe the meteorological station location. This value is considered appropriate for the nature of the area and is suggested within ADMS 5 as being suitable for 'cities and large towns'.

4.11 Deposition Rates

Deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06'. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used are presented within Table 16.

[11] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

Table 16 Conversion Factors to Determine Dry Deposition Flux

Pollutant	Grassland Deposition Velocity (m/s)	Forest Deposition Velocity (m/s)	Conversion Factor (µg/m²/s to kg/ha/yr of pollutant species)
NO_2	0.0015	0.0030	96.0
SO_2	0.0120	0.0240	157.7

Acid deposition occurs as a result of NO_2 and SO_2. Predicted ground level pollutant concentrations were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the critical load for acid deposition at each of the identified ecological receptors.

The conversion to units of equivalents, a measure of the potential acidifying effect of a species, was undertaken by multiplying the dry deposition flux by the standard conversion factors shown in Table 17.

Table 17 Conversion Factors to Units of Equivalents

Species	Conversion Factor from kg/ha/yr to keq/ha/yr
Nitrogen	0.07143
Sulphur	0.06250

The tool provided on the APIS website[12] was utilised to determine potential exceedences of the relevant critical load at the ecological designations.

4.12 Assessment Criteria

Predicted ground level pollutant concentrations and deposition rates were compared with the relevant AQOs, critical levels and critical loads identified within Section 3.4.2. These criteria are collectively referred to as Environmental Quality Standards (EQSs).

4.13 Baseline Concentrations

A review of existing data in the vicinity of the site was undertaken in Section 3.0 of this report in order to define baseline pollutant levels. This indicated one diffusion tube was located in close proximity to the proposals. However, due to the roadside designation of this monitoring location, results were considered unsuitable to represent baseline conditions throughout the entire modelling extents. As such, the background concentrations predicted by DEFRA were utilised to represent existing concentrations in the vicinity of the site. Background concentrations across the ecological designation were downloaded from the APIS website[13].

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

[12] http://www.apis.ac.uk/critical-load-function-tool.
[13] http://www.apis.ac.uk/critical-load-function-tool.

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 guidance H1[14], 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.

4.14 NO_x to NO_2 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 NO_2. Comparisons of ambient NO and NO_2 concentrations in the vicinity of point sources in recent years has indicated that it is unlikely that more than 30% of the NO_x is present at ground level as NO_2.

Ground level NO_x concentrations were predicted through dispersion modelling. NO_2 concentrations reported in the results section assume 70% conversion from NO_x to NO_2 for annual means and 35% conversion for 1-hour concentrations, based upon EA guidance[15].

4.15 15-minute Sulphur Dioxide Concentration Predictions

Throughout the assessment, 15-minute mean SO_2 concentrations have been calculated using the following correction factor based upon empirical relationships with the 99.9th percentile of 1-hour means, as described in EA guidance H1[16]:

$$99.9^{th} \text{ percentile of 15-minute means} = 1.34 \times 99.9^{th} \text{ percentile of 1-hour means}$$

4.16 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 have been 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 annual meteorological data sets from the closest observation site to the facility to take account of worst-case conditions;

[14] Horizontal Guidance Note H1 - Annex (f), Environment Agency, 2010.
[15] Conversion Ratios for NO_x and NO_2, EA, undated.
[16] Horizontal Guidance Note H1 - Annex (f), Environment Agency, 2010.

- Plant operating conditions - Operational parameters were supplied by Agrivert Ltd based on the biogas engines and flare capacity. As such, these are considered to be representative of likely operating conditions;
- Emission rates - Emission rates for the biogas engines were calculated from the relevant ELVs and therefore represent the maximum anticipated concentrations. Emissions were also assumed to be constant throughout the relevant modelling periods, 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. Emission rates for the flare were provided by Agrivert Ltd;
- Background concentrations - Obtained from the DEFRA mapping study and the APIS website. 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 was included in the model in order to calculate maximum predicted concentrations throughout the assessment extents. Receptor points were also included at sensitive locations to provide additional consideration of these areas; and,
- Variability - All model inputs are as accurate as possible and worst-case conditions were considered as 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.

4.17 Impact Significance

Predicted pollutant concentrations are summarised in the following formats:

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

The significance of predicted impact has been assessed in accordance with EA criteria and through consideration of likely effects as a result of the proposals. EA guidance[17] states that:

> "Process contributions can be considered insignificant if:
>
> - The long term process contribution is <1% of the long term environmental standard; and,
> - The short term process contribution is <10% of the short term environmental standard."

Should these criteria be exceeded then the guidance indicates that detailed assessment of impacts

[17] Horizontal Guidance Note H1 - Annex (f), Environment Agency, 2010.

should be provided if the PEC is greater than 70% of the standard. Should predictions be lower than this value then they would therefore be considered as insignificant.

4.18 Environment Agency Dispersion Modelling Report Requirements

Table 18 provides the checklist of EA dispersion modelling report requirements.

Table 18 Dispersion Modelling Report Requirements

Item	Location within Report
Location map	Figure 1
Site plan	Figure 2
List of pollutants modelled and relevant air quality guidelines	Table 1, Table 2 and Table 3
Details of modelled scenarios	Table 11
Details of relevant ambient concentrations used	Table 5
Model description and justification	Section 4.1
Special model treatments used	Section 4.0
Table of emission parameters used	Table 13 and Table 14
Details of modelled domain and receptors	Section 4.5, Table 6 and Table 7
Details of meteorological data used (including origin) and justification	Section 4.8
Details of terrain treatment	Section 4.6
Details of building treatment	Section 4.7
Sensitivity analysis	Section 4.16

5.0 ASSESSMENT

Dispersion modelling was undertaken using the input data specified previously. Reference should be made to Appendix I for graphical visualisations of dispersion modelling results throughout the assessment extents.

Predicted concentrations and deposition rates were compared with the criteria shown in Section 4.17. As such, any PCs of less than 1% and PECs of less than 70% were considered to be insignificant. Any values above these levels were investigated further in accordance with the recommendations of EA guidance[18].

5.1 Sensitive Human Receptors

5.1.1 Maximum Pollutant Concentrations

The maximum predicted pollutant concentrations at any point within the modelling extents for any meteorological data set are summarised in Table 19.

Table 19 Maximum Predicted Pollutant Concentrations

Pollutant	Averaging Period	EQS (µg/m³)	PC		PEC	
			Concentration (µg/m³)	Proportion of EQS (%)	Concentration (µg/m³)	Proportion of EQS (%)
NO_2	Annual	40	14.99	37.5	31.15	77.9
	99.8%ile 1-hour	200	95.92	48.0	128.24	64.1
SO_2	99.0%ile 24-hour	125	149.94	120.0	153.61	122.9
	99.73%ile 1-hour	350	162.67	46.5	166.34	47.5
	99.9%ile 15-minute	266	222.32	83.6	229.66	86.3
C_6H_6	Annual	5	43.50	870.0	43.89	877.7
CO	Rolling 8-hour	10,000	614.75	6.1	989.75	9.9

As indicated in Table 19, high concentrations of NO_2 and SO_2 and C_6H_6 were predicted at several locations throughout the assessment extents.

The EA guidance indicates that process contributions can be considered insignificant if the PEC is less than 70% of the EQS. As indicated in Table 19, NO_2 and SO_2 concentrations are above this

[18] Horizontal Guidance Note H1 - Annex (f), Environment Agency, 2010.

criteria. However, as shown in Figure 7 to Figure 11, the maximum values occurred within the site boundary. The maximum predicted concentrations outside of the site boundary are shown in Table 20.

Table 20 Maximum Predicted Pollutant Concentrations Outside of Site Boundary

Pollutant	Averaging Period	EQS (µg/m³)	PC		PEC	
			Concentration (µg/m³)	Proportion of EQS (%)	Concentration (µg/m³)	Proportion of EQS (%)
NO_2	Annual	40	10.17	25.4	26.33	65.8
	99.79%ile 1-hour	200	52.70	26.3	85.02	42.5
SO_2	99.18%ile 24-hour	125	79.64	63.7	83.31	66.6
	99.73%ile 1-hour	350	102.04	29.2	105.71	30.2
	99.90%ile 15-minute	266	144.62	54.4	152.03	57.2

As indicated in Table 20, the PECs for NO_2 and SO_2 concentrations outside of the site boundary are below 70% of the EQS and are therefore considered to be insignificant in accordance with the EA guidance.

Reference should be made to Figure 7 to Figure 13 for graphical representations of predicted pollutant concentrations, inclusive of background, throughout the assessment extents. It should be noted that the data shown in the Figures are predictions from the meteorological data set which resulted in the maximum pollutant concentration for that species. For example, the maximum annual mean NO_2 concentration was predicted using the 2014 meteorological data set. As such, the contours shown in Figure 7 were produced from the 2014 model outputs.

Although an exceedence of the C_6H_6 AQO is shown in Table 19, this assumes the entire VOC emission consists of only one species. Emissions from the AD facility will comprise numerous VOC components, of which C_6H_6 is anticipated to be a very small proportion. Information obtained from stack emissions monitoring undertaken at a similar AD plant[19] indicated a total VOC emission concentration within the exhaust gas stream of 648mg/m³, whilst the total non-methane VOC (NMVOC) emission concentration was 0.16mg/m³. Although C_6H_6 would be included in both results, the only difference between the monitored species is CH_4. As such, this indicates the majority of the release is CH_4 and the maximum C_6H_6 emission from the plant is 0.16mg/m³. This is still considered worst-case as it assumes the entire NMVOC emission is C_6H_6.

Based on the above, a factor was derived from the VOC monitoring results and applied to the predicted C_6H_6 concentrations to provide a more accurate representation of impacts in the vicinity of the site. This is shown in Table 21.

[19] Stack Emissions Testing Report - Wallingford AD Plant, Catalyst Environment, 2013.

Table 21 Maximum Predicted C_6H_6 Concentration

Pollutant	Averaging Period	EQS (µg/m³)	PC		PEC	
			Concentration (µg/m³)	Proportion of EQS (%)	Concentration (µg/m³)	Proportion of EQS (%)
C_6H_6	Annual	5	1.07	21.5	1.46	29.2

As indicated in Table 21, predicted annual mean C_6H_6 concentrations did not exceed the relevant EQS throughout the assessment extents when considered in the context of actual monitoring results. The PEC was also below 70% of the EQS, therefore predicted impacts on annual mean C_6H_6 concentrations is considered insignificant in accordance with the EA guidance.

5.1.2 Nitrogen Dioxide

Predicted NO_2 concentrations inclusive of baseline levels are summarised in Table 22. Reference should be made to Figure 7 and Figure 8 for graphical representations of predicted concentrations throughout the assessment extents.

Table 22 Predicted NO_2 Concentrations

Receptor	Predicted NO_2 Concentration (µg/m³)									
	Annual Mean					99.8%ile 1-hour Mean				
	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
R1	19.29	21.31	20.91	19.46	20.25	69.08	69.20	69.37	68.94	68.98
R2	19.33	21.36	20.97	19.51	20.30	69.34	69.67	69.85	69.37	69.46
R3	17.76	18.70	18.43	17.99	18.21	51.35	51.54	51.63	51.63	51.63
R4	17.76	18.70	18.43	18.00	18.21	51.36	51.57	51.65	51.62	51.62
R5	19.07	20.39	20.07	19.45	19.91	64.33	64.53	64.58	64.44	64.56
R6	19.08	20.42	20.10	19.47	19.94	64.58	64.96	64.87	64.72	64.85
R7	19.63	20.88	20.69	20.00	20.71	70.55	70.24	70.87	70.08	70.39
R8	19.67	20.95	20.75	20.04	20.77	70.83	70.78	71.16	70.75	70.83

As indicated in Table 22, predicted NO_2 concentrations were below the relevant EQSs at all sensitive receptor locations for all meteorological data sets.

5.1.3 Sulphur Dioxide

Predicted SO_2 concentrations inclusive of baseline levels are summarised in Table 23 and Table 24. Reference should be made to Figure 9 to Figure 11 for graphical representations of predicted concentrations throughout the assessment extents.

Table 23 Predicted SO_2 Concentrations - 24-hour Mean and 1-hour Mean

Receptor	Predicted SO_2 Concentration (µg/m³)									
	99.0%ile 24-hour Mean					99.73%ile 1-hour Mean				
	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
R1	36.06	36.70	36.76	36.07	36.34	37.31	37.78	38.08	37.51	37.61
R2	36.32	37.02	37.08	36.44	36.71	37.85	38.14	38.40	37.91	38.11
R3	19.93	20.17	20.52	20.21	20.17	20.82	21.06	21.59	21.29	21.13
R4	19.93	20.19	20.70	20.23	20.20	20.83	21.10	21.65	21.29	21.19
R5	31.29	31.93	31.84	31.71	32.01	32.48	32.79	32.74	32.74	32.81
R6	31.50	32.15	32.05	31.95	32.23	32.77	33.25	33.00	33.07	33.22
R7	36.97	37.21	37.10	36.99	37.16	38.00	39.26	38.58	38.20	38.26
R8	37.49	37.71	37.65	37.57	37.63	38.55	39.20	38.66	38.66	38.88

Table 24 Predicted SO_2 Concentrations - 15-minute Mean

Receptor	Predicted 99.9%ile 15-minute Mean SO_2 Concentration (µg/m³)				
	2010	2011	2012	2013	2014
R1	50.09	50.40	51.20	50.10	49.88
R2	50.89	51.11	51.40	50.87	50.78
R3	27.25	28.02	28.58	28.16	28.57
R4	27.30	28.02	28.63	28.19	28.62
R5	43.06	43.35	43.11	43.32	43.52
R6	43.31	43.55	43.54	43.55	43.61
R7	54.10	52.56	54.20	51.79	52.65
R8	54.16	53.00	54.86	51.96	52.92

As indicated in Table 23 and Table 24, predicted SO_2 concentrations were below the relevant EQSs at all sensitive receptor locations for all meteorological data sets.

5.1.4 Benzene

Predicted C_6H_6 concentrations inclusive of baseline levels are summarised in Table 25. Reference should be made to Figure 12 for a graphical representation of predicted concentrations throughout the assessment extents. It should be noted that the presented results have taken monitoring results into consideration when determining the potential C_6H_6 content of total VOC emission, as detailed previously.

Table 25 Predicted C_6H_6 Concentrations

Receptor	Predicted Annual Mean C_6H_6 Concentration (µg/m³)				
	2010	2011	2012	2013	2014
R1	0.39	0.39	0.39	0.39	0.39
R2	0.39	0.39	0.39	0.39	0.39
R3	0.39	0.39	0.39	0.39	0.39
R4	0.39	0.39	0.39	0.39	0.39
R5	0.39	0.39	0.39	0.39	0.39
R6	0.39	0.39	0.39	0.39	0.39
R7	0.39	0.39	0.39	0.39	0.39
R8	0.39	0.39	0.39	0.39	0.39

As indicated in Table 25, predicted C_6H_6 concentrations were below the relevant EQS at all sensitive receptor locations for all meteorological data sets.

5.1.5 Carbon Monoxide

Predicted CO concentrations inclusive of baseline are summarised in Table 26. Reference should be made to Figure 13 for a graphical representation of predicted concentrations throughout the assessment extents.

Table 26 Predicted CO Concentration

Receptor	Predicted 8-hour CO Concentration (µg/m³)				
	2010	2011	2012	2013	2014
R1	489.77	497.85	490.31	497.42	489.27
R2	489.57	498.44	492.17	500.08	489.60
R3	433.44	429.83	437.15	444.75	428.56
R4	433.31	429.97	437.04	444.65	428.48
R5	477.22	475.55	476.80	472.93	477.01
R6	478.09	477.10	478.61	473.63	477.66
R7	501.93	495.81	504.27	500.79	503.51
R8	503.61	497.70	506.59	502.38	505.42

As indicated in Table 26, predicted CO concentrations are below the relevant EQS at all sensitive receptor locations for all meteorological data sets.

5.2 Sensitive Ecological Receptors

Predicted concentrations and deposition rates of each pollutant at the ecological receptor locations identified in Table 7 are summarised in the following Sections.

5.2.1 Oxides of Nitrogen

Predicted NO_x concentrations inclusive of baseline levels are summarised in Table 27 for each meteorological data set considered.

Table 27 Predicted NO_x Concentrations

Receptor	Predicted NO_x Concentration (µg/m³)									
	Annual Mean					24-hour Mean				
	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
E1	25.80	26.89	26.60	26.14	26.40	63.50	63.09	61.90	64.24	65.91
E2	24.00	23.90	23.94	23.98	23.94	49.59	50.31	49.09	50.08	50.01

As indicated in Table 27, predicted NO_x concentrations were below the relevant EQSs at all ecological designations for both averaging periods using all meteorological data sets.

The maximum predicted annual mean NO_x concentrations at the ecological designations are summarised in Table 28.

Table 28 Maximum Predicted Annual Mean NO_x Concentrations

Receptor	Predicted PC (µg/m³)	PC Proportion of EQS (%)	Predicted PEC (µg/m³)	PEC Proportion of EQS (%)
E1	3.10	10.3	26.89	89.6
E2	0.11	0.4	23.90	79.7

As indicated in Table 28, the PC proportion of the EQS was above 1% at receptor E1. Reference should be made to Section 6.0 for a discussion on the exceedence.

The maximum predicted 24-hour mean NO_x concentrations at the ecological designations are summarised in Table 29.

Table 29 Maximum Predicted 24-hour Mean NO_x Concentrations

Receptor	Predicted PC (µg/m³)	PC Proportion of EQS (%)	Predicted PEC (µg/m³)	PEC Proportion of EQS (%)
E1	18.33	24.4	65.91	87.9
E2	2.43	3.2	50.01	66.7

As indicated in Table 29, the PC proportion of the EQS was above 1% at both receptors. However, the PEC proportion of the EQS was below 70% at E2, as such no further assessment is required at this location. Reference should be made to Section 6.0 for discussion regarding the exceedence at E1.

5.2.2 Sulphur Dioxide

Predicted SO_2 concentrations inclusive of baseline levels are summarised in Table 30.

Table 30 Predicted SO_2 Concentrations

Receptor	Predicted Annual Mean SO_2 Concentration (µg/m^3)				
	2010	2011	2012	2013	2014
E1	4.92	5.56	5.40	5.10	5.29
E2	3.80	3.74	3.77	3.79	3.76

As indicated in Table 30, predicted SO_2 concentrations were below the relevant EQS at all ecological designations.

Maximum predicted annual mean SO_2 concentrations at the ecological designations are summarised in Table 31.

Table 31 Maximum Predicted Annual Mean SO_2 Concentrations

Receptor	Predicted PC (µg/m^3)	PC Proportion of EQS (%)	Predicted PEC (µg/m^3)	PEC Proportion of EQS (%)
E1	1.89	9.5	5.56	27.8
E2	0.13	0.7	3.80	19.0

As indicated in Table 31, the PC proportion of the EQS was above 1% at E1. However, the PEC proportion of the EQS was below 70%, as such no further assessment is required at this location.

5.2.3 Nitrogen Deposition

Predicted nitrogen deposition rates are summarised in Table 32. It should be noted all results relate to the maximum predicted by any meteorological data set.

Table 32 Predicted Nitrogen Deposition

Receptor	Annual Nitrogen Deposition (kgN/ha/yr)							
	EQS		Predicted PC	Proportion of EQS (%)		Predicted PEC	Proportion of EQS (%)	
	Low	High		Low	High		Low	High
E1	10	15	0.313	**3.13**	**2.09**	16.41	164.13	109.42
E2	10	15	0.021	0.21	0.14	30.26	302.61	201.74

As indicated in Table 32, the PC proportion of the EQS was above 1% at receptor E1. It should be noted that the EQS for nitrogen is exceeded as a baseline at all ecological receptor locations. Reference should be made to Section 6.0 for a discussion on the exceedences.

5.2.4 Acid Gas Deposition

Predicted acid deposition rates are summarised in Table 33. It should be noted all results relate to the maximum predicted by any meteorological data set. It should be noted all results relate to the maximum predicted by any meteorological data set.

Table 33 Predicted Acid Deposition

Receptor	Annual Acid Deposition (keq/ha/yr)								
	EQS			PC		Prop. EQS (%)	PEC		Prop. of EQS (%)
	CLmaxS	CLmaxN	CLminN	N	S		N	S	
E1	0.87	1.09	0.22	0.022	0.224	**22.9**	1.17	0.46	150.5
E2	2.64	3.00	0.36	0.002	0.016	0.7	2.16	0.32	82.7

As indicated in Table 33, there were predicted exceedences of the relevant EA criteria for acid deposition at receptor R1. It should be noted that the EQS is exceeded as a baseline at all ecological receptor locations. Reference should be made to Section 6.0 for a discussion on the exceedences.

6.0 DISCUSSION

As indicated in Section 5.2, there were predicted exceedences of the 1% EA criteria for concentrations of NO_x, nitrogen deposition and acid deposition in the vicinity of the development. Further discussion in regards these exceedences is provided below.

6.1 Oxides of Nitrogen

The APIS[20] website provides the likely effect of NO_x concentrations on habitats such as acid grassland. The main effect is related to an increase in vegetation growth, although a decline in growth, including leaf discolouration, can occur at very high concentrations (>400µg/m^3).

The critical level for annual and 24-hour NO_x concentrations, of 30µg/m^3 and 75µg/m^3 respectively, were not exceeded at either ecological designation. As such, it is considered that effects from NO_x concentrations are likely to be minimal. Additionally, NO_x concentrations are known to have greater adverse effects in the presence of SO_2. Exceedences of the relevant criteria were not predicted for concentrations of sulphur oxides (SO_x). As such, impacts from NO_x concentrations are unlikely to be amplified due to the presence of SO_x.

6.2 Nitrogen Deposition

The APIS[21] website provides information on the effects and implications of nitrogen deposition on a variety of habitats. Exceedences of the significance criteria were predicted at the Colney Heath LNR. The main habitat at this location is non-Mediterranean dry acid and neutral closed grassland, which is categorised by APIS as Acid Grassland.

Grasslands are comprised of several components each with varying sensitivities to nitrogen deposition. Review of aerial photographs highlights that the LNR is sparsely populated with acid heathland shrubs such as heather, and therefore this would experience the most significant effects of nitrogen deposition.

The APIS website states that:

> "Nitrogen deposition provides a fertilization effect on acid grasslands which are generally nitrogen limited."

There are however, a number of indirect effects:

- Nitrogen deposition favours graminoids (grasses) at the expense of forbs and lower plants, especially where sites are surrounded by farmland;
- Nitrophilous grasses tend to shade out slower growing species;
- Nitrophilous grasses increase the amount of litter which falls on and shades out under-storey bryophytes; and,
- Lower plants especially mosses are at risk from nitrogen accumulation.

[20] http://www.apis.ac.uk/search-pollutant-impacts
[21] http://www.apis.ac.uk/search-pollutant-impacts

It is considered that the increased level of nitrogen deposition at the LNR is unlikely to significantly alter the existing coverage due to the large influence of heathers and shrubs such as Hawthorn, Gorse and Bracken, with the most significant impact anticipated to be associated with increased growth. This would not affect the integrity of the designation and is therefore considered acceptable in the context of the development.

It is noted that the site boundary is dominated by a mix of Alder and Oak trees. Figure 14 indicates that only a small proportion of the edge of the LNR site exceeds the 1% criteria. The APIS website states the following regarding woodland edges:

> "Woodlands provide a rough surface and tend to intercept larger amounts of both dry deposited nitrogen and orographic deposition than less rough surfaces, e.g. grasslands. This is particularly the case for woodland edges, which experience the highest nitrogen deposition, especially where there is a local source of gaseous nitrogen, e.g. roads and/or intensive agricultural areas. Thus there is often a gradient of nitrogen deposition declining from the woodland edge."

Increased nitrogen deposition would therefore be expected along the edge of the LNR, as it is bounded by a layer of trees. This will act as a buffer for the majority of the designation, and as outlined previously, is considered unlikely to affect the integrity of the main features of the LNR.

6.3 Acid Deposition

The APIS[22] website also provides information on the effects and implications of acid deposition on a variety of habitats. Predicted exceedences of the EA criteria occur at the Colney Heath LNR. The predominant habitats at this location is non-Mediterranean dry acid and neutral closed grassland, which is categorised by APIS as Acid Grassland.

The APIS website explains that the main effects and implications of acid deposition on acid grassland include:

- Root damage;
- Nutrient imbalance; and,
- Leaching.

The APIS website highlights the nitrogen contribution as opposed to sulphur within total acidification as the main reason for the decline in species richness within acid grassland. The dispersion modelling results shown in Section 5.2 indicate that sulphur contribution is significantly higher than nitrogen at all ecological receptors. This is summarised in Table 34.

[22] http://www.apis.ac.uk/search-pollutant-impacts.

Table 34 Predicted Acid Deposition - Species Apportionment

Receptor	PC (keq/ha/yr)		PC Proportion of EQS (%)	
	N	S	N	S
E1	0.02	0.22	2.2	22.4

As shown in Table 34, the nitrogen contribution to acid deposition is 2.2% at the ecological designation. Of the total proportion of the EQS, the majority comprises sulphur. As stated above, sulphur has less of an impact than nitrogen on the declination in species richness. Due to the small proportion of nitrogen, impacts at the ecological receptor are unlikely to be significant.

6.4 Summary

NO_x concentrations, nitrogen deposition and acid deposition are not considered to have a significant impact on the integrity of the Colney Heath LNR due to the dominating species, the protective layer of the trees along the site boundary and the small contribution of nitrogen to total acid deposition.

7.0 CONCLUSION

REC Ltd was commissioned by Agrivert Ltd to undertake a Dispersion Modelling Assessment of potential atmospheric emissions from an AD plant on land at Coursers Farm, St Albans.

Atmospheric emissions associated with the AD plant have the potential to cause increases in ground level pollutant concentrations and deposition rates. As such, an Air Quality Assessment was required to quantify impacts in the vicinity of the site.

Dispersion modelling of a number of pollutants was undertaken using ADMS 5. Impacts at sensitive human receptors and ecological designations were quantified and the results compared with the relevant EQSs.

Predicted concentrations of all pollutants considered for the protection of human health were below the relevant EQSs at all locations outside of the site boundary for all meteorological data sets modelled. Impacts on baseline concentrations at all sensitive receptor locations were not considered to be significant in accordance with the EA criteria.

Nitrogen and acid deposition rates, as well as NO_x and SO_2 concentrations, were predicted at the relevant ecological designations. The results indicated exceedences NO_x concentrations at an ecological designation. SO_2 concentrations were below the relevant environmental quality standards at all designations for all modelling scenarios.

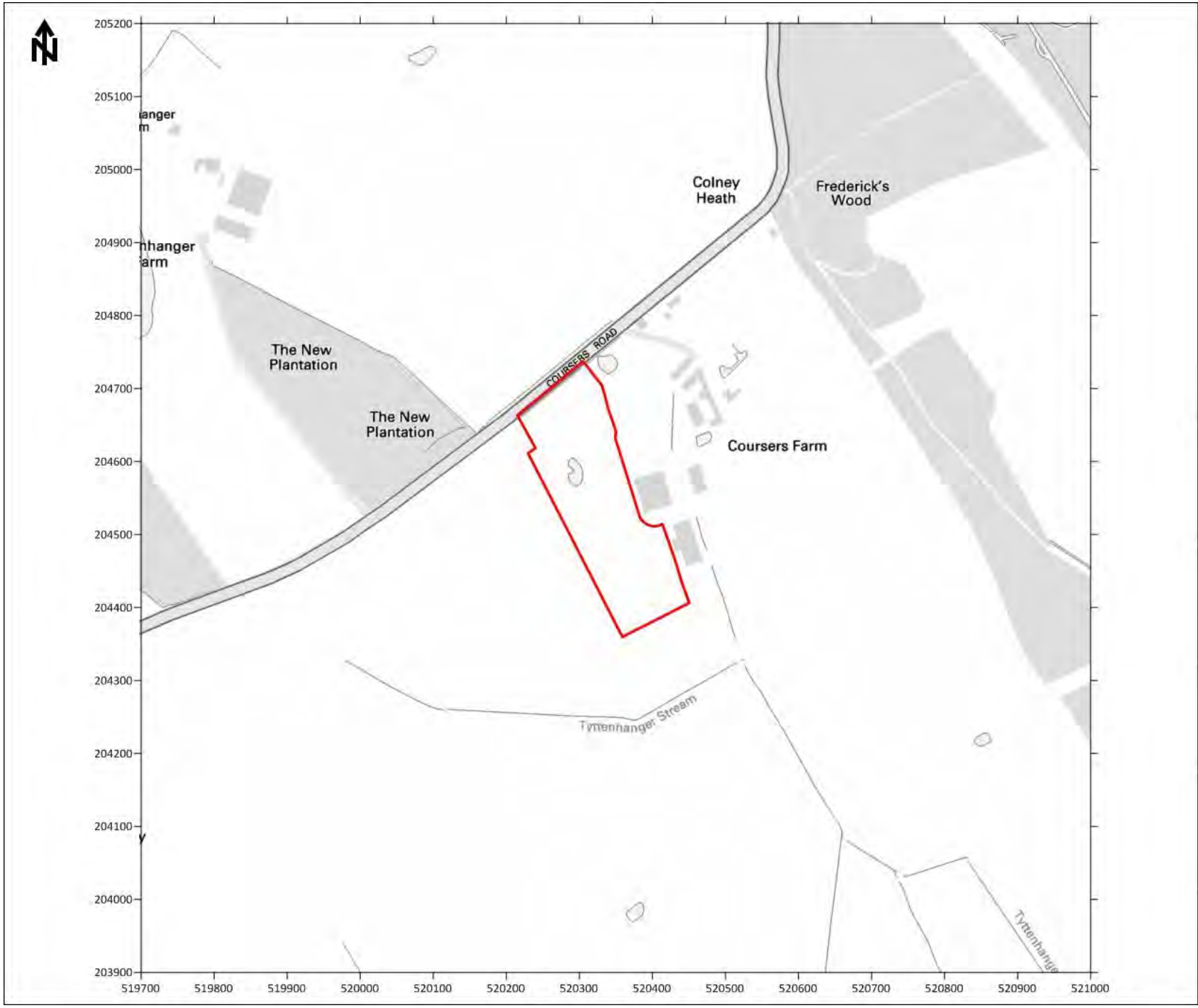
The assessment indicated exceedences of the relevant critical loads for nitrogen and acid deposition at an ecological designation as a baseline condition. The contribution of emissions from the proposed facility to deposition rates at some locations was also predicted to be above the Environment Agency criteria for insignificant impacts. This was partly due to the very low critical loads, as well as the high baseline levels and the geographical location of the site in close proximity to the designation.

Further discussion was undertaken to assess impacts as a result of varying emission profiles, as well as to provide consideration of likely impacts at the relevant habitat types in the vicinity of the site. The results of the assessment indicated that although exceedences of the relevant criteria were predicted in all scenarios, effects on the integrity of the designation were unlikely to be significant.

8.0 ABBREVIATIONS

%ile	Percentile
AD	Anaerobic Digestion
ADM	Atmospheric Dispersion Modelling
APIS	Air Pollution Information System
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
C_6H_6	Benzene
CO	Carbon Monoxide
CERC	Cambridge Environmental Research Consultants
CHP	Combined Heat and Power
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ELV	Emission Limit Value
EQS	Environmental Quality Standard
EU	European Union
HDC	Hertsmere District Council
LA	Local Authority
LAQM	Local Air Quality Management
LNR	Local Nature Reserve
MAGIC	Multi-Agency Geographic Information for the Countryside
NGR	National Grid Reference
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
PC	Process Contribution
PEC	Predicted Environmental Concentration
REC	Resource and Environmental Consultants
SO_2	Sulphur dioxide
SSSI	Site of Special Scientific Interest
VOC	Volatile Organic Compound
z_0	Roughness length

APPENDIX I FIGURES



Legend

Site Location

Title

Figure 1

Site Location

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

AQ100410

Client

Agrivert Ltd

REC
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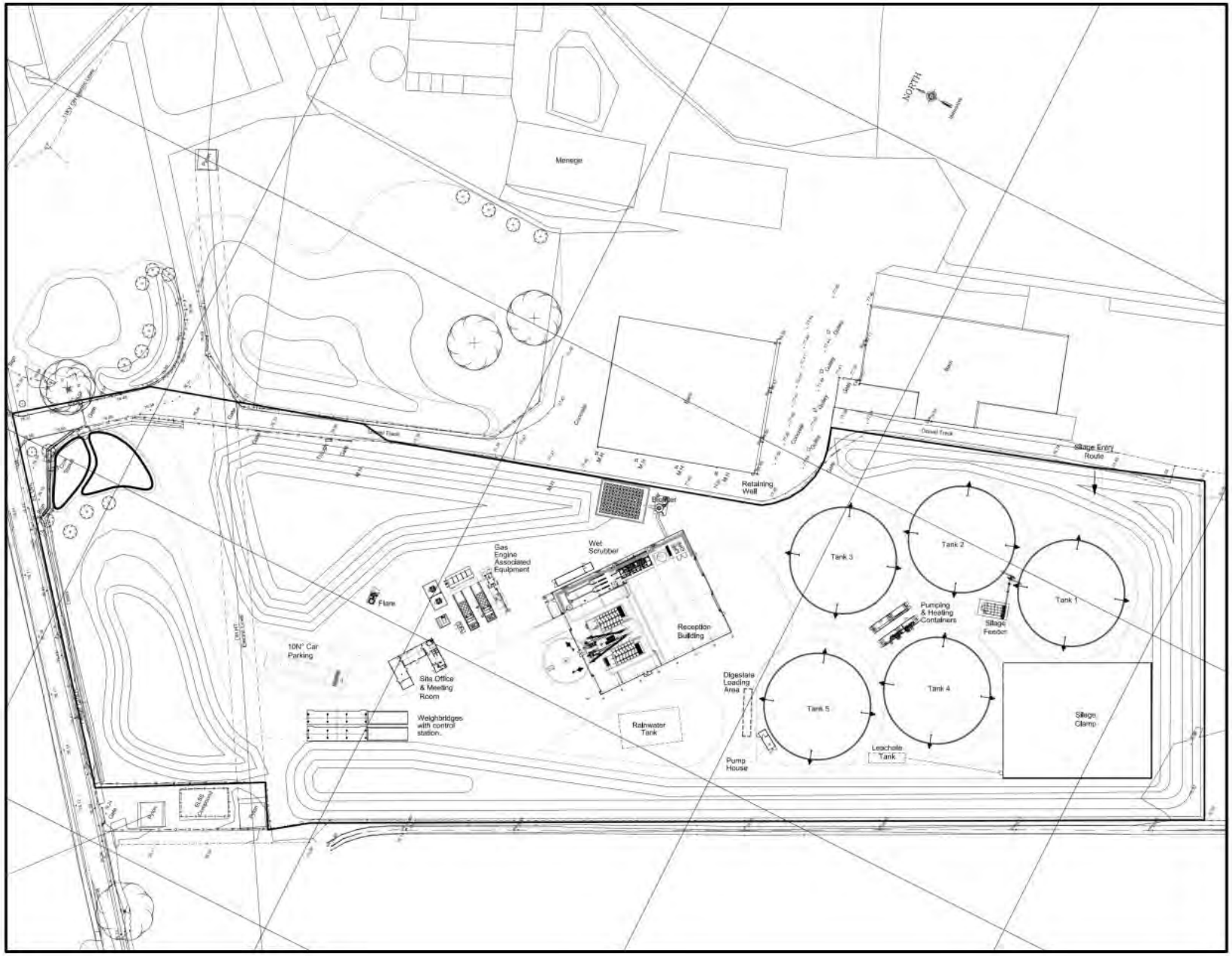

Legend

Title

Figure 2

Site Layout

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

AQ100410

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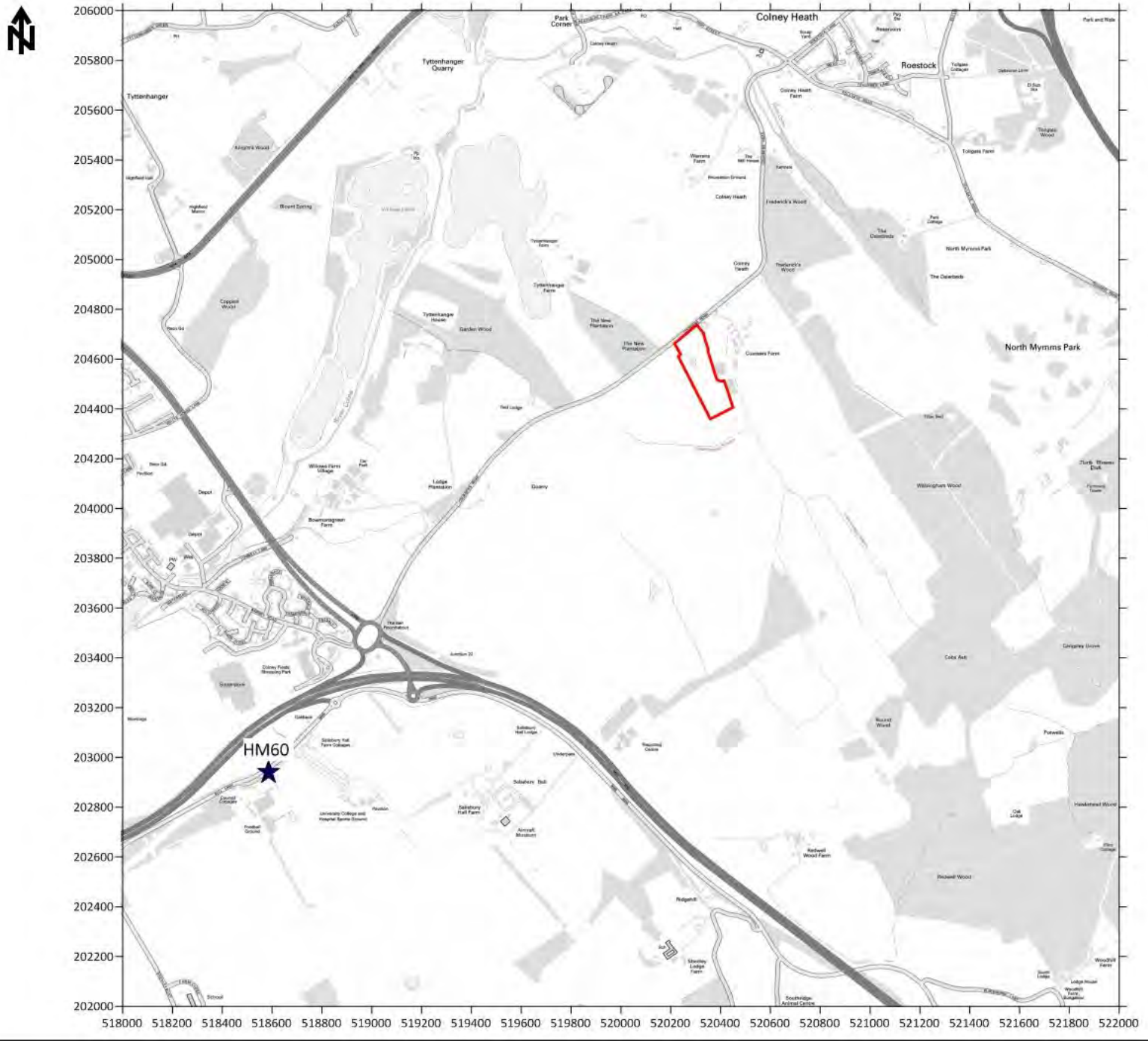

Legend

Site Location

Diffusion Tube Monitoring Location

Title

Figure 3

Monitoring Locations

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

AQ100416

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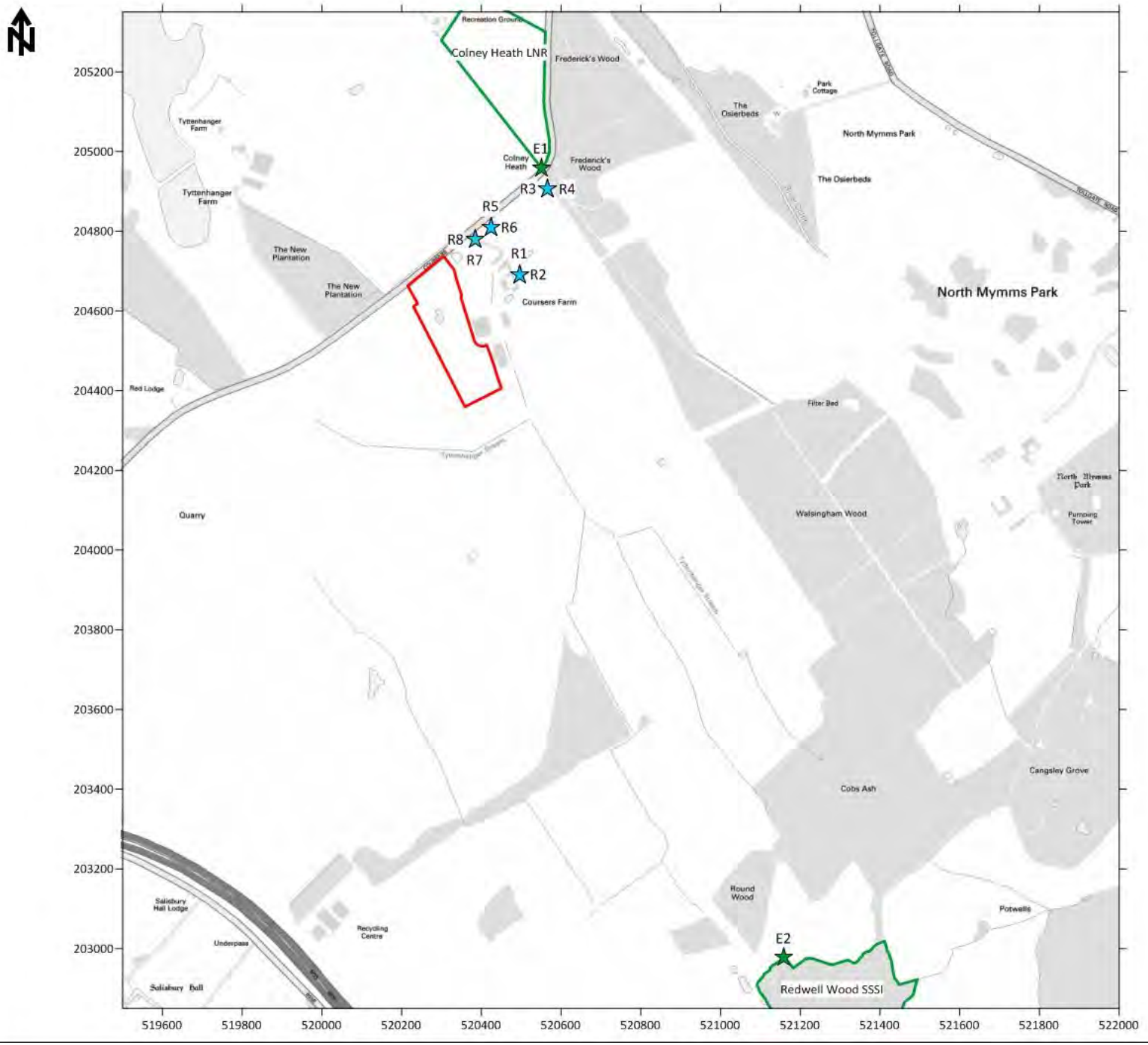

Legend

- Site Location
- Human Receptor Location
- Ecological Receptor Location
- Ecological Site Boundary

Title

Figure 4

Sensitive Receptor Locations

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

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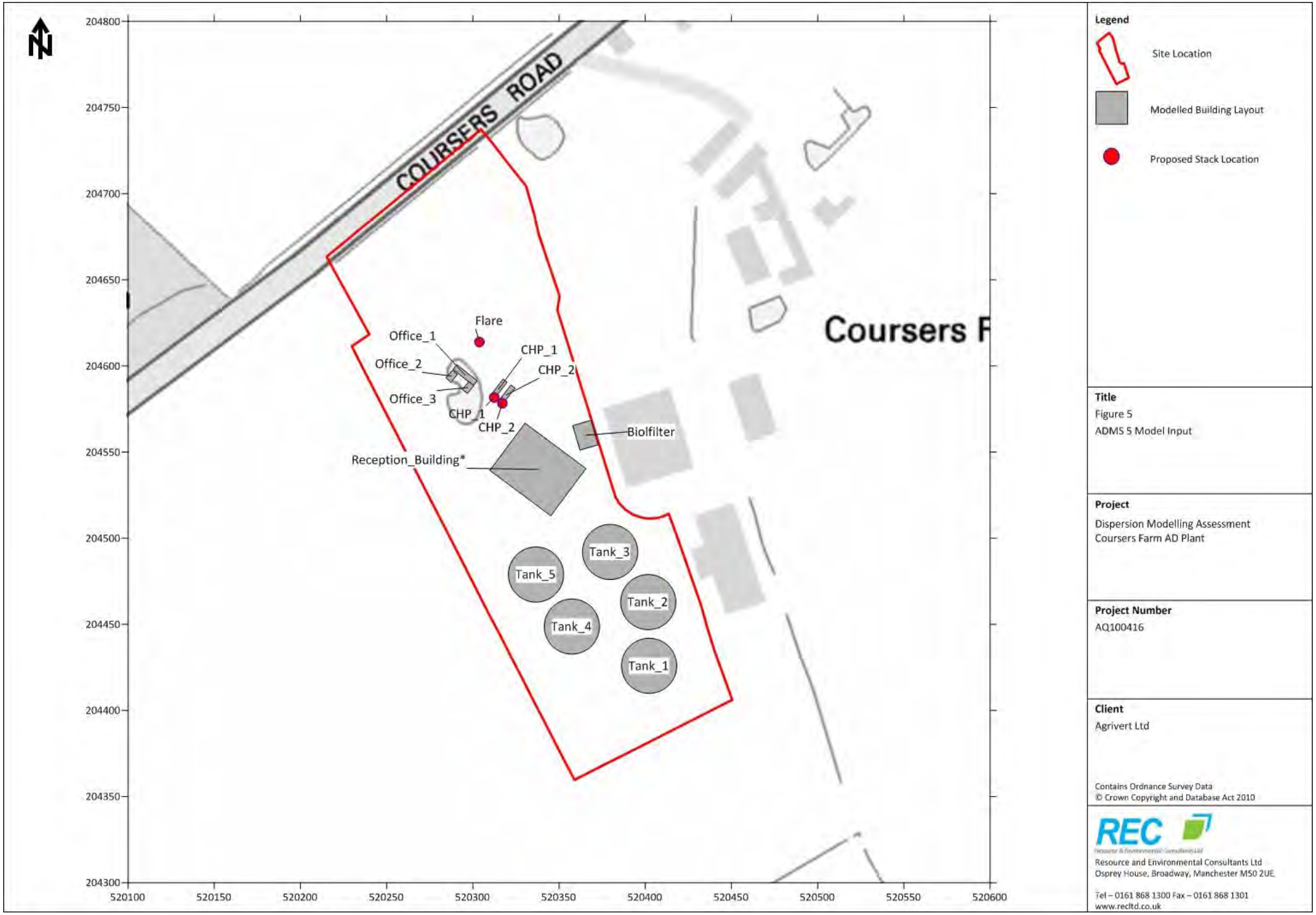

Legend

Site Location

Modelled Building Layout

Proposed Stack Location

Title

Figure 5

ADMS 5 Model Input

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

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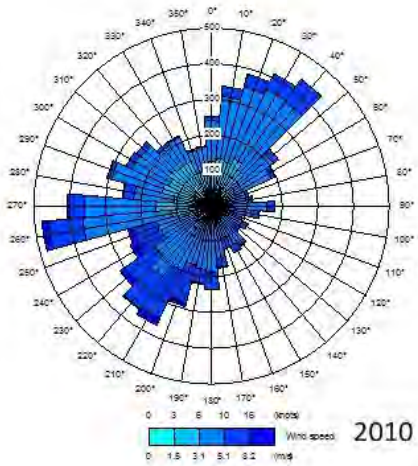

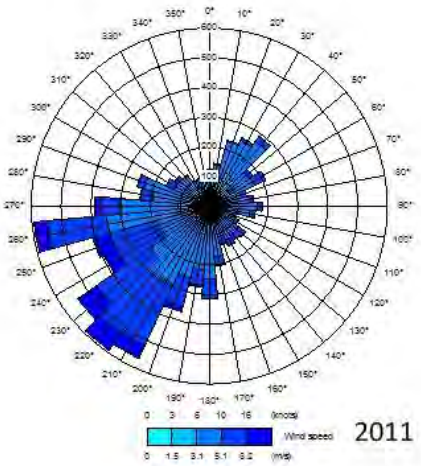

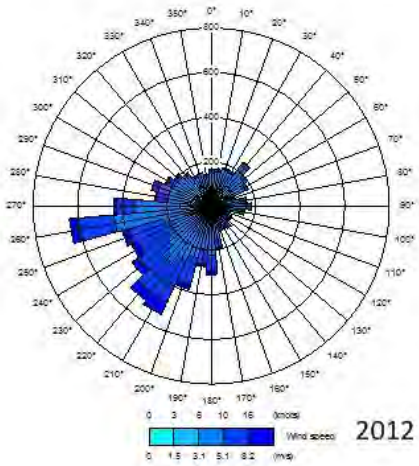

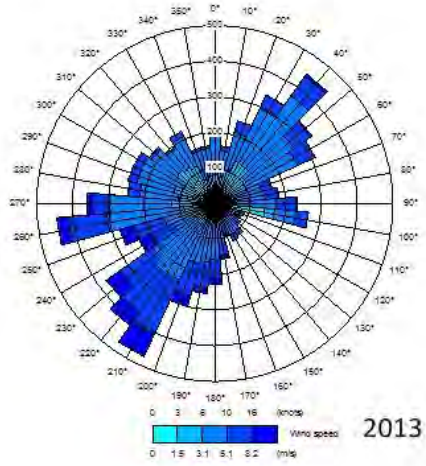

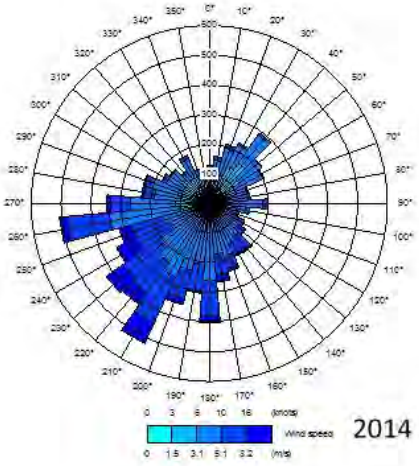

Legend

Title

Figure 6

Heathrow Meteorological Data
Windroses for 2010, 2011, 2012, 2013 and 2014

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

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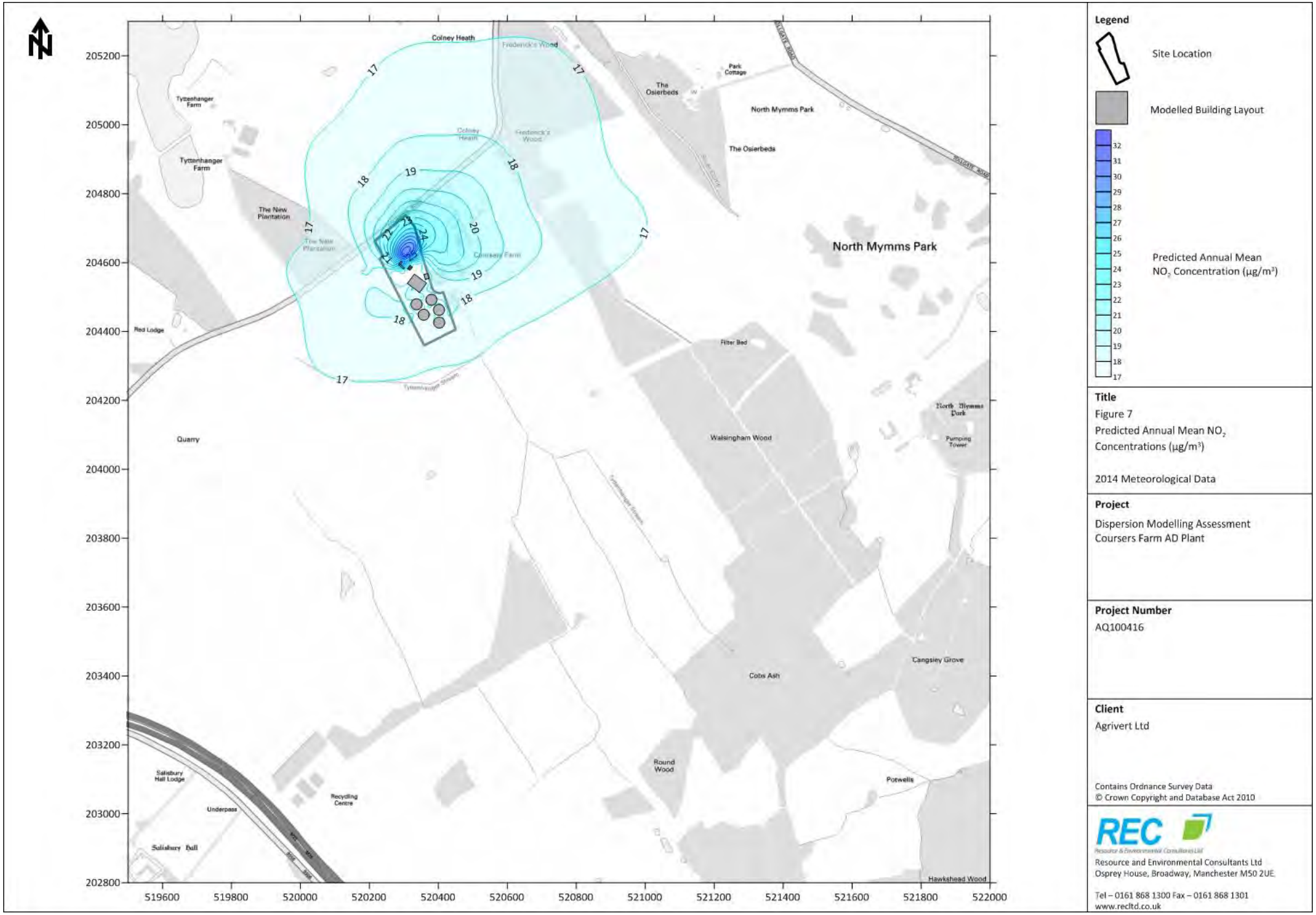

Legend

Site Location

Modelled Building Layout

Predicted Annual Mean NO_2 Concentration (µg/m³)

32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17

Title

Figure 7
Predicted Annual Mean NO_2 Concentrations (µg/m³)

2014 Meteorological Data

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

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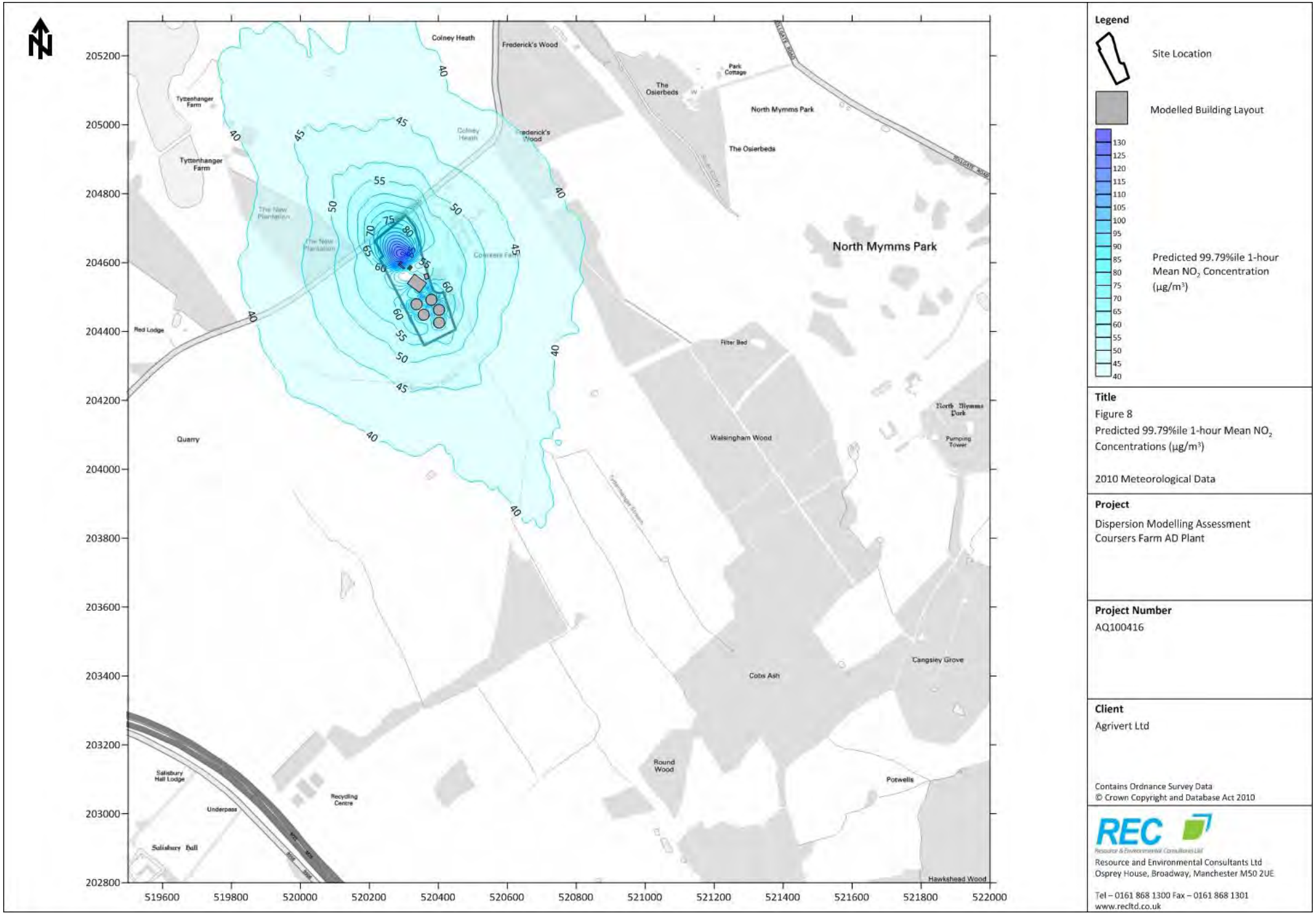

Legend

Site Location

Modelled Building Layout

130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40

Predicted 99.79%ile 1-hour Mean NO_2 Concentration ($\mu g/m^3$)

Title

Figure 8
Predicted 99.79%ile 1-hour Mean NO_2 Concentrations ($\mu g/m^3$)

2010 Meteorological Data

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

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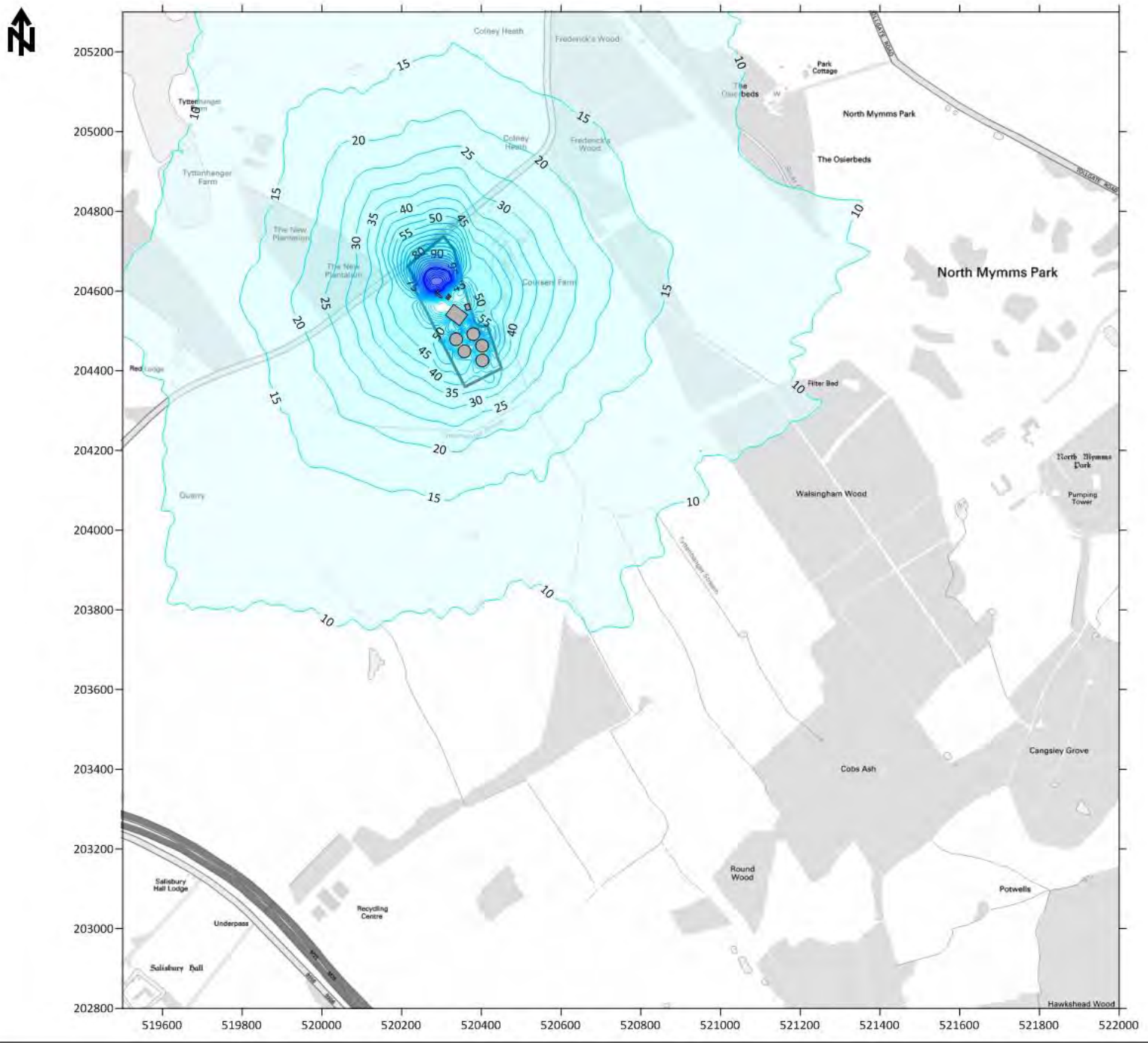

Legend

Site Location

Modelled Building Layout

Predicted 99.18%ile 24-hour Mean SO_2 Concentration ($\mu g/m^3$)

160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

Title

Figure 9

Predicted 99.18%ile 24-hour Mean SO_2 Concentrations ($\mu g/m^3$)

2014 Meteorological Data

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

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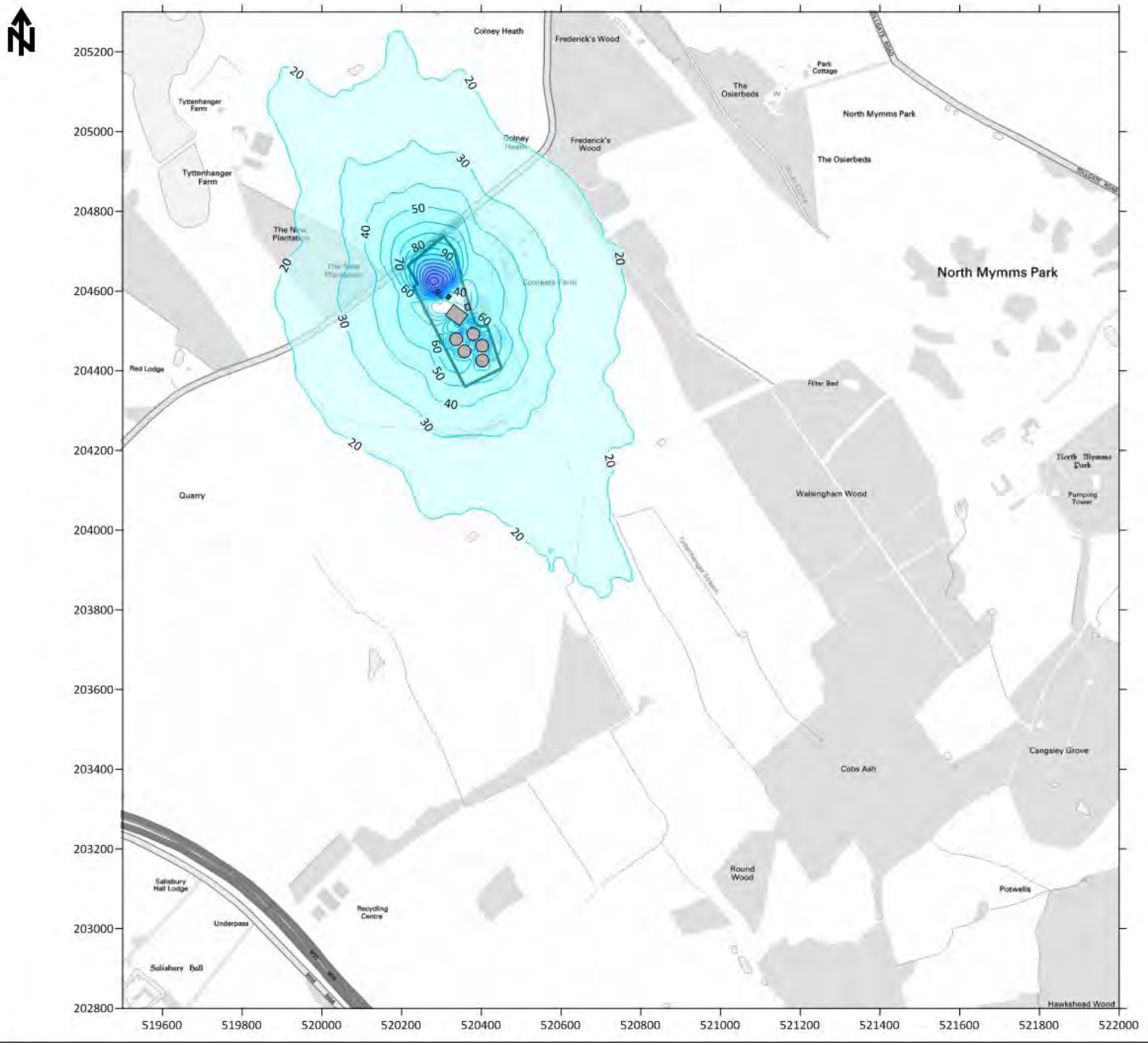

Legend

Site Location

Modelled Building Layout

Predicted 99.73%ile 1-hour Mean SO_2 Concentration ($\mu g/m^3$)

170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20

Title

Figure 10

Predicted 99.73%ile 1-hour Mean SO_2 Concentrations ($\mu g/m^3$)

2014 Meteorological Data

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

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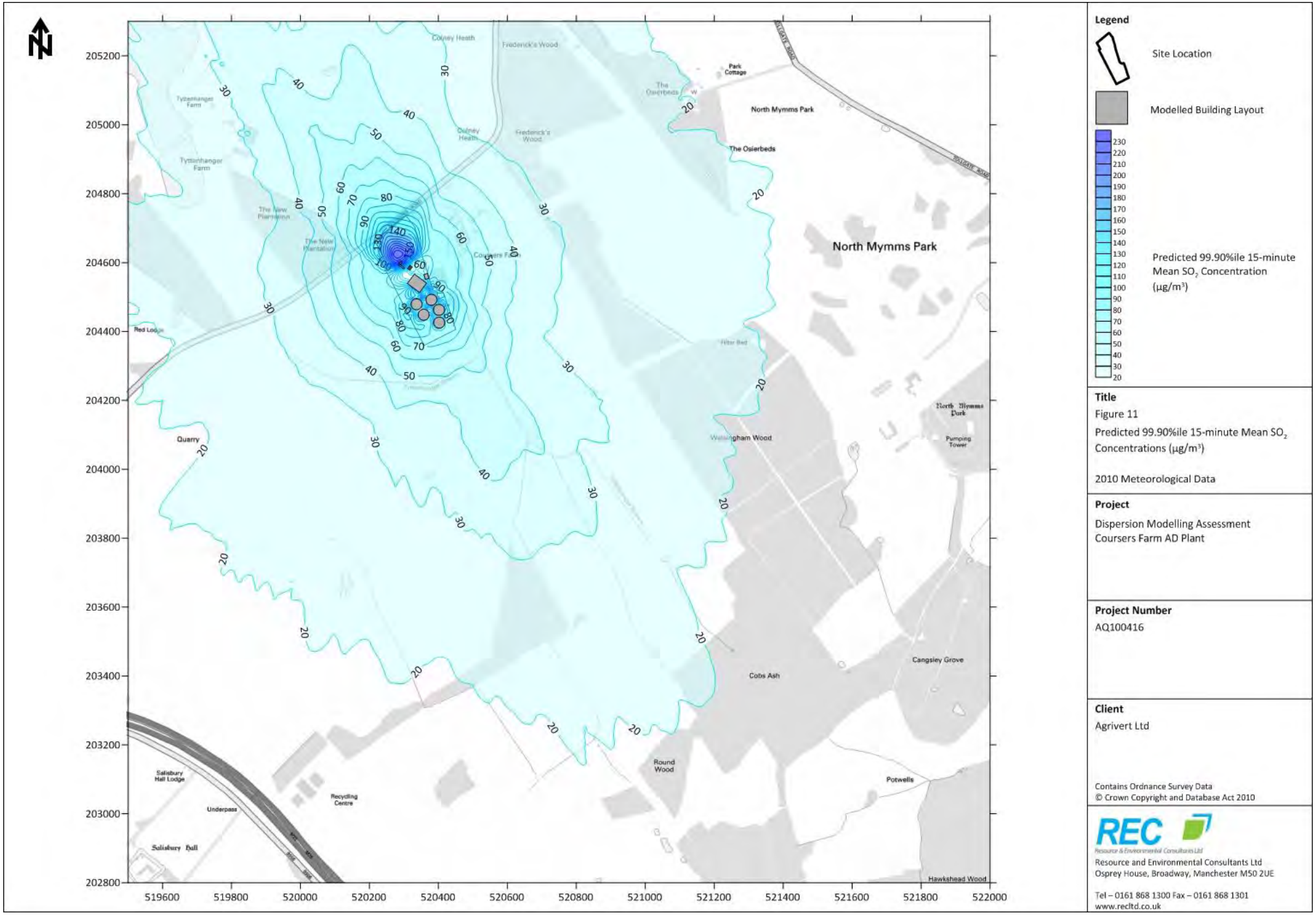

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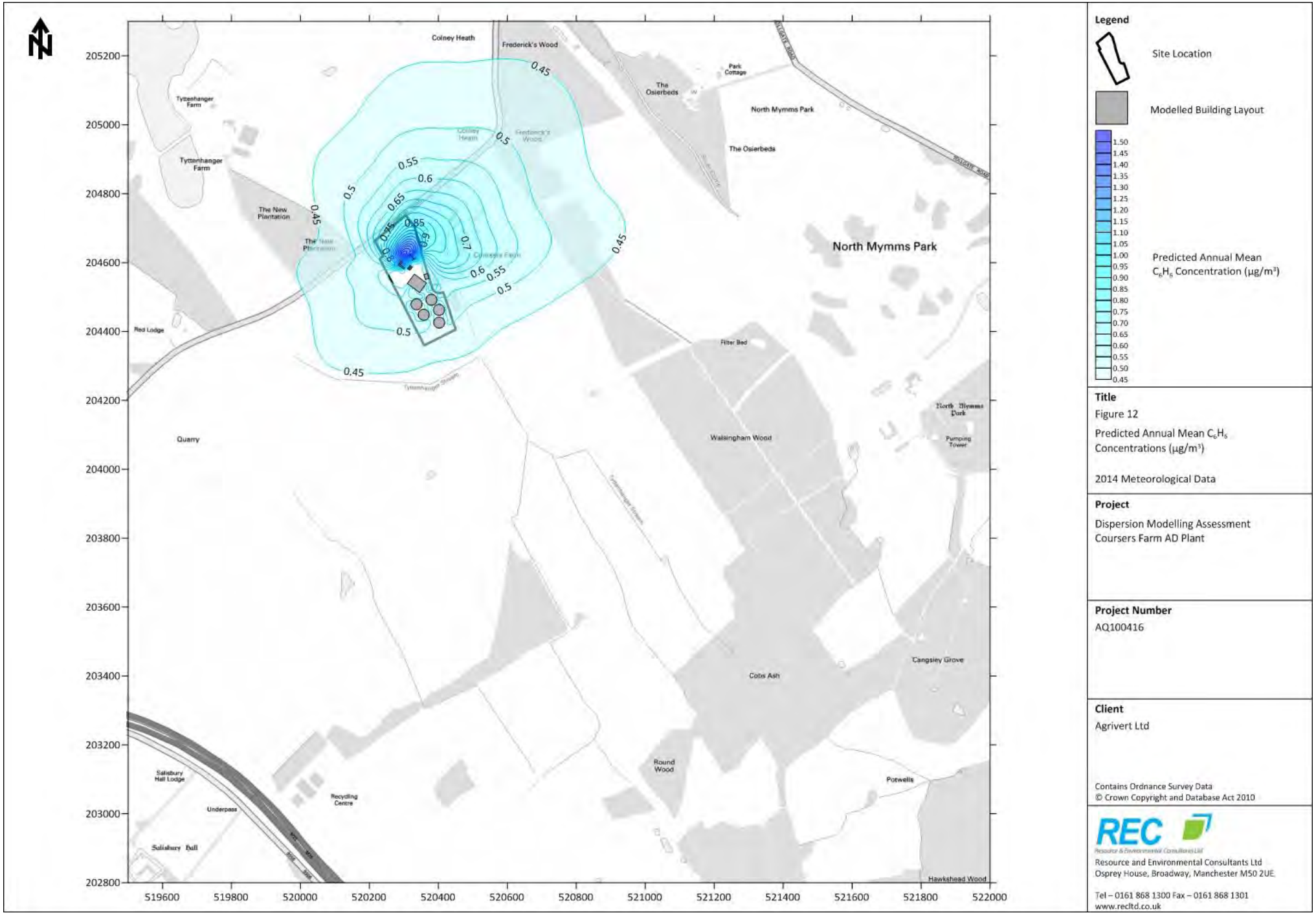

Legend

Site Location

Modelled Building Layout

Predicted Annual Mean C_6H_6 Concentration (µg/m³)

1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45

Title

Figure 12

Predicted Annual Mean C_6H_6 Concentrations (µg/m³)

2014 Meteorological Data

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

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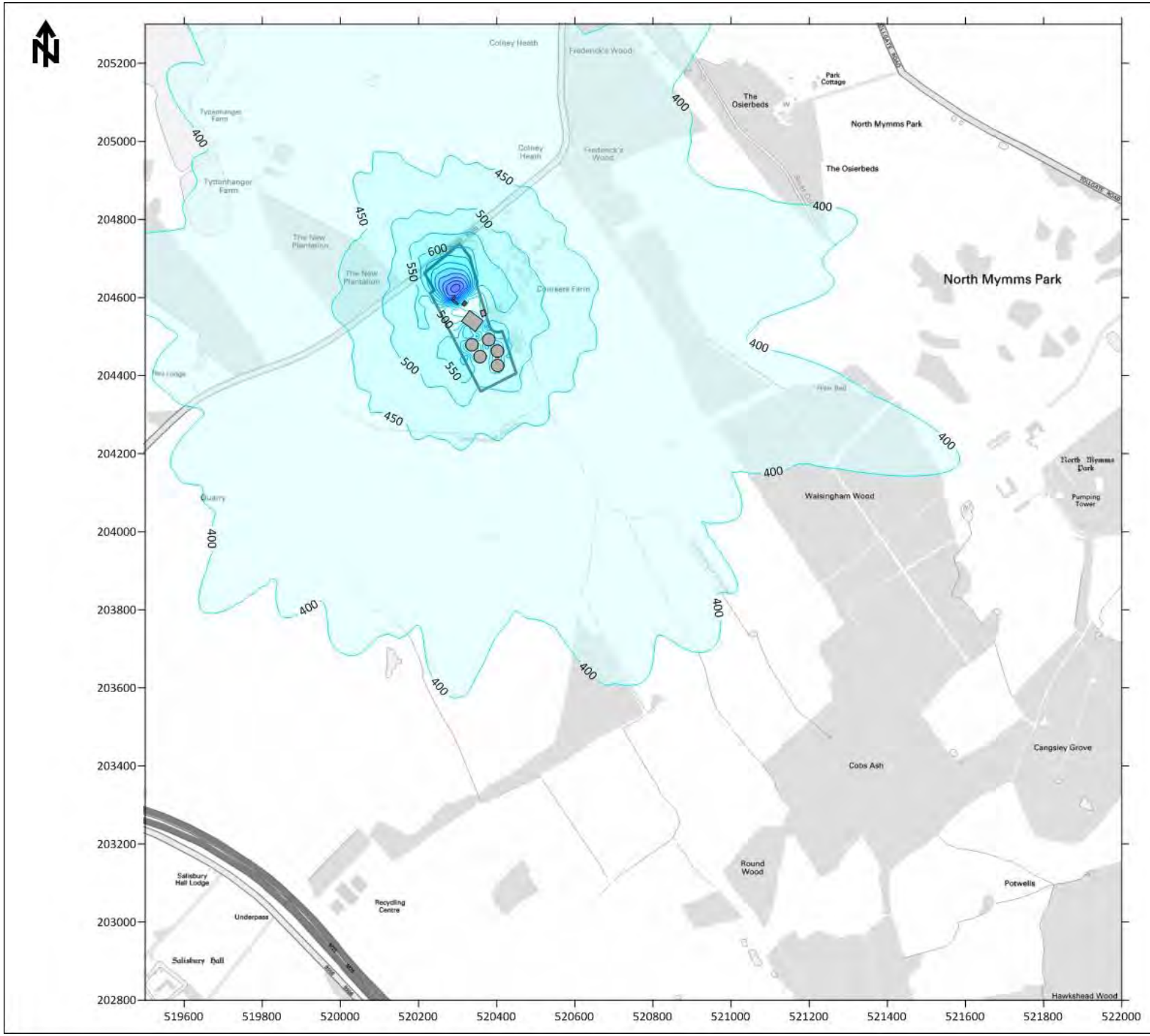

Legend

Site Location

Modelled Building Layout

Predicted 8-hour Rolling Mean CO Concentration ($\mu g/m^3$)

1000
950
900
850
800
750
700
650
600
550
500
450
400

Title

Figure 13

Predicted 8-hour Rolling Mean CO Concentrations ($\mu g/m^3$)

2014 Meteorological Data

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

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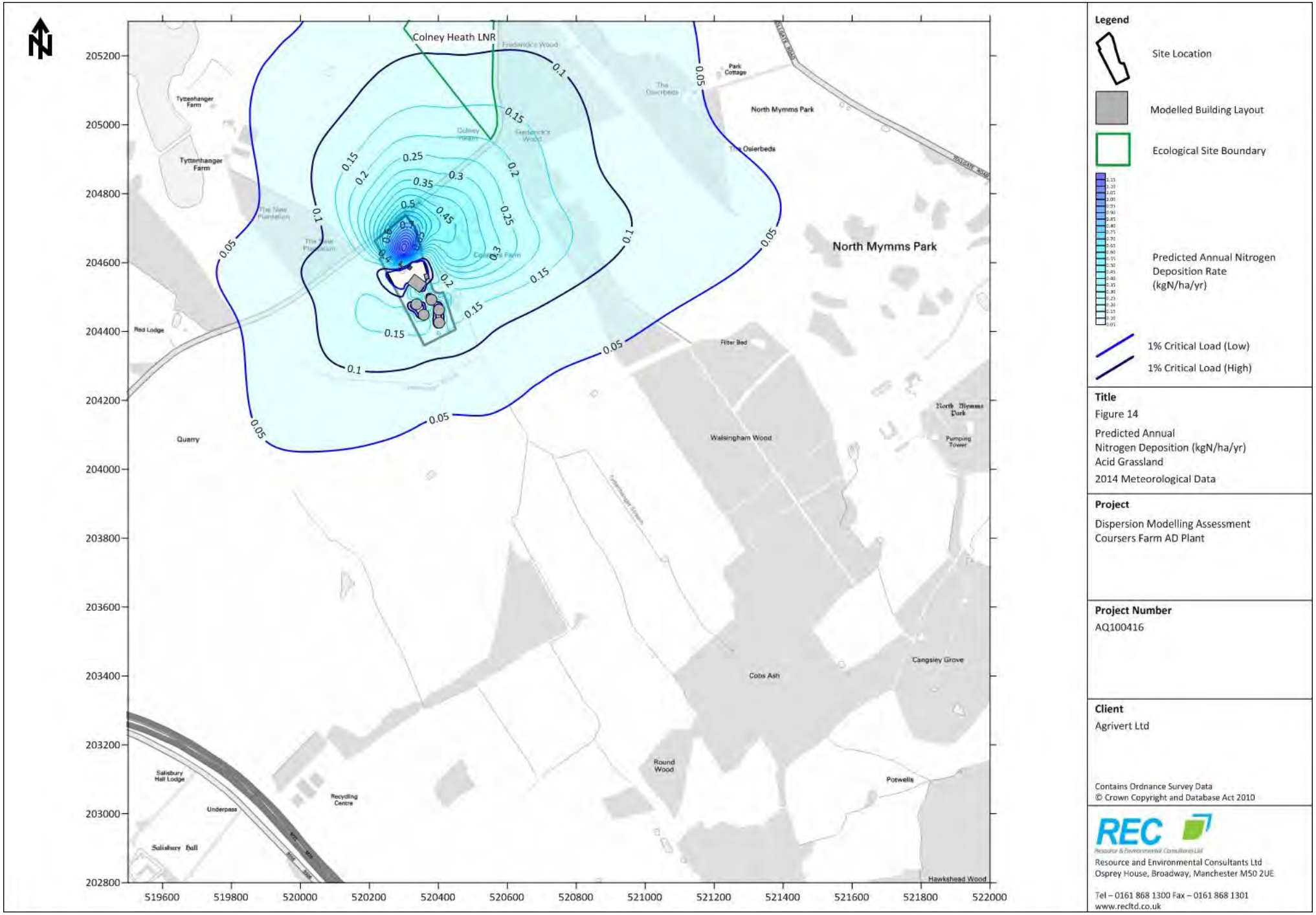

Legend

- Site Location
- Modelled Building Layout
- Ecological Site Boundary
- Predicted Annual Nitrogen Deposition Rate (kgN/ha/yr)
- 1% Critical Load (Low)
- 1% Critical Load (High)

Title

Figure 14

Predicted Annual Nitrogen Deposition (kgN/ha/yr) Acid Grassland

2014 Meteorological Data

Project

Dispersion Modelling Assessment
Coursers Farm AD Plant

Project Number

AQ100416

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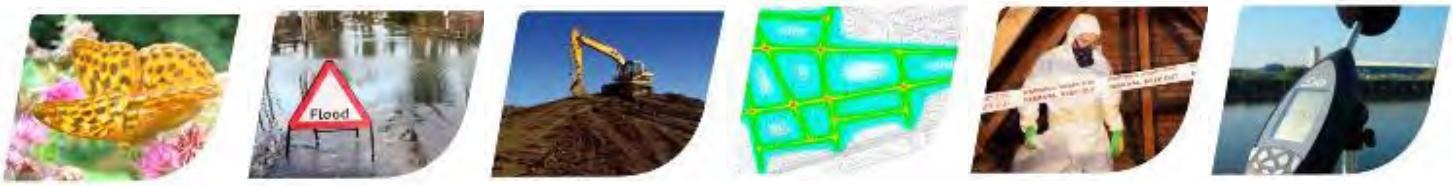
National Consultancy, Locally Delivered

ODOUR ASSESSMENT
COURSERS FARM ANAEROBIC DIGESTION PLANT

REC REFERENCE: AQ100905R1

REPORT PREPARED FOR: AGRIVERT LTD

DATE: 18TH FEBRUARY 2016



REPORT ISSUE

Issue/revision	Issue 1	Revision 2	Revision 3
Remarks	-		
Date	18/02/2016		
Prepared by	Gabor Antony		
Signature			
Position	Principle Air Quality Consultant		
Checked by	Charlotte Smith		
Signature			
Position	Air Quality Consultant		
Verified by	Gabor Antony		
Signature			
Position	Principle Air Quality Consultant		
Project number	AQ100905r1		

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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Agrivert Ltd to undertake a Dispersion Modelling Assessment of potential atmospheric emissions from an anaerobic digestion plant on land at Coursers Farm, St Albans.

Odour emissions from a number of sources on site have the potential to cause impacts at sensitive receptors. An Odour Assessment was therefore undertaken to consider effects in the vicinity of the facility.

Potential odour emissions were defined based on the proposed plant operation and monitoring undertaken at a similar operational plant. Impacts at sensitive receptors were quantified using dispersion modelling, the results compared with the relevant odour benchmark level and the significance of impact assessed in accordance with the appropriate guidance.

Predicted odour concentrations were below the relevant benchmark level at all sensitive locations in the vicinity of the site for all modelling years. Resultant impacts were classified as not significant in accordance with the stated criteria. As such, potential odour emissions from the facility are not considered to represent a constraint to the proposed development.

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1. INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Agrivert Ltd to undertake a Dispersion Modelling Assessment of potential atmospheric emissions from an anaerobic digestion (AD) plant on land at Coursers Farm, St Albans.

During the operational phase of the proposed facility there is the potential for impacts at sensitive locations due to fugitive odour emissions from a number of sources at the plant. An Odour Assessment was therefore undertaken to consider effects in the vicinity of the site.

1.2 Site Location and Context

The proposed AD plant is located on land at Coursers Farm, St Albans, at approximate National Grid Reference (NGR): 520350, 204550. Reference should be made to Figure 1 for a map of the site and surrounding area and for a layout plan.

It is proposed to construct and operate an AD plant that will be fuelled by food waste. Biogas produced by the AD process will be combusted to generate electricity for export to the National Grid. The process can be briefly described as:

- **Feedstock** - The site will operate using biodegradable organic waste feedstock in the form of solid and liquid food waste. The feedstock will be delivered to site and weighed before unloading within an enclosed reception building. This will be kept at negative pressure and vented air will be treated by a bio filter to minimise the potential for odour release;
- **Operation** - The feedstock will be digested within the plant in completely sealed tanks. The biogas produced (a mixture of methane (CH_4) and carbon dioxide (CO_2)) will be stored in the digesters and storage tanks prior to use in two Combined Heat and Power (CHP) engines where it will be combusted for the generation of electricity. Exhaust gases will be released through two dedicated stacks; and,
- **Digestate** - The process will create digestate which can be used as a high quality fertiliser. Sealed tankers will be used to transport the material off-site for final utilisation.

A flare is also included at the plant for emergency venting of biogas during abnormal operation.

The activities associated with the proposed plant are controlled under the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments. As such, the operator will be required to obtain an Environmental Permit from the Environment Agency (EA) as the appropriate regulator prior to operation. This will ensure the plant is managed and operated in accordance with good practice guidance and reduce the potential for environmental impacts.

The operation of the plant may result in odour emissions from a number of sources. These have the potential to cause impacts at sensitive locations in the vicinity of the site and have therefore been assessed within this 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 Odour Legislation and Guidance

The following legislation and guidance was used in this assessment:

- H4: Odour Management, EA, 2011;
- Odour Guidance for Local Authorities, Department for Environment, Food and Rural Affairs (DEFRA), 2010;
- Environmental Permitting (England and Wales) Regulations (2010); and,
- Guidance on the Assessment of Odour for Planning, Institute of Air Quality Management (IAQM), 2014.

2.2 Odour Definition

DEFRA guidance[1] defines odour as:

> "An odour is the organoleptic attribute perceptible by the olfactory organ on sniffing certain volatile substances. It is a property of odorous substances that make them perceptible to our sense of smell. The term odour refers to the stimuli from a chemical compound that is volatilised in air. Odour is our perception of that sensation and we interpret what the odour means. Odours may be perceived as pleasant or unpleasant. The main concern with odour is its ability to cause a response in individuals that is considered to be objectionable or offensive.
>
> Odours have the potential to trigger strong reactions for good reason. Pleasant odours can provide enjoyment and prompt responses such as those associated with appetite. Equally, unpleasant odours can be useful indicators to protect us from harm such as the ingestion of rotten food. These protective mechanisms are learnt throughout our lives. Whilst there is often agreement about what constitutes pleasant and unpleasant odours, there is a wide variation between individuals as to what is deemed unacceptable and what affects our quality of life."

2.3 Odour Impacts

The magnitude of odour impact depends on a number of factors and the potential for complaints varies due to the subjective nature of odour perception. The FIDOR acronym is a useful reminder of the factors that will determine the degree of odour pollution:

- Frequency of detection - frequent odour incidents are more likely to result in complaints;
- Intensity as perceived - intense odour incidents are more likely to result in complaints;
- Duration of exposure - prolonged exposure is more likely to result in complaints;
- Offensiveness - more offensive odours have a higher risk of resulting in complaints; and,
- Receptor sensitivity - sensitive areas are more likely to have a lower odour tolerance.

[1] Odour Guidance for Local Authorities, DEFRA, 2010.

It is important to note that even infrequent emissions may cause loss of amenity if odours are perceived to be particularly intense or offensive.

The FIDOR factors can be further considered in conjunction with the following in regards to the potential for an odour emission to cause a nuisance:

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

2.4 Odour Measurement

The concentration at which an odour is just detectable to a "typical" human nose is referred to as the "threshold" concentration. This concept of a threshold concentration is the basis of olfactometry in which a quantitative sensory measurement is used to define the concentration of an odour. Standardised methods for measuring and reporting the detectability or concentration of an odour sample have been defined by European standard BS:EN 13725:2003. The concentration at which an odour is just detectable by a panel of selected human "sniffers" is defined as the detection threshold and has an odour concentration of 1 European odour unit per cubic metre ($1ou_E/m^3$).

At the detectability threshold, the concentration of an odour is so low that it is not recognisable as any specific odour at all, but the presence of some, very faint, odour can be sensed when the "sample" odour is compared to a clean, odour-free sample of air.

For a simple, single odorous compound (e.g. hydrogen sulphide (H_2S)), the concentration of odour present in a sample of air can be expressed in terms of ppm, ppb or mg/m^3. More usually, odours are complex mixtures of compounds and the concentration of the mixture can be expressed in ou_E/m^3.

The concept of odour concentrations, as ou_E/m^3, is based on a correlation between a physiological response when odour is detected by the nose and exposure to a particular sample at a specific concentration. The results of this assessment are expressed in terms of a single number. The odour sample assessed can be one of many individual odorous substances or a complex mixture of many substances, and so the odour unit or concentration will vary between test samples. A defined measurement standard for the odour unit is prescribed in the BS:EN standard on olfactometry using n-butanol. This gas is used to select and calibrate odour panel members.

An odour at a strength of $1ou_E/m^3$ is in reality so weak that it would not normally be detected

outside the controlled environment of an odour laboratory by the majority of people (that is individuals with odour sensitivity in the "normal" range - approximately 96% of the population[2]). As an odour becomes more concentrated, then it gradually becomes more apparent. Some guidance as to concentrations when this occurs can be derived from laboratory measurements of intensity. The following guideline values have been stated by DEFRA[1] to provide some context for discussion about exposure to odours:

- $1ou_E/m^3$ is the point of detection;
- $5ou_E/m^3$ is a faint odour; and,
- $10ou_E/m^3$ is a distinct odour.

It is important to note that these values are based on laboratory measurements and in the general environment other factors affect our sense of odour perception, such as:

- The population is continuously exposed to a wide range of background odours at a range of different concentrations, and usually people are unaware of there being any background odours at all due to normal habituation. Individuals can also develop a tolerance to background and other specific odours. In an odour laboratory the determination of detection threshold is undertaken by comparison with non-odorous air, and in carefully controlled, odour-free, conditions. Normal background odours such as those from traffic, vegetation, grass mowings etc, can provide background odour concentrations from 5 to $60ou_E/m^3$ or more;
- The recognition threshold may be about $3ou_E/m^3$, although it might be less for offensive substances or higher if the receptor is less familiar with the odour or distracted by other stimuli; and,
- An odour which fluctuates rapidly in concentration is often more noticeable than a steady odour at a low concentration.

2.5 Odour Benchmark Levels

There is no statutory limit in the UK for ambient odour concentrations, whether set for individual chemical species or for mixtures. However, the EA has issued guidance on odour[1] which contains indicative benchmark levels for use in the assessment of potential impacts from facilities regulated under the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments.

Benchmark levels are stated as the 98th percentile (%ile) of hourly mean concentrations in ou_E over a year for odours of different offensiveness. In practice this is the 175th highest hourly average recorded in the year. This parameter reflects the previously described FIDOR factors, where an odour is likely to be noted on several occasions above a particular threshold concentration before an annoyance occurs. EA odour benchmark levels are summarised in Table 1.

[2] Code of Practice on Odour Nuisance from Sewage Treatment Works, DEFRA, 2006.

Table 1 Odour Benchmark Levels

Relative Offensiveness of Odour	Benchmark Level as 98th %ile of 1-hour Means (ou_E/m^3)
Most offensive odours: • Processes involving decaying animal or fish • Processes involving septic effluent or sludge • Biological landfill odours	1.5
Moderately offensive odours: • Intensive livestock rearing • Fat frying (food processing) • Sugar beet processing • Well aerated green waste composting	3.0
Less offensive odours: • Brewery • Confectionery • Coffee roasting • Bakery	6.0

It is considered that odours from the AD Plant would be classified as 'moderately offensive', in accordance with the criteria shown in Table 1, as they are likely to be similar to composting. As such, an EA benchmark level of $3.0ou_E/m^3$ would be considered appropriate for the facility.

2.6 National Planning Policy

The National Planning Policy Framework[3] (NPPF) was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including odour. The document includes the following considerations which are relevant to this assessment:

> "The planning system should contribute to and enhance the natural and local environment by: […]
>
> Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."

The implications of the NPPF have been considered during the production of this report.

[3] National Planning Policy Framework, Department for Communities and Local Government, 2012.

2.7 Institute of Air Quality Management Guidance

The IAQM published the 'Guidance on the Assessment of Odour for Planning'[4] document on 20th May 2014. This guidance specifically deals with assessing odour impacts for planning purposes, namely potential effects on amenity. The assessment methodology outlined in the guidance has been utilised in throughout this report where relevant.

[4] Guidance on the Assessment of Odour for Planning, IAQM, 2014.

3. METHODOLOGY

The proposed AD facility may result in odour emissions during normal operations. These were assessed in accordance with the following stages:

- Identification of odour sources;
- Identification of odour emission rates;
- Dispersion modelling of odour emissions; and,
- Comparison of modelling results with relevant criteria.

The following Sections outline the methodology and inputs used for the assessment.

3.1 Odour Sources

Potential odour sources were identified from the proposed process. These included:

- Emissions from the biofilter; and,
- Expelled air during the filling of the digestate tanker.

Further information on the anticipated operation of the facility was provided through discussions with the plant operator in order to define emissions from each source in more detail.

The actual AD process itself is sealed and therefore does not form a source of odour, or other emissions such as CH_4 or H_2S under normal operation. Should releases of these species occur then this would indicate a fault with the plant and immediate remedial measures would be taken to eliminate the problem to avoid seriously affecting the AD process, with associated financial consequences for the operator.

3.2 Dispersion Modelling

Dispersion modelling was undertaken using ADMS 5.1 (v5.1.2.0), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS 5.1 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.

Reference should be made to Figure 1 for a graphical representation of the dispersion model inputs.

3.2.1 Modelling Scenarios

The scenarios considered in the modelling assessment are summarised in Table 2.

Table 2 Dispersion Modelling Scenarios

Parameter	Modelled As Short Term
Odour	98th%ile 1-hour mean

3.2.2 Emissions

There are no Emission Limit Values (ELVs) for odour and since the facility is not operational, it was not possible to monitor site specific emissions. In the absence of such information, odour emission rates for the relevant sources were provided by Agrivert Ltd. These were based on odour monitoring data reported at a similar plant and are therefore considered to provide representative inputs for an assessment of this nature. Odour emission rates are summarised in Table 3.

Table 3 Odour Emission Rates

Source	Odour Emission Rate	Unit
Biofilter	6.99	$ou_E/m^2/s$
Tanker	100,000	ou_E/m^3

Reference should be made to Appendix II for full details of the odour emission rate calculation.

The emission rates shown in Table 3 were utilised with additional information provided by the plant operator to define emissions within the dispersion model. These are summarised in Table 4.

Table 4 Emissions

Source	Odour Emission Rate	Unit	Characteristics
Biofilter	6.99	$ou_E/m^2/s$	225m^2 of media exposed constantly within the biofilter
Tanker	2,500	ou_E/s	Constant tanker filling for 6-hours per day

The emission characteristics summarised within Table 4 include the following assumption:

- Tankers are filled constantly for 6-hours per day. It is anticipated that a maximum of 6 tankers will be processed per day with each taking approximately 10-minutes to fill. As such, the assumption of constant emissions for 6-hours is considered to be a significant over estimation.

3.2.3 Assessment Extents

Ambient concentrations were predicted over the area NGR: 520200, 204350 to 520600, 204950. One Cartesian grid with a resolution of 10m was used within the model to provide data suitable for plotting within the Surfer software package.

A desk-top study was undertaken in order to identify any sensitive receptor locations in the vicinity

of the site that required specific consideration during the assessment. The sensitivity of each receptor was defined based upon the guidance provided within the IAQM document Guidance on the Assessment of Odour for Planning[5]. The IAQM recommend that the assessor uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the principles summarised in Table 5.

Table 5 Odour Receptor Sensitivity

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

The identified sensitive receptors and associated sensitivity are summarised in Table 6. Reference should be made to Figure 1 for a graphical representation of the receptor locations.

Table 6 Sensitive Receptors

Receptor		NGR (m)		Sensitivity
		X	Y	
R1	Coursers Farm Ground (Residential)	520496	204691	High
R2	Coursers Farm First (Residential)	520496	204691	High
R3	3 Coursers Road Ground (Residential)	520567	204907	High

[5] Guidance on the Assessment of Odour for Planning, IAQM, 2014.

Receptor		NGR (m)		Sensitivity
		X	Y	
R4	3 Coursers Road First (Residential)	520567	204907	High
R5	5 Coursers Road Ground (Residential)	520425	204809	High
R6	5 Coursers Road First (Residential)	520425	204809	High
R7	2 Coursers Road Ground (Residential)	520385	204780	High
R8	2 Coursers Road First (Residential)	520385	204780	High

The sensitive receptors identified in Table 6 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience odour impacts as a result of atmospheric emissions from the facility that have not been individually identified above.

3.2.4 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 5.1.

3.3 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 the source than would arise in the absence of the buildings.

Analysis of the site layout indicated that a number of buildings should be included within the model in order to take account of effects on pollutant dispersion. Input geometries are shown in Table 7.

Table 7 Building Geometries

Building	NGR (m)		Height (m)	Diameter/ Length (m)	Width (m)	Angle (º)
	X	Y				
Reception	520337.7	204539.9	13.0	44.1	34.2	232.7
CHP 1	520314.9	204586.6	2.6	2.9	12.2	233.4
CHP 2	520319.5	204583.2	2.6	3.0	12.2	233.9
Office	520293.1	204589.0	6.0	19.6	3.7	234.6
Meeting Room	520290.5	204599.0	6.0	3.6	9.7	235.6
Tank 1	520402.2	204425.9	13.5	32.0	-	-

Building	NGR (m)		Height (m)	Diameter/ Length (m)	Width (m)	Angle (º)
	X	Y				
Tank 2	520401.7	204462.9	13.5	32.0	-	-
Tank 3	520379.6	204492.0	13.5	32.0	-	-
Tank 4	520357.4	204448.7	13.5	32.0	-	-
Tank 5	520336.6	204478.9	13.5	32.0	-	-

Reference should be made to Figure 1 for the building locations.

3.4 Meteorological Data

Meteorological data used in this assessment was taken from Heathrow Airport meteorological station, over the period 1st January 2010 to 31st December 2014 (inclusive). Heathrow Airport meteorological station is located at NGR: 506947, 176515, which is approximately 29km south-west of the proposed facility. LAQM.TG(09)[6] recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling. Although it is acknowledged this project was not undertaken in support of Local Air Quality Management (LAQM) reporting, it is considered the guidance provided on dispersion modelling is valid for all assessment purposes.

All meteorological data used in the assessment was provided by at the relevant ADM Ltd, which is an established distributor of meteorological data within the UK.

Reference should be made to Figure 2 for wind roses of the utilised meteorological data.

3.5 Roughness Length

A roughness length (z_0) of 0.3m was used in the dispersion modelling study. This value of z_0 is considered appropriate for the morphology of the assessment area and meteorological station location and is suggested within ADMS 5.1 as being suitable for 'agricultural areas (max)'.

3.6 Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A 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 is suggested within ADMS 5.1 as being suitable for 'small towns < 50,000'.

A Monin-Obukhov length of 30m was used to describe the meteorological station location. This value is considered appropriate for the nature of the area and is suggested within ADMS 5.1 as being suitable for 'cities and large towns'.

[6] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

3.6.1 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, land use characteristics and meteorology; and,
- Variability - randomness of measurements used.

Potential uncertainties in model results have been 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 5.1 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 annual meteorological data sets from the closest observation site to the facility to take account of worst-case conditions;
- Plant operating conditions - Information was provided by the plant operator to describe the activities and associated durations associated with the facility. As such, these are considered to be representative of likely operating conditions;
- Emission rates - Emission rates were derived from monitoring undertaken at a similar facility and are therefore considered to be representative of potential releases during normal operation;
- Receptor locations - Receptor points were included at sensitive locations to provide consideration of impacts on these areas. Odour levels at any point within the assessment extents may be derived from the relevant Figure; and,
- Variability - All model inputs are as accurate as possible and worst-case conditions were considered as necessary in order to ensure a robust assessment of potential odour concentrations.

Results were considered in the context of the relevant odour benchmark level. 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.

3.6.2 Environment Agency Dispersion Modelling Report Requirements

Table 8 provides the checklist of EA dispersion modelling report requirements.

Table 8 Dispersion Modelling Report Requirements

Item	Location within Report
Location map	Figure 1
Site plan	Figure 1
List of odours modelled and relevant odour guidelines	Section 3.2.1, Table 1, Table 2, Table 9

Item	Location within Report
Details of modelled scenarios	Section 3.1
Details of relevant ambient concentrations used	Not relevant to odour
Model description and justification	Section 3.2
Special model treatments used	Section 3.2.3
Table of emission parameters used	Table 4
Details of modelled domain and receptors	Section 3.2.3
Details of meteorological data used (including origin) and justification	Section 3.4
Details of building treatment	Table 7
Sensitivity analysis	Section 3.3

3.7 Significance of Odour Impacts

The significance of impacts was assessed through the interaction of the predicted 98th %ile of 1-hour mean odour concentrations and receptor sensitivity, as outlined in the IAQM guidance[4]. The relevant assessment matrix is summarised in Table 9.

Table 9 Odour Impact

Odour Exposure Level as 98th %ile of 1-hour Means (ou_E/m^3)	Receptor Sensitivity		
	Low	Medium	High
Greater than 10	Moderate	Substantial	Substantial
5 - 10	Moderate	Moderate	Substantial
3 - 5	Slight	Moderate	Moderate
1.5 - 3	Negligible	Slight	Moderate
0.5 - 1.5	Negligible	Negligible	Slight
Less than 0.5	Negligible	Negligible	Negligible

The IAQM guidance[4] states that an assessment must reach a conclusion on the likely significance of the predicted impact. Where the overall effect is **moderate** or **substantial**, the effect is likely to be considered **significant**, whilst if the impact is **slight** or **negligible**, the impact is likely to be considered **not significant**. It should be noted that this is a binary judgement of either it is **significant** or it is **not significant**. This has been considered to determine the overall significance of potential odour impacts associated with the facility.

4. ASSESSMENT

4.1 Predicted Concentrations

Dispersion modelling of potential odour emissions was undertaken using the input data specified previously for the proposed AD plant. Predicted odour concentrations at discrete receptor locations are summarised in Table 10. It should be noted that all odour concentrations are presented as a 98th%ile of 1-hour mean values over the relevant assessment year.

Table 10 Predicted Odour Concentrations

Receptor		Predicted 98th%ile 1-hour Mean Concentration (ou_E/m^3)				
		2010	2011	2012	2013	2014
R1	Coursers Farm Ground (Residential)	0.30	0.31	0.33	0.31	0.31
R2	Coursers Farm First (Residential)	0.28	0.29	0.31	0.30	0.29
R3	3 Coursers Road Ground (Residential)	0.07	0.08	0.08	0.08	0.08
R4	3 Coursers Road First (Residential)	0.07	0.08	0.08	0.08	0.07
R5	5 Coursers Road Ground (Residential)	0.13	0.15	0.14	0.13	0.15
R6	5 Coursers Road First (Residential)	0.13	0.14	0.14	0.13	0.14
R7	2 Coursers Road Ground (Residential)	0.16	0.18	0.17	0.16	0.18
R8	2 Coursers Road First (Residential)	0.16	0.17	0.17	0.15	0.17

As indicated in Table 10, predicted odour concentrations were significantly below the EA odour benchmark of 3.0ou_E/m^3 at the sensitive receptor locations for all modelling years. It should be noted that the lower EA odour benchmark value of 1.5ou_E/m^3 was also achieved at all receptors.

Reference should be made to Figure 3 for graphical representations of predicted odour concentrations throughout the assessment extents as a result of the proposed AD plant. These indicate maximum levels in close proximity to the odour sources, with concentrations reducing over a short distance. As shown in the Figures, odour impacts were not predicted to extend beyond the proposals, with exceedences of the lower odour threshold value of 1.5ou_E/m^3 only predicted over non-sensitive areas beyond the site boundary.

4.2 Impact Significance

The significance of predicted odour impacts at the sensitive receptors is summarised in Table 11. It should be noted that the IAQM guidance has been compiled on the assumption that the odour in question is at the offensive end of the spectrum. As shown in Table 1, odours from the proposed plant would fall into the 'moderately offensive' category. As such, the IAQM assessment criteria is likely to overestimate the significance of impacts.

Table 11 Predicted Odour Impacts

Sensitive Receptor		Odour Exposure Level as 98th%ile of 1-hour Means (ou_E/m^3)	Receptor Sensitivity	Significance of Impact
R1	Coursers Farm Ground (Residential)	Less than 0.5	High	Negligible
R2	Coursers Farm First (Residential)	Less than 0.5	High	Negligible
R3	3 Coursers Road Ground (Residential)	Less than 0.5	High	Negligible
R4	3 Coursers Road First (Residential)	Less than 0.5	High	Negligible
R5	5 Coursers Road Ground (Residential)	Less than 0.5	High	Negligible
R6	5 Coursers Road First (Residential)	Less than 0.5	High	Negligible
R7	2 Coursers Road Ground (Residential)	Less than 0.5	High	Negligible
R8	2 Coursers Road First (Residential)	Less than 0.5	High	Negligible

As indicated in Table 11, the significance of odour impacts as a result of the development was predicted to be **negligible** at all sensitive receptor locations. As such, impacts are considered **not significant**, in accordance with the stated methodology.

5. CONCLUSION

REC Ltd was commissioned by Agrivert Ltd to undertake an Odour Assessment of potential emissions from a proposed AD plant on land at Coursers Farm, St Albans.

Odour emissions from a number of sources on site have the potential to cause impacts at sensitive receptors. An Odour Assessment was therefore undertaken to consider effects in the vicinity of the facility.

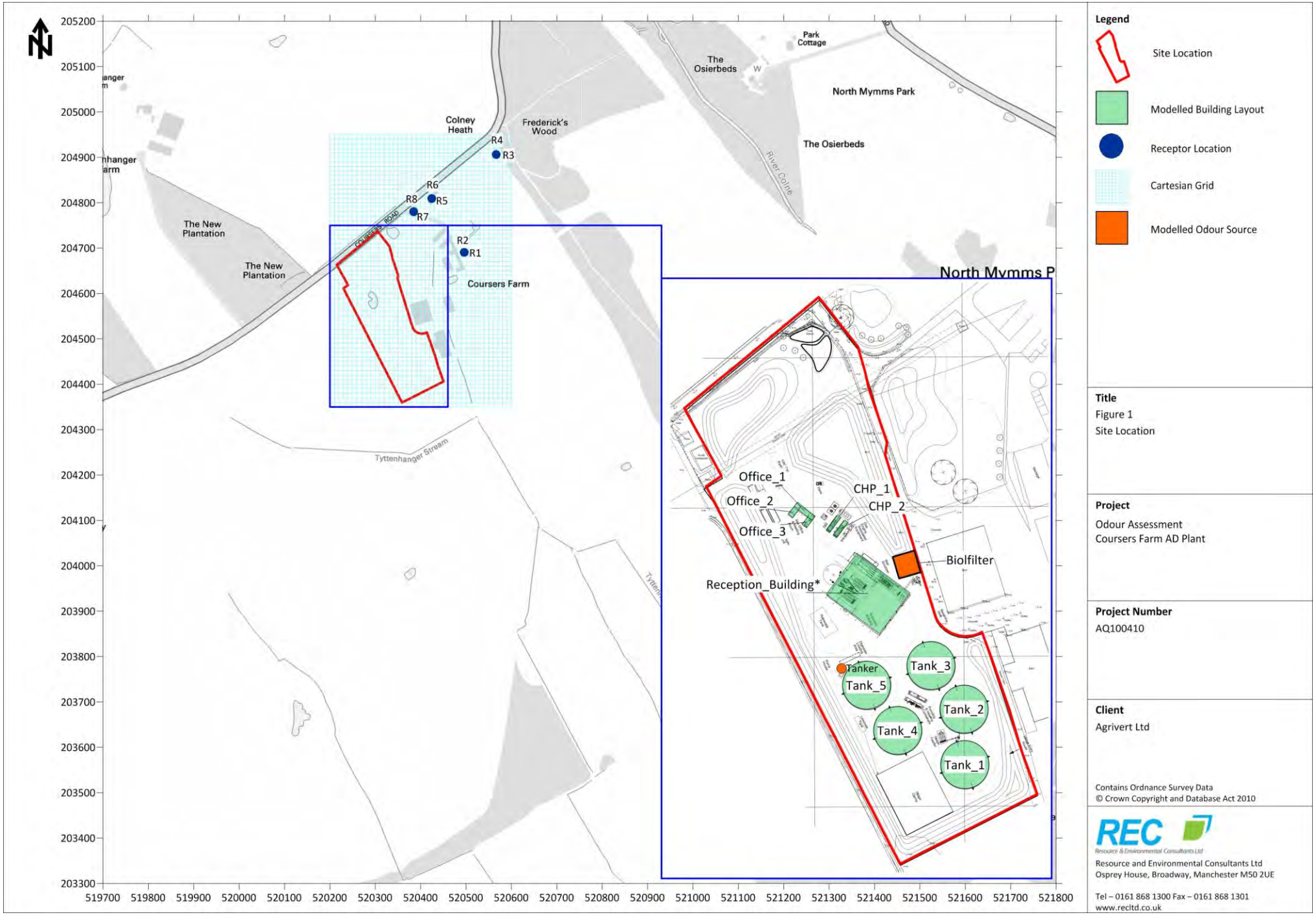
Potential odour emissions were defined based on the proposed plant operation and monitoring undertaken at an existing operational facility. These were represented within a dispersion model produced using ADMS 5.1. Impacts at sensitive receptor locations in the vicinity of the site were quantified, the results compared with the relevant EA odour benchmark level and the significance of impacts assessed in accordance with the IAQM guidance.

Predicted odour concentrations were below the relevant EA odour benchmark level at all receptor locations for all modelling years. The significance of predicted impacts was defined as **negligible** at all sensitive receptors in accordance with the IAQM Guidance. The overall odour effects as a result of the proposed AD are considered to be **not significant**. As such, potential odour emissions from the facility are not considered to represent a constraint to the proposed development.

6. ABBREVIATIONS

%ile	Percentile
AD	Anaerobic Digestion
ADM	Atmospheric Dispersion Modelling
CERC	Cambridge Environmental Research Consultants
CH_4	Methane
CO_2	Carbon Dioxide
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ELV	Emission Limit Values
H_2S	Hydrogen sulphide
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NGR	National Grid Reference
NPPF	National Planning Policy Framework
REC	Resource and Environmental Consultants
z_0	Roughness length

APPENDIX I FIGURES



Legend

- Site Location
- Modelled Building Layout
- Receptor Location
- Cartesian Grid
- Modelled Odour Source

Title

Figure 1
Site Location

Project

Odour Assessment
Coursers Farm AD Plant

Project Number

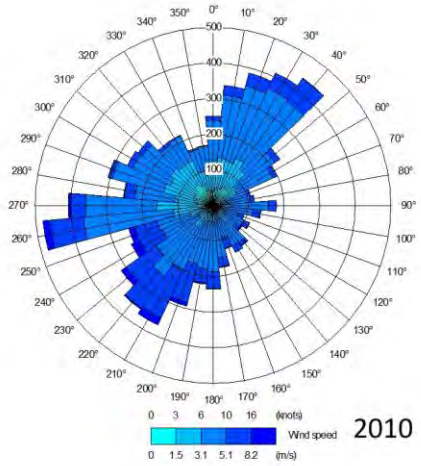
AQ100410

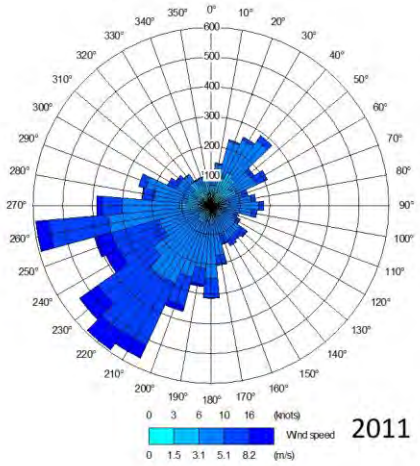
Client

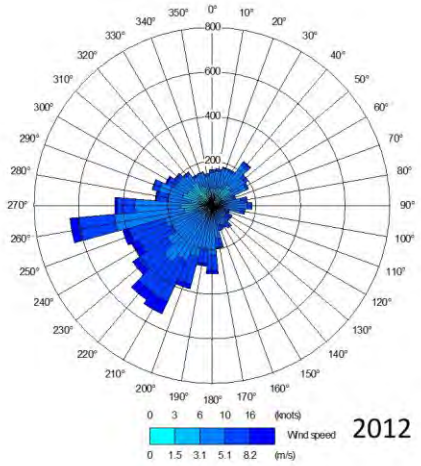
Agrivert Ltd

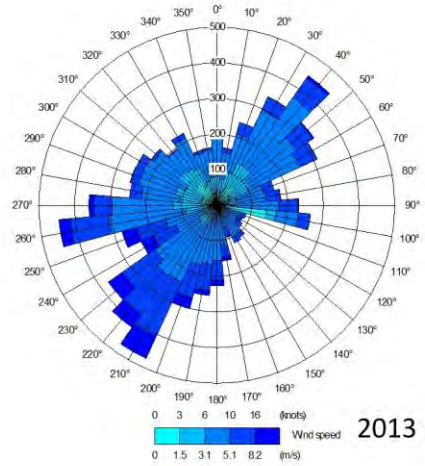
REC
Resource & Environmental Consultants Ltd
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE

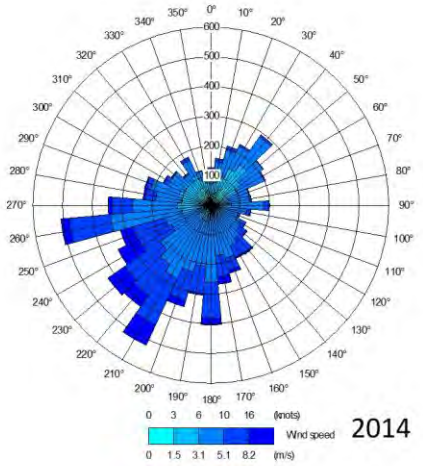
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk











Title

Figure 2

Heathrow Meteorological Data
Windroses for 2010, 2011, 2012, 2013 and 2014

Project

Odour Assessment
Coursers Farm AD Plant

Project Number

AQ100416

Client

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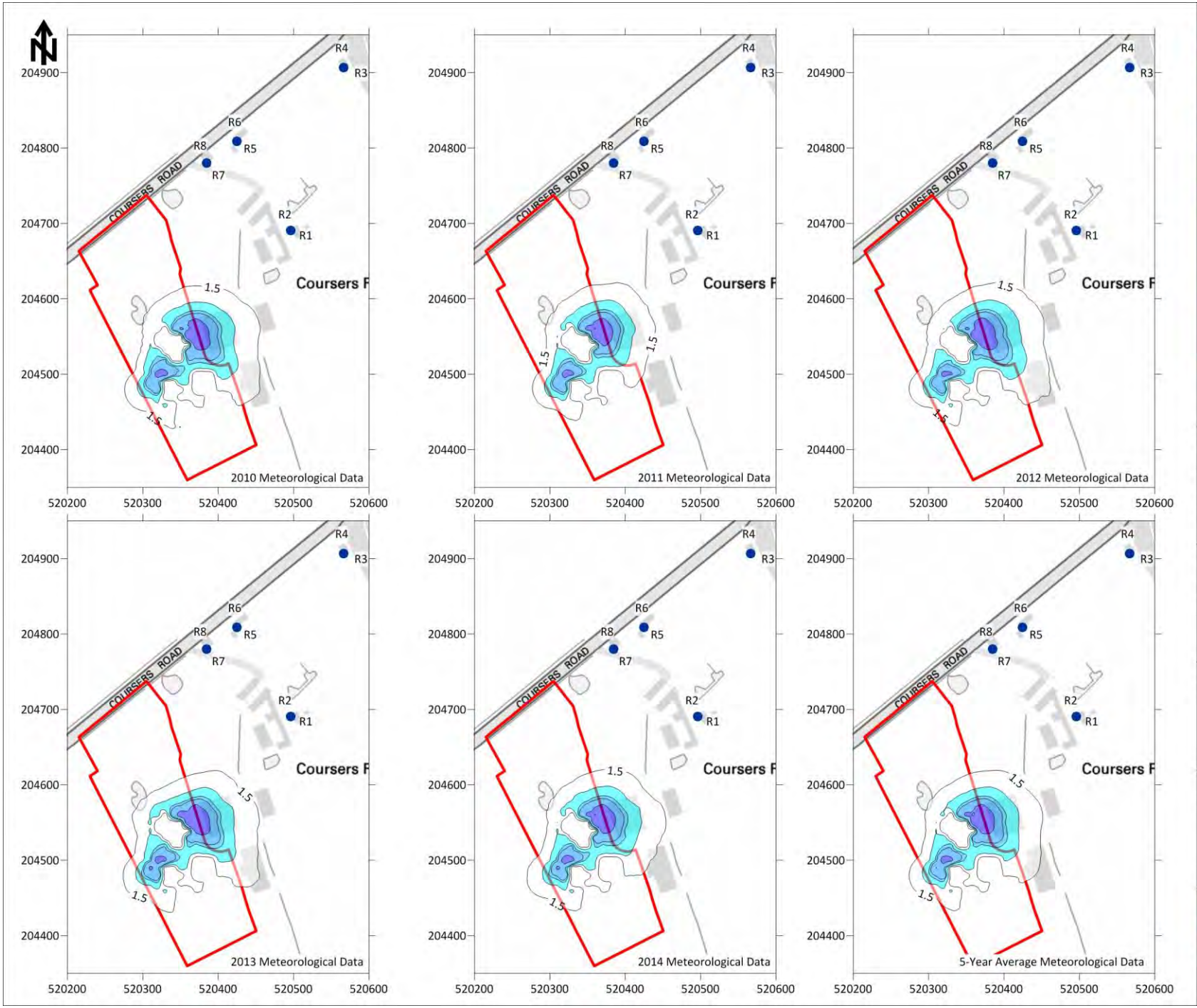

Legend

Site Location

Receptor Location

10.0
6.0
5.0
3.0
1.5

Predicted 98th %ile 1-hour Mean Odour Concentration (ou_E/m^3)

Title

Figure 3

Predicted 98%ile 1-hour Mean Odour Concentration (ou_E/m^3) 2010-2014 Meteorological Data and 5-year Average Mean for 2010 to 2014

Project

Odour Assessment
Coursers Farm AD Plant

Project Number

AQ100905

Client

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APPENDIX II ODOUR EMISSION RATE CALCULATION

ODOUR EMISSION RATE CALCULATION

The odour emission rate for use in the dispersion modelling assessment was calculated in the following way:

Odour concentrations within the waste reception building of the Cassington AD plant operated by Agrivert Ltd (C) were monitored as 9,106ou_E/m^3. The airflow through the building (V) was provided as 12,442m^3/hr. Utilising this data, an odour emission rate ($ER_{internal}$) of 113,297,406ou_E/hr was calculated [$ER_{internal}$ = C x V].

It was confirmed by Agrivert that similar waste streams would be handled at Coursers Farm using comparable methods. As such, it was considered likely that a similar amount of odour would be generated in the building. An odour emission rate of 113,297,406ou_E/hr was therefore assumed for the Coursers Farm facility.

It was confirmed by Agrivert that an abatement efficiency (E) of 0.95 (95%) was anticipated for the Coursers Farm biofilter. The odour emission rate ($ER_{biofilter}$) was therefore reduced to 5,664,870ou_E/hr [$ER_{biofilter}$ = $ER_{internal}$ x (1 - E)].

The area of the biofilter (A) was confirmed as 225m^2. Using this information, the odour emission rate was transformed to 6.99$ou_E/m^2/s$ for input into the dispersion model [$ER_{area\ source}$ = $ER_{biofilter}$ / A / 3600].

REC
Resource & Environmental Consultants Ltd

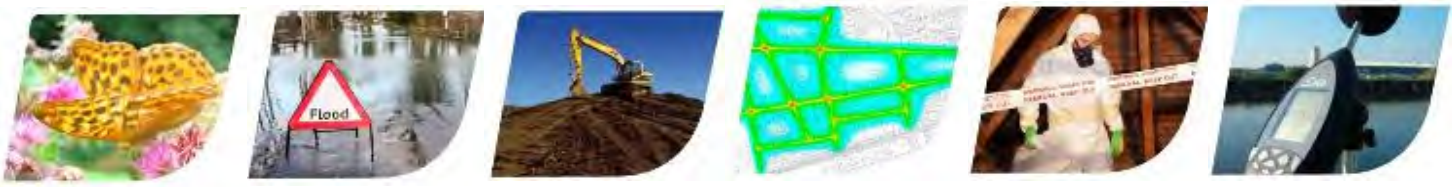
National Consultancy, Locally Delivered

NOISE IMPACT ASSESSMENT
ANAEROBIC DIGESTION FACILITY – COURSERS FARM
EA PERMIT

REC REFERENCE: AC100899-1R1

REPORT PREPARED FOR: AGRIVERT

15TH FEBRUARY 2016



QUALITY ASSURANCE

Issue/revision	Revision 1	Revision 2	Revision 3
Remarks	Draft, for comment	Final	
Date	1st February 2016	15th February 2016	
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Signature			
Project number	AC100899-1r0	AC100899-1r1	

EXECUTIVE SUMMARY

Noise Survey

A full weekday and weekend Background Sound Survey had been completed in order to quantify the existing levels of background sound levels at the closest receptors to the Site. Given that the Site was under construction, a location away from the Site was chosen. This resulted in lower measured background sound levels that prevail at the receptors and so is considered worst case.

Noise Impact Assessment

The Noise Impact Assessment has shown that the predicted daytime and night-time rating levels at the closest receptors due to the operation of the AD Facility fall below the adopted criteria.

Therefore, noise should not give rise to an adverse impact at the closest receptors and is in accordance with the following advice given in NPPF:

> *"avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of development; and,*
>
> *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions."*

Additionally, the predicted specific sound pressure levels falls below the absolute criteria given in the EPR Guidelines.

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1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Limited have been commissioned by Agrivert to complete a Noise Impact Assessment in order to support an Environment Agency Permit for a Anaerobic Digestion Facility *'the facility'* at Coursers Farm, Coursers Road, St Albans.

This Noise Impact Assessment has been completed in order to assess the noise impact of the proposed development upon the closest existing residential receptor.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

1.2 Facility Location and Description

The facility is located on a parcel of agricultural land associated with Coursers Farm off Coursers Road in St Albans. The Site is located to the south west of the main building complex and is accessed off the entrance road to Coursers Farm. The Site is located in a predominately agricultural area with few residential dwellings located in the vicinity. The farm is commercial in nature and several commercial/industrial operations take place within the ownership of Coursers Farm.

The closest residential receptors to the Site are: Coursers Farm to the north east, 2 Coursers Road to the north and 3 Coursers Road to the north east.

- 2 x 1500kW CHP and Gas Engine Unit;
- 1 x Flare Stack;
- 1 x Silage Feeder;
- 2 x Pumping and Heating Containers;
- 5 x Digester Tanks;
- 1 x Pump House;
- 1 x Biofilter;
- 1 x Wet Scrubber;
- 1 x Site Office and Meeting Room;
- 2 x Weighbridge;
- 1 x Reception Building; and,
- 1 x Silage Clamp.

REC has comprehensive knowledge of the processes and associated noise emissions from AD Facilities and the key sources of noise are from the CHP Gas Engines. The Flare Stack will operate only on an emergency basis for the purposes of burning excess biogas which cannot be handled by the CHP Gas Engine. The data used is based on a previous assessment, undertaken by REC, for the Coleshill AD Facility (90288r2 dated 18th June 2013) at the request of Agrivert.

This assessment has been undertaken with due regard to the supplied Site plan shown on the following planning drawings:

- Site Layout Plan (drawing number: 1000 C 001 Rev 6) dated 1st May 2015 and produced by Agrivert.

The Proposed Site Layout is shown in Figure I of Appendix III.

1.3 Limitations

The limitations of this report are presented in Appendix I.

1.4 Confidentiality

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.

2.0 ASSESSMENT CRITERIA

2.1 The Environment Agency for England and Wales

The Environment Agency for England and Wales has issued their own guidance on the management and control of noise at permitted Installations. Specifically Horizontal Guidance Note IPPC H3 (Parts 1 and 2) 'Horizontal Guidance for Noise' detail general issues relating to the regulation, assessment and control of noise relevant to all sectors.

The EPR horizontal guidance for noise indicates that the methodology contained in British Standard 4142: 1997 'Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas' should be used as the basis of the noise assessment. BS4142:1997 was superseded by BS4142:2014 in October 2014 and so this most current version of the guidance will be adopted in this assessment.

In addition to an assessment in accordance with BS4142:2014, Section 2.4 'Determination of BAT' offers the following absolute noise criteria levels for daytime and night-time periods:

- Daytime: 50dB free-field $L_{Aeq,16hr}$; and,
- Night-time: 45dB façade $L_{Aeq,8hr}$

2.1.1 BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and,
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted noise level 'the specific noise level' from any of the above detailed noise sources with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.'

The specific noise level also acknowledges the following reference time intervals depending upon whether the noise source operates during daytime or night-time periods:

- Daytime (07:00 – 23:00): 1 hr; and,
- Night-time (23:00 – 07:00): 15 minutes.

There are a number of 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows. These penalties vary in their weighting depending upon the severity of the acoustic feature, as follows:

Tonality

- +2dB: where the tonality is just perceptible;
- +4dB: where the tonality is clearly perceptible; and,
- +6dB: where the tonality is highly perceptible.

Impulsivity

- +3dB: where the impulsivity is just perceptible;
- +6dB: where the impulsivity is clearly perceptible; and,
- +9dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above acoustic features, there is a penalty for 'other sound characteristics' of +3dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment.

BS4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background noise level can yield the following commentary:

- Typically the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and,
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

With the above in mind, it is common that a Local Planning Authority will specify their own criteria for the rating level relative to the background sound level and, where this is the case, this criteria usually takes precedence over a simple comparison of the rating level against the background sound level.

2.1.2 Absolute Criteria

Under the heading 'Indicative BAT Requirements', the EPR guidelines for noise indicate that justification should be given where the rating level exceeds the numerical value of the background noise level ($L_{A90,t}$) or 50dB $L_{Aeq,t}$ by day (free-field) or 45dB $L_{Aeq,t}$ by night (façade) when assessed at local noise-sensitive receptors.

3.0 NOISE SURVEYS

3.1 Background Sound Survey

REC has conducted a full weekday and weekend Background Sound Survey in order to quantify the existing levels of background noise at a location considered representative of the closest noise sensitive receptor to the Installation.

- 11:16 Friday 22nd – 13:16 Monday 25th January 2016.

The following noise measurement position was chosen for the Background Sound Survey:

- Noise Measurement Position 1 (NMP1): Located to the south east of the Site, approximately 1.1km to the south east of the centre of the Site. This separation distance was required due to construction activities on Site and the requirement for generators to run security lighting through the night-time and weekend periods. This position is considered representative of the receptors, albeit worst case given the increased distance from Coursers Road. The main source of noise was noted to be distant road traffic noise from the A1(M) and the M25.

The location of the meter was pinpointed to be X: 520932 Y:203652 or grid reference TL 20932 03652.

Table 3.1 details the Average measured background sound levels. The daytime average is based on the hourly data and the night-time levels are based on the 15 minute data in accordance with BS4142:2014. A full representation of the hourly data is shown in Table A1 of Appendix IV.

Table 3.1: Summary of Average Measured Background Sound Level

Date	Period	Average Measured Background Sound Level $L_{A90,T}$ (dB)
Friday 22nd January 2016	Daytime (11:16 – 23:00)	56.8
	Night-time (23:00 – 07:00)	53.7
Saturday 23rd January 2016	Daytime (07:00 – 23:00)	54.9
	Night-time (23:00 – 07:00)	49.3
Sunday 24th January 2016	Daytime (07:00 – 23:00)	54.0
	Night-time (23:00 – 07:00)	51.4
Monday 25th January 2016	Daytime (07:00 – 13:16)	55.6

3.2 Meteorological Conditions & Equipment

Tables 3.2 and 3.3 detail the recorded meteorological conditions at the start and end of the background sound survey.

Table 3.2: Record of Meteorological Conditions at Start of Survey

Measured Wind Speed (m/s)	Wind Direction	Precipitation Occurred?	Fog or Mist Evident?	Was the Ground Wet, Frozen or Snow Covered?	Measured Temperature (°C)	Cloud Cover (%)
4.6	South	No	No	Damp ground	6.0	100

Table 3.3: Record of Meteorological Conditions at Termination of Survey

Measured Wind Speed (m/s)	Wind Direction	Precipitation Occurred During Survey?	Fog or Mist Evident?	Was the Ground Wet, Frozen or Snow Covered?	Measured Temperature (°C)	Cloud Cover (%)
7.2	South	Occasional Light Rain	No	No	12.0	75

The light rain was found to occur on Saturday evening for approximately 2 hours. By consulting the noise level data, no change in noise levels was recorded due to this, therefore it is considered negligible. Weather data between installation and collection was taken from internet based historical weather data.

Table 3.4 details the equipment used for the survey.

Table 3.4: Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
NMP3	Sound Level Meter	01dB-Metravib Fusion	10819	26th May 2017
	Pre-amplifier	GRAS 40CE	10714	
	Microphone	01dB-Metravib	217637	
	Calibrator	01dB-Metravib CAL-21	34554787	4th June 2016

4.0 NOISE IMPACT ASSESSMENT

4.1 BS4142:2014 Assessment

The main sources of noise associated with operation of the AD Facility are the CHP units and Mobile Plant.

REC have been provided with details of the CHP Unit, JMC 420 GS- B.L 1500kW, that provides a sound pressure level of 65dB at 10m for the container within which the plant is housed.

REC has used previously supplied and measured data in relation to a previous AD Facility undertaken which includes for the following:

- Heating System Pump: 35dB(A) at 1m;
- Exhaust Stack: 70.5dB(A) at 1m;
- Digester Loading Pump: 71.8dB(A) at 1m;
- Hydraulic Pump: 74.3dB(A) at 0.5m;
- Mixing Pit Pump: 70.2dB(A) at 0.5m;
- 360 Excavator within Reception Building: 107dB(A) L_W; and,
- Tipping of Material within Reception Building: 117dB(A) L_W.

Given the very low noise level from the Heating System Pump, this will not be considered in the assessment as it will not contribute to the overall noise level. With regards the reception building, internal to external calculations have been undertaken below. Therefore, the noise levels of the facades of the Reception Building have been calculated as follows assuming a 360 excavator and tipping of material within the building:

The direct sound pressure levels (Direct SPL) within the reception building as a result of the mobile plant have been calculated based on the following formula:

$$\text{Direct SPL} = L_W + (10 \times \text{Log} (1/ ((4*3.14) \times D^2)))$$

Where: *L_W is the sound power level of the source*
D is the distance of the source from the facade

Each Direct SPL of each item of plant on each façade have been logarithmically added together to provide the Direct SPL for each façade.

The reverberant sound pressure level (Reverb SPL) has been calculated as follows:

$$\text{Reverb SPL} = L_W + (10 \times \text{Log} (4 / R_C)$$

Where: *L_W is the sound power level of the source*
R_C is the room constant

These have again been logarithmically added together to provide the Reverb SPL for each façade for all sources. The Reverb SPL has then been logarithmically added to the Direct SPL for each façade.

Assuming a Sound Reduction Index of 24dB for a single steel skin for the reception building, the following equation has been used to determine the sound power level of each façade:

$$L_W = L_P + (10 \times \text{Log} (S))$$

Where: *L_P is the sound pressure level of the façade assuming -6 directivity*
S is the surface area of the facade

Table 4.1 details the calculated sound power levels of each façade. It is assumed that the door at the entrance to the tipping hall will be kept shut the majority of the time and when opened, for deliveries, etc, the machines inside will be switched off. The south façade has not been considered as this is located with full line of sight removal from the receptors.

Table 4.1: Calculated Sound Power Levels of Reception Building Facades

Façade	Assumed Surface Area (m^2)	Calculated Sound Power Level of Façade (dB)
North	573.3	89.7
East	444.6	88.5
West	444.6	88.5
Roof	1508.22	94.6

This assessment has used the different component parts associated with the Site. The calculated sound power levels from the reception building facades have been distance corrected in accordance with the following equation:

$$L_P = L_W - 20 \times \text{Log}(R) - 8$$

Where: *L_W is the sound power level; and,*
R is the distance to the receptor.

This has been completed for the combined facades at a nominal distance of 10m resulting in a sound pressure level of the reception building of 69.2dB at 10m.

The measured noise levels for the above plant have been calculated for the closest non-associated receptor using the following formulas:

Distance Attenuation: $L_{Aeq,T\,2} = L_{Aeq,T\,1} - 20 \times \log(D_2 / D_1)$

Where:
$L_{Aeq,T\,2}$ = Noise level under investigation
$L_{Aeq,T\,1}$ = Known noise level
D_2 = Distance from source to receiver
D_1 = Measurement distance of source

Soft Ground Attenuation: $\text{Correction} = 5.2\ I \times \log(6H - 1.5/(d+3.5))$

Where:
H = Height
d = Distance from source to receiver
I = Proportion of soft ground cover

The reference time intervals as detailed in BS4142:2014 are 1 hour for the daytime period and 15 minutes for the night-time period.

BS4142:2014 specifies applicable penalties in relation to tonal, impulsive and intermittent characteristics. The penalties have been applied to each specific plant item that the penalties correspond to. Table 4.2 determines the applicable penalties for fixed and mobile plant respectively.

Table 4.2: Identification of Applicable Penalties – Fixed and Mobile Plant

Penalty	Applicable?	Attributable Penalty	Comment
Tonality	Yes	6dB	No 1/3 octave band data available for analysis however there is the potential of tonal noise from the CHP Unit and to a lesser extent with regards the pumps.
Impulsivity	No	-	From REC's experience of noise generated by CHPs, they produce steady-state noise continuously and impulsivity is not considered to be an issue.
Intermittency	Yes	3dB	From REC's experience of noise generated by CHPs, they produce steady-state noise continuously and intermittency is not considered to be an issue. However, the intermittent noise from the reception building may be perceptible.
Other Sound Characteristic	No	-	Not applicable as other penalties have been assigned.

4.1.1 Daytime BS4142 Assessment

Receptor 1 – Coursers Farm

Table 4.3 calculates the specific noise level at Receptor 1 (Coursers Farm) for the daytime period. Additionally, full (-10dB) or partial line of sight (-5dB) removal has been applied to certain plant items to account for on-site buildings, where applicable. The sound pressure level for the CHP has been increased by 3dB to account for 2 units.

Table 4.3: Calculation of Specific Noise Level at Receptor 1 - Daytime

Plant	Calculated L_W/ Measured Noise Level (dB)	Assumed Activity Duration (seconds)	Distance to Receptor (m)	Reference Time Period (seconds)	Soft Ground Attenuation and Line of Sight Removal (dB)	Calculated Specific Noise Level at Receptor (dB)
2 x CHP	68	3600	212	3600	-16.4	25.1
Exhaust Stack	70.5	3600	212	3600	-16.4	7.6
Digester Loading Pump	71.8	120	281	3600	-14.2	-6.2
Hydraulic Pump	74.3	3600	260	3600	-14.2	5.8
Mixing Pit Pump	70.2	3600	260	3600	-14.2	1.7
Reception Building	69.2	3600	198	3600	-13.8	29.4

Receptor 2 – 2 Coursers Road

Table 4.4 calculates the specific noise level at Receptor 2 (2 Coursers Road) for the daytime period. Additionally, full (-10dB) or partial line of sight (-5dB) removal has been applied to certain plant items to account for on-site buildings, where applicable.

Table 4.4: Calculation of Specific Noise Level at Receptor 2 - Daytime

Plant	Calculated L_W/ Measured Noise Level (dB)	Assumed Activity Duration (seconds)	Distance to Receptor (m)	Reference Time Period (seconds)	Soft Ground Attenuation and Line of Sight Removal (dB)	Calculated Specific Noise Level at Receptor (dB)
2 x CHP	68	3600	209	3600	-5.7	36.0
Exhaust Stack	70.5	3600	191	3600	-5.5	19.4
Digester Loading Pump	71.8	120	275	3600	-16.9	-8.7
Hydraulic Pump	74.3	3600	318	3600	-17.2	1.0
Mixing Pit Pump	70.2	3600	318	3600	-17.2	-3.1
Reception Building	69.2	3600	231	3600	-6.6	35.4

Receptor 3 – 3 Coursers Road

Table 4.5 calculates the specific noise level at Receptor 3 (3 Coursers Road) for the daytime period. Additionally, full (-10dB) or partial line of sight (-5dB) removal has been applied to certain plant items to account for on-site buildings, where applicable.

Table 4.5: Calculation of Specific Noise Level at Receptor 3 - Daytime

Plant	Calculated L_W/ Measured Noise Level (dB)	Assumed Activity Duration (seconds)	Distance to Receptor (m)	Reference Time Period (seconds)	Soft Ground Attenuation and Line of Sight Removal (dB)	Calculated Specific Noise Level at Receptor (dB)
2 x CHP	68.0	3600	405	3600	-7.7	28.2
Exhaust Stack	70.5	3600	405	3600	-7.7	10.7
Digester Loading Pump	71.8	120	474	3600	-18.0	-14.5
Hydraulic Pump	74.3	3600	486	3600	-18.1	-3.5
Mixing Pit Pump	70.2	3600	486	3600	-18.1	-7.6
Reception Building	69.2	3600	413	3600	-17.7	19.2

Table 4.6 calculates the resulting rating level at all Receptors during the daytime period.

Table 4.6: Calculation of Rating Level at All Receptors for Daytime Period

Receptor	Calculated Combined Specific Noise Level at Receptor (dB)	Calculated Combined Rating Level, $L_{A,r}$ (dB)	Lowest Average Measured Background Sound Level, $L_{A90,1hr}$ (dB)	Criteria (dB)	Difference + / - (dB)
R1 – Coursers Farm	30.8	34.9	54.0	$L_{A,r} = L_{A90}$	-19.1

R2 – 2 Coursers Road	38.7	43.6	54.0		-10.4
R3 – 3 Coursers Road	29.2	34.5	54.0		-19.5

Table 4.6 indicates that the rating level will fall comfortably below the criteria noise level for the daytime period, at all receptors, and as such no consideration of mitigation measures is required.

Under the heading 'Indicative BAT Requirements', the EPR guidelines for noise indicate that justification should be given where the rating level exceeds the numerical value of the background noise level ($L_{A90,t}$) or 50dB $L_{Aeq,t}$ by day (free-field) when assessed at local noise-sensitive receptors.

Table 4.7 compares the predicted specific sound pressure level for the daytime period at each receptor with the absolute criteria.

Table 4.7: Comparison of Specific Sound Pressure Level with EPR Absolute Criteria for Daytime Period

Receptor	Calculated Specific Sound Pressure Level at Receptor (dB)	Daytime Criteria (dB)	Difference +/- (dB)
R1 – Coursers Farm	30.8	50	-19.2
R2 – 2 Coursers Road	38.7	50	-11.3
R3 – 3 Coursers Road	29.2	50	-20.8

Table 4.7 indicates that the EPR benchmark criteria will not be exceeded at all receptors during the daytime period.

4.1.2 Night-time BS4142 Assessment

For the night-time assessment, it is assumed that no deliveries or activity within the reception building will take place.

Receptor 1 – Coursers Farm

Table 4.8 calculates the specific noise level at R1 for the night-time period.

Table 4.8: Calculation of Specific Noise Level at Receptor 1 – Night-time

Plant	Calculated L_W/ Measured Noise Level (dB)	Assumed Activity Duration (seconds)	Distance to Receptor (m)	Reference Time Period (seconds)	Soft Ground Attenuation and Line of Sight Removal (dB)	Calculated Specific Noise Level at Receptor (dB)
2 x CHP	68	900	212	900	-16.4	25.1
Exhaust Stack	70.5	900	212	900	-16.4	7.6
Digester Loading Pump	71.8	120	281	900	-14.2	-0.2
Hydraulic Pump	74.3	900	260	900	-14.2	5.8
Mixing Pit Pump	70.2	900	260	900	-14.2	1.07

Receptor 2 – 2 Coursers Road

Table 4.9 calculates the specific noise level at R2 for the night-time period.

Table 4.9: Calculation of Specific Noise Level at Receptor 2 – Night-time

Plant	Calculated L_W/ Measured Noise Level (dB)	Assumed Activity Duration (seconds)	Distance to Receptor (m)	Reference Time Period (seconds)	Soft Ground Attenuation and Line of Sight Removal (dB)	Calculated Specific Noise Level at Receptor (dB)
2 x CHP	68.0	900	209	900	-5.7	36.0
Exhaust Stack	70.5	900	191	900	-5.5	19.4
Digester Loading Pump	71.8	120	275	900	-16.9	-2.6
Hydraulic Pump	74.3	900	318	900	-17.2	1.0
Mixing Pit Pump	70.2	900	318	900	-17.2	-3.1

Receptor 3 – 3 Coursers Road

Table 4.10 calculates the specific noise level at R3 for the night-time period.

Table 4.10: Calculation of Specific Noise Level at Receptor 3 – Night-time

Plant	Calculated L_W/ Measured Noise Level (dB)	Assumed Activity Duration (seconds)	Distance to Receptor (m)	Reference Time Period (seconds)	Soft Ground Attenuation and Line of Sight Removal (dB)	Calculated Specific Noise Level at Receptor (dB)
2 x CHP	68.0	900	405	900	-7.7	28.2
Exhaust Stack	70.5	900	405	900	-7.7	10.7
Digester Loading Pump	71.8	120	474	900	-18.0	-8.5
Hydraulic Pump	74.3	900	486	900	-18.1	-3.5
Mixing Pit Pump	70.2	900	486	900	-18.1	-7.6

Table 4.11 calculates the resulting rating level at all Receptors during the night-time period.

Table 4.11: Calculation of Rating Level at All Receptors for Night-time Period

Receptor	Calculated Combined Specific Noise Level at Receptor (dB)	Calculated Combined Rating Level, $L_{A,r}$ (dB)	Lowest Average Measured Background Sound Level, $L_{A90,15mins}$ (dB)	Criteria (dB)	Difference + / - (dB)
R1 – Coursers Farm	25.2	31.2	49.3	$L_{A,r} = L_{A90}$	-18.1
R2 – 2 Coursers Road	36.1	42.0	49.3		-7.3

R3 – 3 Coursers Road	28.3	34.2	49.3		-15.1

Table 4.11 indicates that the rating level will fall below the criteria noise level for the night-time period, at all receptors, and as such no consideration of mitigation measures is required.

Under the heading 'Indicative BAT Requirements', the EPR guidelines for noise indicate that justification should be given where the rating level exceeds the numerical value of the background noise level ($L_{A90,t}$) or 45dB $L_{Aeq,t}$ by night (façade) when assessed at local noise-sensitive receptors.

Table 4.12 compares the predicted specific sound pressure level for the night-time period at each receptor with the absolute criteria.

Table 4.12: Comparison of Specific Sound Pressure Level with EPR Absolute Criteria for Night-time Period

Receptor	Calculated Specific Sound Pressure Level at Receptor (dB)	Night-time Criteria (dB)	Difference +/- (dB)
R1 – Coursers Farm	25.2	45	-19.8
R2 – 2 Coursers Road	36.1	45	-8.9
R3 – 3 Coursers Road	28.3	45	-16.7

Table 4.12 indicates that the EPR benchmark criteria will not be exceeded at all receptors during the night-time period.

5.0 CONCLUSION

Resource and Environmental Consultants Limited have been commissioned by Agrivert to complete a Noise Impact Assessment in order to determine the impact of an Anaerobic Digestion Facility at Coursers Farm, St Albans as part of the Environmental Permit.

This assessment has been undertaken to identify key noise sources associated with the AD Facility and to determine their potential impact upon the closest noise-sensitive residential receptors.

A noise survey has been completed in order to measure the background and ambient sound levels at a location which was considered representative of the closest residential receptors to the Site.

The Noise Impact Assessment has shown that the predicted daytime and night-time rating levels at the closest receptors due to the operation of the AD Facility should fall comfortably below the adopted criteria.

Therefore, noise should not give rise to an adverse impact at the closest receptors and is in accordance with the following advice given in NPPF:

> *"avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of development; and,*
>
> *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions."*

Additionally, the predicted specific sound pressure levels falls below the absolute criteria given in the EPR Guidelines.

APPENDIX I LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Limited and the Client as indicated in Section 1.2.

2. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

3. REC cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by REC is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by REC in this connection without their explicit written agreement there to by REC.

APPENDIX II GLOSSARY OF ACOUSTICAL TERMINOLOGY

Noise

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A1: Typical Sound Pressure Levels

Sound Pressure Level dB(A)	Location
0	Threshold of hearing
20 - 30	Quiet bedroom at night
30 - 40	Living room during the day
40 - 50	Typical office
50 - 60	Inside a car
60 - 70	Typical high street
70 - 90	Inside factory
100 - 110	Burglar alarm at 1m away
110 - 130	Jet aircraft on take off
140	Threshold of pain

Acoustic Terminology

Table A2: Terminology

Descriptor	Explanation
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} & L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Fast	A time weighting used in the root mean square section of a sound level meter with a 125millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000millisecond time constant.

APPENDIX III FIGURES

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Figure 1

Proposed Site Layout

APPENDIX IV MEASURED NOISE LEVEL DATA

Table A1: Measured Background Sound Levels at NMP1

Date and Time	Measured Sound Pressure Level	
	$L_{Aeq,1hr}$	$L_{A90,1hr}$
22/01/2016 11:16	59.5	56.3
22/01/2016 12:16	57.2	55.3
22/01/2016 13:16	57	55.6
22/01/2016 14:16	59.3	57.7
22/01/2016 15:16	59.2	57.2
22/01/2016 16:16	59	57.2
22/01/2016 17:16	58.2	56.3
22/01/2016 18:16	59.8	58.2
22/01/2016 19:16	59.9	58.7
22/01/2016 20:16	58.7	57.1
22/01/2016 21:16	58.1	56.4
22/01/2016 22:16	57.3	55.5
22/01/2016 23:16	56.2	54.6
23/01/2016 00:16	56	54.3
23/01/2016 01:16	54.6	52.3
23/01/2016 02:16	53.8	51.7
23/01/2016 03:16	55	52.9
23/01/2016 04:16	55.2	53.2
23/01/2016 05:16	55.9	54.2
23/01/2016 06:16	58.5	56.2
23/01/2016 07:16	60.1	59
23/01/2016 08:16	60.5	59.2
23/01/2016 09:16	58	56.6
23/01/2016 10:16	55.6	54.1
23/01/2016 11:16	56	54.1
23/01/2016 12:16	57.2	56.1
23/01/2016 13:16	56.4	54.1
23/01/2016 14:16	55.5	53.8
23/01/2016 15:16	59.6	55.1
23/01/2016 16:16	61	55.7
23/01/2016 17:16	56.3	55.1
23/01/2016 18:16	55.6	54.4
23/01/2016 19:16	55	53.6
23/01/2016 20:16	54.8	53.4
23/01/2016 21:16	54.3	52.2
23/01/2016 22:16	53.7	51.8
23/01/2016 23:16	54.9	52.5
24/01/2016 00:16	53.5	50.9
24/01/2016 01:16	51.3	48.7
24/01/2016 02:16	50.7	46.8
24/01/2016 03:16	49.2	46.2
24/01/2016 04:16	51.3	47.5
24/01/2016 05:16	51.5	49.1
24/01/2016 06:16	53.4	51.1
24/01/2016 07:16	54.1	52.1
24/01/2016 08:16	55.6	53.8
24/01/2016 09:16	56.8	55.1
24/01/2016 10:16	56.9	55.3
24/01/2016 11:16	57.1	55.5
24/01/2016 12:16	56.3	54.6
24/01/2016 13:16	55.6	53.9
24/01/2016 14:16	56	54.5
24/01/2016 15:16	56.1	54.1
24/01/2016 16:16	56	54.6
24/01/2016 17:16	56.3	55.1
24/01/2016 18:16	56.1	54.7
24/01/2016 19:16	56	54.5
24/01/2016 20:16	55.4	53.6
24/01/2016 21:16	53.9	52.4
24/01/2016 22:16	52.2	50.6

24/01/2016 23:16	52.5	50.8
25/01/2016 00:16	51.6	49.7
25/01/2016 01:16	51	49
25/01/2016 02:16	50.9	49.1
25/01/2016 03:16	51.7	50
25/01/2016 04:16	53.4	51.7
25/01/2016 05:16	56.4	54.2
25/01/2016 06:16	57.9	56.9
25/01/2016 07:16	60.5	56.4
25/01/2016 08:16	56.7	54.9
25/01/2016 09:16	57.7	55.5
25/01/2016 10:16	57.8	55.6
25/01/2016 11:16	57.5	55.8
25/01/2016 12:16	58.2	55.5