APPENDIX 1.1
SITE LOCATION PLAN

REPLACEMENT PIG REARING UNIT WITH NEW BUILDINGS, FEED MILL AND STAFF FACILITIES BUILDING, SLURRY TANK, SURFACE WATER ATTENUATION POND, HARDSTANDING, LANDSCAPING, ACCESS IMPROVEMENTS AND ASSOCIATED INFRASTRUCTURE
REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY, BEDS. SG19 3BQ
LOCATION PLAN

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Promap®

Plan No. B-930P

Scale 1:2500

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APPENDIX 2.1
PRE-APPLICATION ENQUIRY FOR THE PROPOSED DEVELOPMENT

Howard House,
17 Church Street,
St Neots,
Cambs PE19 2BU

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Ms L Newcombe
Development Management Team Leader (South)
Development Services
Huntingdonshire District Council
Pathfinder House
St Mary's Street
Huntingdon, Cambs, PE29 3TN

Date: 4th July 2017
Our Ref: MLP/M-627P
Your Ref:

Dear Ms Newcombe

PRE-APPLICATION ENQUIRY IN RESPECT OF EXPANSION OF PIG REARING UNIT AT REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY SG19 3BQ

We have been instructed to seek officer's views on proposals to expand the above pig rearing unit and we enclose herewith a pre-application request for advice. With this letter we are enclosing a cheque for the sum of £138 to cover the Council's fee along with the following:-

- Completed form and EIR Notice
- Site Location Plan M-627P/1
- Aerial photograph M-627P/2
- Site photographs M-627P/3
- Proposed Site Layout Plan 10342-07 Rev. B

Existing Buildings and Complex

The current pig rearing unit has evolved over a number of years and houses 250 sows employing 2 full time and 2 part time staff. The buildings on the site have a floor area of approximately 3,022 sq. metres comprising:

- A dry sow house
- Fattening house
- Service house
- Farrowing house
- Farrowing unit
- Portapig unit
- Boar house
- Two nursery Units
- Trowbridge units
- Modern Fattening Unit
- Two grower units
- Mill and mix building
- Sluurry Store
- Residential dwelling

From the photographs it will be seen the buildings are a range of different forms, ages and materials with the tallest being the dry sow house, which is 6.0m to eaves and 7.6m to ridge.

Proposed Operation

To enable the pig rearing unit to be more viable against increasing competition, the decision has been taken to invest in the replacement of buildings that will enable the number of sows to be increased from 250 to 1,200 over a 4-5 year period.

Directors: Philip Halmshaw BSc (Hons) MRICS, Martin Page DipEP, MRTPI, Sheila Smyth BSc (Hons) MRICS
Associates: Martin Olley BSc MRICS, Howard Westgate BSc (Hons) MRICS, Simon Tindle BA (Hons) Dip TP MRTPI
Consultant: David Barford FRICS

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RICS RTPI Chartered Town Planners

This will involve new replacement buildings with a floor area of circa 14,625 sq, metres, as illustrated on the attached Proposed Site Layout plan. The new buildings will be approx. 4.3m to eaves and 6 m to the ridge, with the large dry sow house being 7.0m to ridge and therefore lower than the current building.

The buildings will be steel portal frames with fibre cement roof sheets with appropriate colours to blend with the landscape.

The layout facilitates an attenuation pond that will enable surface water to be managed to green field run-off rates. The layout also identifies the intention to introduce new landscape planting around the northern and eastern edges of the site that will screen the new built form from the bridleway and footpath to the north of the site.

The expanded farm operation will employ 8 to 10 staff.

Contamination/Odour

Aside from Redwood Farm house the nearest residential property is in excess of 300 metres away to the north east.

The current pig rearing unit, slurry and waste is carefully managed to avoid nuisance complaints and this will remain the case. Although the expansion will increase the number of sows, the nature of the activities on the site will not differ and there is not felt to be any greater risk of contamination or odour complaints. To minimise the risk of odour the muck will be stored under cover in a building, with a covered tank to hold the dirty water run-off. These are positioned furthest from the property to the north east.

Transport & Access

The current farm access will be improved with either widening works or the provision of passing bays.

The current farm operation typically generates 4 lorry deliveries and 3 lorry collections per week. With the more efficient operation it is envisaged the expanded unit will generate a similar number of lorry deliveries and collections per week, as these will be organised to be more efficient. The proposal will not therefore materially increase the number of vehicle generation trips.

Policy

The proposal will involve the expansion of an existing pig unit in the countryside and in policy terms this is considered an appropriate location for the larger unit.

We would be grateful to receive your advice at the earliest and should you have any questions or require further clarification please do not hesitate to contact the writer. In relation to visiting the site, for animal health and hygiene reasons visitors to the farm have to be carefully monitored and in the circumstances can you please liaise direct with the writer if an officer intends to visit the farm.

Yours sincerely

MARTIN PAGE MRTPI
BARFORD + CO

Mobile: 07989 999568

E-mail: mpage@barfords.co.uk

Enc

MLP/M-627P HDC Newcombe04.07.17

The Hunts Post HUNTINGDONSHIRE BUSINESS AWARDS 2017

www.huntingdonshire.gov.uk
Email: developmentcontrol@huntingdonshire.gov.uk
Tel: 01480 388853

Planning Services, Pathfinder House, St. Mary's Street, Huntingdon, PE29 3TN

Huntingdonshire
DISTRICT COUNCIL

Application for Preliminary Enquiry

It is important that you read the checklist overleaf as incorrect completion may delay the processing of your application.
EIR FORM ON PAGE 2 MUST BE COMPLETED

1. Applicant Name and Address

Title: _____ First name: _____

Last name: _____

Company (optional): Redwood Pigs Ltd.

Address 1: C/O Agent

Address 2: _____

Address 3: _____

Town: _____

County: _____

Country: _____

Postcode: _____

Email: _____

Phone: _____

Mobile: _____

2. Agent Name and Address

Title: Mr First name: Martin

Last name: Page

Company (optional): Barford + Co

Address 1: Howard House

Address 2: 17 Church Street

Address 3: _____

Town: St. Neots

County: Cambs.

Country: UK

Postcode: PE19 2BU

Email: mpage@barfords.co.uk

Phone: 01480 479084

Mobile: 07989999568

3. Site Address

Address 1: Redwood Farm Address 2: Caxton Road

Town: Great Gransden Post Code: SG19 3BQ

4. Description of the Proposal

Please describe the proposed development, including any change of use:

Expansion of pig rearing unit.

5. Does this application relate to a property which is, or is likely to be, liable for business rates?

☐ **Yes** ☑ **No**

If yes, please continue to question 6.

6. Will this property accommodate a newly established or growing business?**

☐ **Yes** ☑ **No**

Type of preliminary enquiry (PENQ)

☑ **Written Only** ☐ **Meeting and Written** ☐ ***Meeting Only**
(for initial meeting for major developments* only)

** Please note: if your application relates to business set up or growth, we recommend you choose meeting and written advice as this will include access to business support services.

Pre-Application Advice – Environmental Information Regulations

Requests may be received in respect of Environmental Information Regulations legislation to disclose information.
The background as to why this might happen is contained in a report considered and approved by the Development Control Panel on 24 April 2006.

Although there are various exceptions within the legislation that might prevent disclosure of an enquiry, all exceptions are subject to the 'public interest' test.This means that even though information may be covered by an exception, we must still disclose it if the public interest in disclosing the information outweighs withholding it.

Declaration:

I understand that, as a result of advice in respect of Environmental Information Regulations legislation, it is possible that the enquiry I make now, together with any response made by this council, could be made available for public inspection at some future date.

I wish to continue with your preliminary enquiry on this basis.

Name: MARTIN PAGE Signature: Martin Page.

Date: 4/7/17.

Contact Address: BARFORD + Co.
HOWARD HOUSE, 17 CHURCH STREET, ST. NEOTS. CAMBS PE19 2BU

Contact Phone Number: 01480 479084.

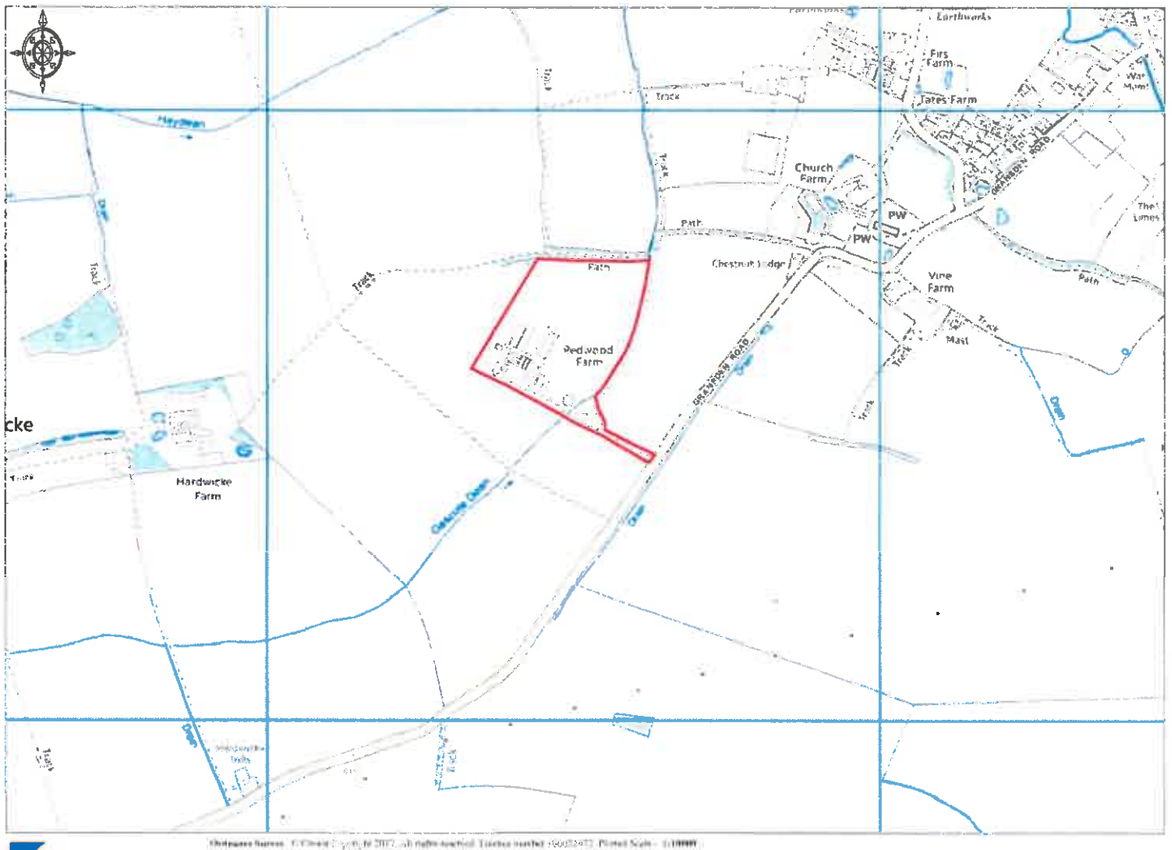
Email: mpage@barfords.co.uk

Site Address: REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN SG19 3BQ

If there are reasons why you consider that the information should not be made public in accordance with the exceptions set out in the Regulations, for example where there are issues of commercial sensitivity, please outline them below. We reserve the right to release the information, where appropriate, in accordance with the requirements of the legislation.

PRE-APPLICATION ENQUIRY IN RESPECT OF EXPANSION OF PIG REARING UNIT AT REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY SG19 3BQ

LOCATION PLAN



Promap®

Scale 1:10,000

Plan No. M-627P/1

Barford+co

PRE-APPLICATION ENQUIRY IN RESPECT OF EXPANSION OF PIG REARING UNIT AT REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY SG19 3BQ

Plan No. M-627P/2

Barford+co

PRE-APPLICATION ENQUIRY IN RESPECT OF EXPANSION OF PIG REARING UNIT AT REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY SG19 3BQ

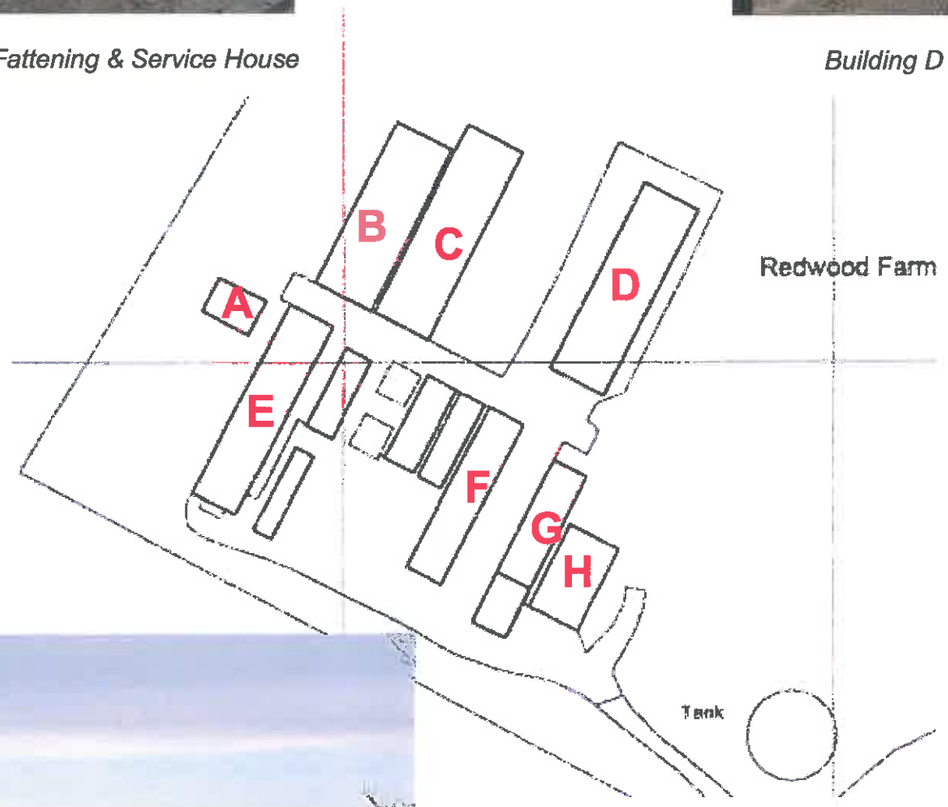
PHOTOS

Building A Farrowing House

Buildings B & C Fattening & Service House

Building D Dry Sow House

Building E Farrowing Unit



Building H Mill & Mix Building

View from the south.

Building F & G Grower Units

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Plan No. M-627P/3

APPENDIX 2.2
PRE-APPLICATION RESPONSE

Pathfinder House, St Mary's Street
Huntingdon. PE29 3TN
Development.control@huntingdonshire.gov.uk

01480 388388

www.huntingdonshire.gov.uk

Mr M Page
Barford + Co
17 Church Street
St Neots
PE19 2BU

By email only

Dear Mr Page,

Proposal: Expansion of a pig rearing unit

Site address: Agricultural Buildings, Redwood Farm, Caxton Road, Gt Gransden

Applicant: Redwood Pigs Ltd c/o Barford + Co (FAO Mr M Page)

30 August 2017

Thank you for your preliminary enquiry received on 05 July 2017 and described above.

Key planning policies:
The National Planning Policy Framework (2012).
Huntingdonshire Local Plan (1995): E1; E7; E11; EN17; EN18; EN20; EN25
Huntingdonshire Local Plan Alterations (2002): N/A
Huntingdonshire Local Development Framework Core Strategy (2009): CS1
Huntingdonshire's Draft Local Plan to 2036 (Stage 3): LP1; LP10; LP11; LP13; LP15; LP18, LP21; LP29
Huntingdonshire's Local Plan to 2036: Consultation Draft 2017: LP1; LP8; LP10; LP11; LP13; LP14; LP15; LP16 and LP18.

Supplementary Planning Guidance / Other relevant documents:
- Huntingdonshire Design Guide (2017)
- Huntingdonshire Landscape and Townscape Assessment (2007)

Local policies are viewable at https://www.huntingdonshire.gov.uk

Most recent relevant planning history:
N/A

Having regard to the relevant planning guidance and policies, site history and other planning considerations, the main issues in relation to your enquiry are:
- The principle of the proposed development;
- Design and the impact upon the character/appearance of the area;
- The impact on the amenity of neighbours

Principle:

The presumption in favour of sustainable development is clearly outlined within the NPPF, with the goal of creating positive improvements in the quality of the built, natural and historic environment, which includes making it easier for jobs to be created and improving the conditions in which people work and travel.

Policies E1, E7 and E11 offer broad support for economic development, subject to the development complying with other local policies which seek to ensure that any environmental impacts which may arise from a development are taken into account.

I would stress the importance of the criteria outlined in LP18 of Huntingdonshire's Local Plan to 2036: Consultation Draft 2017, with a particular emphasis on g). Should a full application be submitted, these points would form the basis of an assessment.

For reference:

LP18 - Expansion of an existing business:
A proposal for the expansion of an established business within its existing operational site will be supported.
A proposal for the expansion of an established industrial or rural business on land outside of its existing operational site in the open countryside will be supported where it is demonstrated that:

d. consideration has been given to reuse or replacement of existing buildings in preference to new build;
e. any opportunities to make more efficient use of land within the existing site boundary are not suitable for the proposed use;
f. it avoids the irreversible loss of the best and most versatile agricultural land (Grade 1 to 3a) particularly Grade 1 where possible and should use land of lower agricultural value in preference to land of higher agricultural value; and
g. the scale, character and siting of the proposal will not have a detrimental impact on its immediate surroundings and the wider landscape.
A rural business is one which has a legitimate reason to be located in the countryside, including but not limited to agriculture, horses, horticulture or forestry.

Sustainable economic development (including the expansion of established rural businesses) receives broad policy support at both national and local level. I would suggest that the principle of expansion would likely receive officer support subject to all other material considerations (noise, odour, traffic/highways impacts etc.) being satisfactorily addressed.

Please note that installations for the intensive rearing of pigs with more than 900 places for sows would fall within Schedule 1 of the Environmental Impact Assessment Regulations (2017). Should 900 spaces be exceeded, an Environmental Impact Assessment would be required.

Design and the impact upon the character/appearance of the area:
The supporting information identifies that the ridge height of the tallest building will reach a maximum height of approx. 7m, with other buildings reaching approx. 6m. The supporting information indicates that the proposed ridge heights would be below those of the existing buildings on the application site. I would suggest that this aspect of the design would be considered positively.
Similarly, the introduction of structural landscaping around the north and east boundaries would be encouraged in order to lessen the visual impact of the development.
Should a full application be submitted, I would suggest that details of current and anticipated vehicle movements (deliveries/collections/staff movements) are included within the supporting documentation.

Residential amenity:
Please note that a full assessment on the potential impact on amenity cannot be undertaken until such time as a planning application is submitted and consultations with neighbours undertaken. Given the separation distance between the application site and the nearest neighbouring dwelling, it is considered that the proposed expansion would not have a significant detrimental impact upon the amenity of neighbouring occupants of the application site in terms of overlooking, overshadowing or by way of being overbearing.

Conclusion:

- General policy support for rural economic development
- Sensitive countryside setting requires consideration of visual impact/landscape mitigation
- EIA thresholds should be taken into account at an early stage

C er matters:
If a planning application is received, I would expect to consult the following:

Statutory consultees:
- Adjoining landowners
- Great Gransden Parish Council
- LLFA

Other consultees:
- CCC Highways/HDC Transport; HDC Landscape; HDC Environmental Health

Please note the following:

Developer contributions:
Community Infrastructure Levy:
Huntingdonshire District Council (HDC) became a Community Infrastructure Levy (CIL) Charging Authority on the 1st May 2012. The Council is obliged to collect the levy from liable parties once development that received planning permission on or after the 1st May 2012 commences. Full details are available here. A CIL calculator is available here.

I would stress that the views stated in this letter are an expression of officer opinion only and have been prepared in accordance with the Procedures for Pre-Application Advice set out on the Planning pages on the Council's website www.huntsdc.gov.uk. They are made without prejudice to the determination of any subsequent application for planning permission. The advice provided is correct at the time of writing. Changes in circumstances on the ground, planning decisions and/or changes in planning policy after the writing of this letter may have an impact on the acceptability of the proposal. If you propose to pursue the matter further, you are strongly encouraged to discuss the proposal with neighbours.

If you would like a translation of this document, a large text version or an audio version, please contact us on 01480 388388 and we will try to accommodate your needs.

Yours sincerely,

James Lloyd
Development Management Officer
Planning Services
01480 388389
James.lloyd@huntingdonshire.gov.uk

APPENDIX 2.3
FORMAL SCOPING REQUEST

Howard House,
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Cambs PE19 2BU

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Ms L Newcombe
Development Management Team Leader (South)
Development Services
Huntingdonshire District Council
Pathfinder House
St Mary's Street
Huntingdon, Cambs, PE29 3TN

Date: 12th October 2017
Our Ref: MLP/M-627/P
Your Ref: 17/70147/PENQ

Dear Ms Newcombe

SCOPING OPINION REQUEST UNDER REGULATION 15 OF THE TOWN AND COUNTY PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 2017 IN RESPECT OF EXPANSION OF PIG REARING UNIT AT REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY SG19 3BQ

Further to our Pre-application enquiry and the advice in the letter dated 30th August highlighting that a unit of more than 900 places for sows would fall within Schedule 1 of the Environmental Impact Assessment Regulations (2017), we write requesting a Scoping Opinion in accordance with Regulation 15 on what issues an Environmental Statement should contain.

As required by Regulation 15(2) this letter provides:

i) A plan sufficient to identify the land;
ii) A brief description of the development and a brief description of the nature and purpose of the development, including its location and technical capacity;
(iii) An explanation of the likely significant effects of the development on the environment.

i) The Land

The proposed development relates to the area edged red on the Location Plan that extends approximately to 5.2 ha and comprises open arable farm land and a pig rearing unit that houses 250 sows with buildings having a floor area of approximately 3,022 sq. metres.

ii) Proposed Development

To enable the pig rearing unit to be more viable against increasing competition, the decision has been taken to invest in the replacement of buildings that will enable the number of sows to be increased from 250 to 1,200 over a 4-5 year period.

This will involve new replacement buildings with a floor area of circa 14,625 sq, metres, as illustrated on the attached Proposed Site Layout plan.

iii) Explanation of the likely significant effects of the development on the environment

Landscape impact

The buildings will be steel portal frames with fibre cement roof sheets with appropriate colours to blend with the landscape. Although the footprint of the buildings will increase from 3,022 sq metres to about 14,625 sq metres, the building height will not be any greater and with the surrounding established screening, and proposed new screening, it is not considered the proposal will have any significant impact on the wider landscape.

Directors: Philip Halmshaw BSc (Hons) MRICS, Martin Page DipEP, MRTPI, Sheila Smyth BSc (Hons) MRICS
Associates: Martin Olley BSc MRICS, Howard Westgate BSc (Hons) MRICS, Simon Tindle BA (Hons) Dip TP MRTPI, Clayton Smalley BSc
Consultant: David Barford FRICS

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RICS RTPI Chartered Town Planners

Surface Water

The proposed development will involve an attenuation pond that will enable surface water to be managed to green field run-off rates.

Contamination/Odour

Aside from Redwood Farm house, the nearest residential property is in excess of 300 metres away to the north east.

Furthermore the current pig rearing unit, slurry and waste is carefully managed to avoid nuisance complaints and this will remain the case. Although the expansion will increase the number of sows, the nature of the activities on the site will not differ and there is not felt to be any greater risk of contamination or odour impact. To minimise the risk of odour the muck will be stored under cover in a building, with a covered tank to hold the dirty water run-off. These are positioned furthest from the property to the north east.

Transport & Access

The current farm access will be improved with either widening works or the provision of passing bays.

The current farm operation typically generates 4 lorry deliveries and 3 lorry collections per week. With the more efficient operation it is envisaged the expanded unit will generate a similar number of lorry deliveries and collections per week, as these will be organised to be more efficient. The proposal will not therefore materially increase the number of vehicle generation trips.

Noise

The proposal will not introduce any new activities on the site and the expansion of the unit is not considered to have any noise implications.

Biodiversity

The site has limited significance in biodiversity terms and the redevelopment could incorporate measures to enhance the local biodiversity.

We look forward to receiving your advice at the earliest in relation to the submission of an application and what issues an Environmental Statement should contain and if you require any further clarification please do not hesitate to contact me.

Yours sincerely

MARTIN PAGE MRTPI
BARFORD + CO

Mobile: 07989 999568

E-mail: mpage@barfords.co.uk

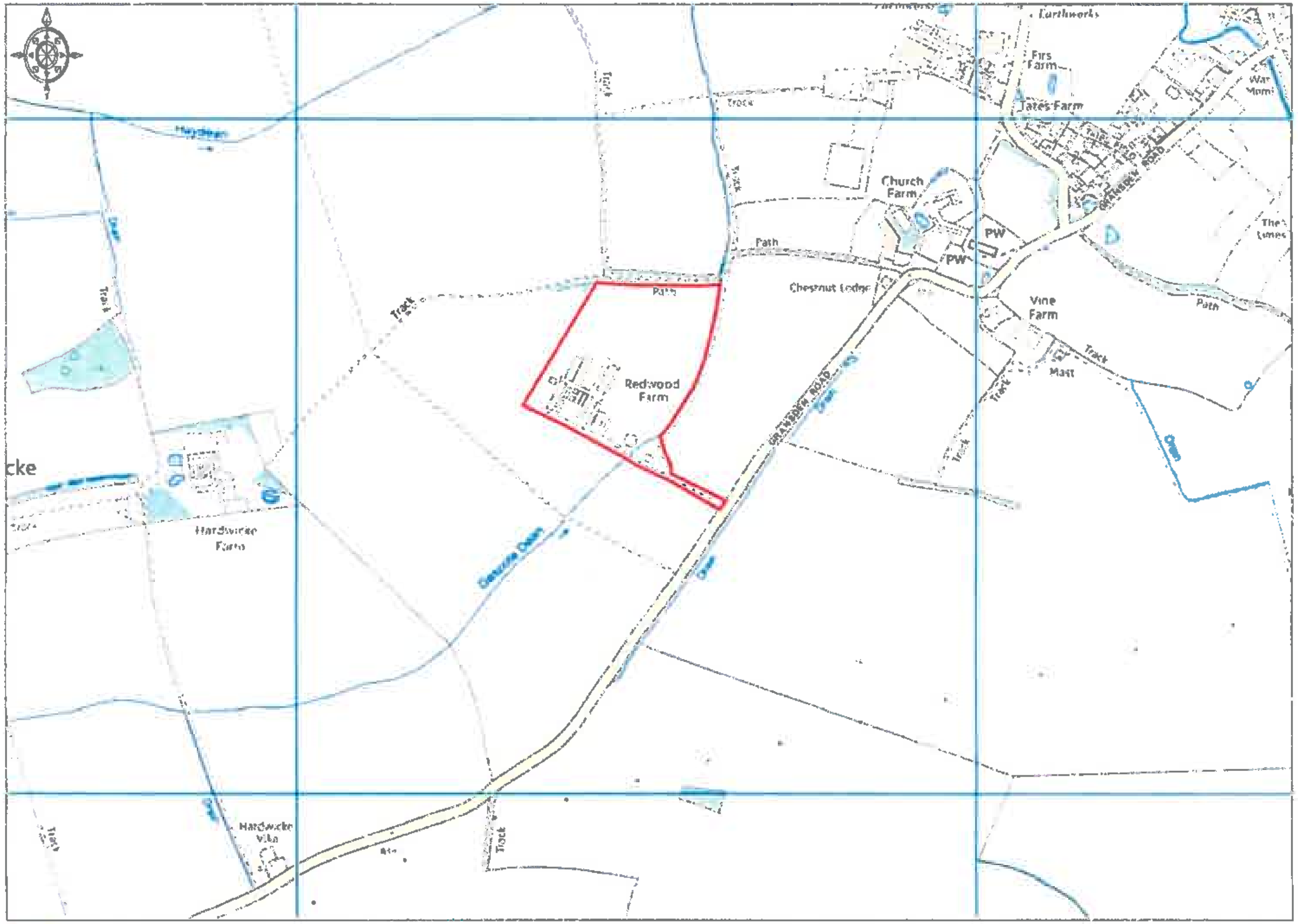
Enc

MLP/M-627P HDC Newcombe 12.10.17

The Hunts Post HUNTINGDONSHIRE BUSINESS AWARDS 2017

PROPOSED EXPANSION OF PIG REARING UNIT AT REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY SG19 3BQ

LOCATION PLAN



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Promap

Scale 1:10,000

Plan No. M-627P/1

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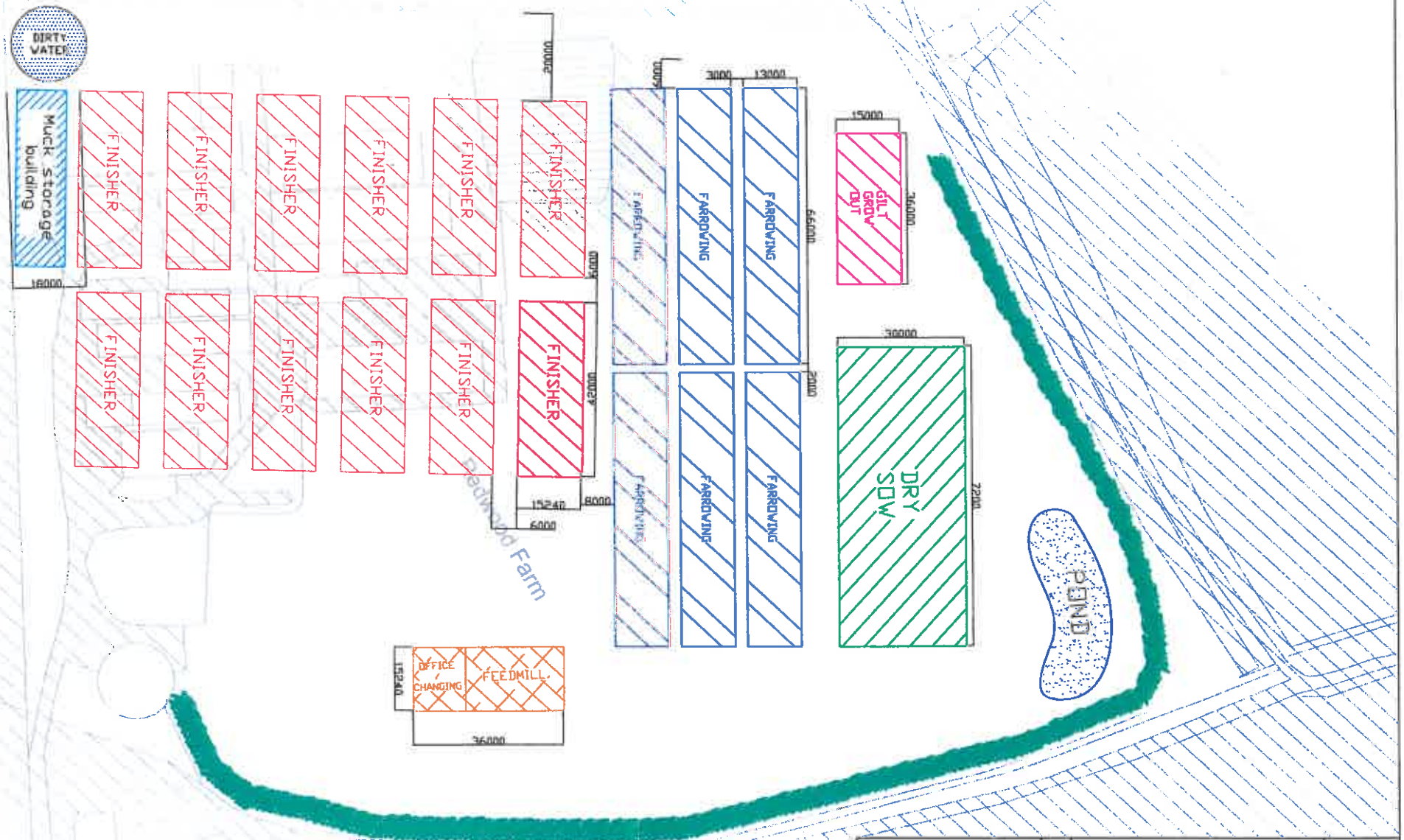

Quality Equipment

Heath Rd, Westpit, Bury St. Edmunds Suffolk, IP30 9NN
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Email: info@quality-equipment.co.uk

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Rev	Revision note	Date 10/05/2017
If in doubt, ask	Customer MILARD	Scale NTS
Dwg. Title	SITE LAYOUT	
Dwg. No 10342-07	Drawn by LS	Rev B

APPENDIX 2.4
SCOPING OPINION

Pathfinder House, St Mary's Street
Huntingdon. PE29 3TN
Development.control@huntingdonshire.gov.uk

01480 388388
www.huntingdonshire.gov.uk

Mr M Page
Barford + Co
Howard House
17 Church Street
St Neots
PE19 2BU

Our ref: **17/70223/SCOP**

20 November 2017

Dear Mr Page,

Scoping opinion request under regulation 15 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 in respect of expansion of pig rearing unit

Location: Redwood Farm, Caxton Road, Great Gransden, Sandy SG19 3BQ

With reference to your submission (16 October 2017), this letter forms the Scoping Opinion of the Local Planning Authority in respect of the proposed development outlined above.

This Scoping Opinion is based on the information set out in the following documents:

- Scoping Letter dated 12 October 2017
- Location Plan (M-627P/1)
- Site Layout (10342-07 Rev B)

The headings outlined in the submitted Scoping Letter are considered to provide a sound platform upon which an Environmental Statement could be developed.

I would suggest that the Environmental Statement refers to:

- Biodiversity/Ecology conservation
- Contamination/Odour
- Surface water drainage and wastewater disposal
- Landscape and visual character impact
- Noise
- Transport and Access
- Consideration of cumulative impacts

In order to inform this Scoping Opinion, the LPA consulted the following:

- Cambridgeshire County Council as Lead Local Flood Authority
- Cambridgeshire County Council Highways
- Cambridgeshire Wildlife Trust
- Environment Agency
- Great Gransden Parish Clerk
- HDC Environmental Health
- HDC Landscape
- Natural England
- South Cambridgeshire District Council

Responses:

Cambridgeshire County Council as Lead Local Flood Authority
The Environmental Impact Assessment Scoping Report submitted includes high level information of the surface water management proposals. Whilst we **support the principle** of attenuating surface water in a basin/pond and restricting runoff to greenfield rates as outlined within the scoping report; as LLFA we will expect a full flood risk assessment and/or surface water drainage strategy to be submitted to support the planning application.

Cambridgeshire County Council Highways
The scoping note indicates that the proposed expansion of the pig rearing unit would not increase vehicle movements and would propose to improve the access, given this I could have no objections to that proposed. The ES should fully cover the transport and access elements of the project.

Cambridgeshire Wildlife Trust
The proposed Environmental Statement (ES) should include a section on biodiversity/ecology. This will require, at a minimum, baseline information (e.g. from a Preliminary Ecological Appraisal) to identify ecological features, such as protected or priority species, priority habitats, or designated nature conservation sites, that could be impacted by the proposals, within the zone of influence of the proposals. If as stated in the Scoping letter the site has limited significance for biodiversity, the evidence provided in the ES with respect to ecology must be sufficient to justify this statement.

Factors to consider when determining potential impacts on ecological features include:

- Potential for impacts at all stages of development, e.g. construction and operation
- The importance of ecological features identified
- Characteristics of potential impacts e.g. type, extent, magnitude, duration
- Potential for cumulative impacts
- Appropriate measures to reduce impacts, following the mitigation hierarchy, i.e. avoidance, mitigation, compensation

Measures to enhance the site for biodiversity (as mentioned in the scoping letter) should also be outlined within the ES.

Further information and guidance on Ecological Impact Assessment has been produced by the Chartered Institute of Ecology and Environmental Management (CIEEM) and is available on their website.

Environment Agency
We regulate intensive pig and poultry farms under the Environmental Permitting Regulations (EPR). Pig and poultry farmers must apply to us for an environmental permit to operate if their livestock capacity exceeds:
750 sows;
2,000 production pigs over 30kg
40,000 poultry (includes chicken, layers, pullets, turkeys, ducks, quail and guinea fowl)

This application is for an increase from 250 sows to 1,2000 sows over a 4-5 year period. Therefore an environmental permit will be required. Information can be found on the gov.uk website below.
https://www.gov.uk/government/publications/intensive-farming-introduction-and-chapters

All buildings and infrastructure will need to comply with the permit standards. The site is located in Zone 3 of the Surface Water Protection Zone. It is not in a Drinking Water Protected Area.

Please note that the general prevailing wind for the UK is south westerly which might impact the village of Caxton from odour pollution. This would need to be taken into account when producing an odour management plan.

Great Gransden Parish Clerk
At their meeting on 6th November 2017, Parish Councillors unanimously resolved to recommend approval to this application on the ground that it is an expansion of an existing business and a modernisation. Councillors commented that the proposals must satisfy current legislation for units of this size as well as all legislation relating to animal production.

HDC Environmental Health
[HDC Environmental Health] would like to request an Odour Assessment in line with Institute of Air Quality Management (IAQM) Guidance on the Assessment of Odour for Planning (May 2014).

HDC Landscape
The scale of this proposal – almost a 500% increase in building footprint – as compared to the existing situation, means that a Landscape and Visual Impact Assessment to EIA standards is required.
The LVIA should include, but not be limited to, the following elements:

- Full details of the baseline landscape, including existing building footprints and heights, focussing mainly on an area within a radius of 1km from the site boundaries.
- Full details of the proposed development, its design and any mitigation proposals.
- Assessment of any landscape and visual effects, including cumulative ones.

All of the above should follow the best practice advice as set out in the "Guidelines for Landscape and Visual Impact Assessment," 3rd edition, published by Routledge 2013.

Natural England
Attached as an appendix.

At the time of writing, I am afraid that no response has been received from South Cambridgeshire District Council. However, should any response be received I will forward it across.

Please note the LPA will not be precluded from requiring additional information if it is considered necessary in connection with the Environmental Statement submitted with a future planning application.

If you wish to discuss this matter further, please contact James Lloyd on Direct Dial 01480 388389.

Yours sincerely,

Andy Moffat
Head of Development
Huntingdonshire District Council

Appendix

Date: 20 October 2017
Our ref: 229175
Your ref: 17/70223/SCOP

Development Management
Huntingdonshire District Council

BY EMAIL ONLY

Customer Services
Hornbeam House
Crewe Business Park
Electra Way
Crewe
Cheshire
CW1 6GL

T 0300 060 3900

Dear Sir/Madam

Environmental Impact Assessment Scoping consultation (Regulation 15 (3) (i) of the EIA Regulations 2011: Expansion of a pig rearing unit at Agricultural Buildings, Redwood Farm, Caxton Road, Great Gransden.

Thank you for seeking our advice on the scope of the Environmental Statement (ES) in your consultation letter dated 18 October 2017.

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

Case law[1] and guidance[2] has stressed the need for a full set of environmental information to be available for consideration prior to a decision being taken on whether or not to grant planning permission. Annex A to this letter provides Natural England's advice on the scope of the Environmental Impact Assessment (EIA) for this development.

Should the proposal be amended in a way which significantly affects its impact on the natural environment then, in accordance with Section 4 of the Natural Environment and Rural Communities Act 2006, Natural England should be consulted again.

We would be happy to comment further should the need arise but if in the meantime you have any queries please do not hesitate to contact us. For any queries relating to the specific advice in this letter only please contact Janet Nuttall on 020 802 65894. For any new consultations, or to provide further information on this consultation please send your correspondences to consultations@naturalengland.org.uk.

Yours faithfully

Janet Nuttall
Sustainable Land Use Adviser

[1] Harrison, J in *R. v. Cornwall County Council ex parte Hardy* (2001)
[2] *Note on Environmental Impact Assessment Directive for Local Planning* Authorities Office of the Deputy Prime Minister (April 2004) available from http://webarchive.nationalarchives.gov.uk/+/http://www.communities.gov.uk/planningandbuilding/planning/sustainabilityenvironmental/environmentalimpactassessment/noteenvironmental/

Annex A – Advice related to EIA Scoping Requirements

1. **General Principles**

Schedule 4 of the Town & Country Planning (Environmental Impact Assessment) Regulations 2011, sets out the necessary information to assess impacts on the natural environment to be included in an ES, specifically:

- A description of the development – including physical characteristics and the full land use requirements of the site during construction and operational phases.
- Expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed development.
- An assessment of alternatives and clear reasoning as to why the preferred option has been chosen.
- A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors.
- A description of the likely significant effects of the development on the environment – this should cover direct effects but also any indirect, secondary, cumulative, short, medium and long term, permanent and temporary, positive and negative effects. Effects should relate to the existence of the development, the use of natural resources and the emissions from pollutants. This should also include a description of the forecasting methods to predict the likely effects on the environment.
- A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.
- A non-technical summary of the information.
- An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.

It will be important for any assessment to consider the potential cumulative effects of this proposal, including all supporting infrastructure, with other similar proposals and a thorough assessment of the 'in combination' effects of the proposed development with any existing developments and current applications. A full consideration of the implications of the whole scheme should be included in the ES. All supporting infrastructure should be included within the assessment.

2. **Biodiversity and Geology**

2.1 Ecological Aspects of an Environmental Statement

Natural England advises that the potential impact of the proposal upon features of nature conservation interest and opportunities for habitat creation/enhancement should be included within this assessment in accordance with appropriate guidance on such matters. Guidelines for Ecological Impact Assessment (EcIA) have been developed by the Chartered Institute of Ecology and Environmental Management (CIEEM) and are available on their website.

The National Planning Policy Framework sets out guidance in S.118 on how to take account of biodiversity interests in planning decisions and the framework that local authorities should provide to assist developers.

2.2 Internationally and Nationally Designated Sites

The ES should thoroughly assess the potential for the proposal to affect designated sites. European sites (e.g. designated Special Areas of Conservation and Special Protection Areas) fall within the scope of the Conservation of Habitats and Species Regulations 2010. In addition paragraph 118 of the National Planning Policy Framework requires that potential Special Protection Areas, possible Special Areas of Conservation, listed or proposed Ramsar sites, and any site identified as being necessary to compensate for adverse impacts on classified, potential or possible SPAs, SACs and Ramsar sites be treated in the same way as classified sites.

Under Regulation 61 of the Conservation of Habitats and Species Regulations 2010 an appropriate assessment needs to be undertaken in respect of any plan or project which is (a) likely to have a significant effect on a European site (either alone or in combination with other plans or projects) and (b) not directly connected with or necessary to the management of the site.

Should a Likely Significant Effect on a European/Internationally designated site be identified or be uncertain, the competent authority (in this case the Local Planning Authority) may need to prepare an Appropriate Assessment, in addition to consideration of impacts through the EIA process.

Sites of Special Scientific Interest (SSSIs) and sites of European or International Importance (Special Areas of Conservation, Special Protection Areas and Ramsar sites)

The proposed development in this location triggers Natural England Impact Risk Zones (IRZs) for potential air quality impacts for the following sites:

- Hayley Wood SSSI (~ 4km);
- Waresley Wood SSSI (~ 4km);
- Elsworth Wood SSSI (~ 5km);
- Kingston Wood and Outliers SSSI (~ 5km); and

- Further information on the SSSI and its special interest features can be found at www.magic.gov . The Environmental Statement should include a full assessment of the direct and indirect effects of the development on the features of special interest within the Nene Washes and should identify such mitigation measures as may be required in order to avoid, minimise or reduce any adverse significant effects.

- Natura 2000 network site conservation objectives are available on our internet site http://publications.naturalengland.org.uk/category/6490068894089216

Based on the information currently available it is not possible to determine whether the proposal will have a significant adverse effect on the above sites, all of which are sensitive to changes in air quality. The Environmental Statement should include sufficient information to address this including an assessment of air quality impacts, through ammonia emissions from the proposed expansion to the pig rearing unit (including associated waste storage and disposal operations) and/or the associated contribution to nitrogen deposition.

Eversden and Wimpole Woods SSSI is located within approximately 7km of the proposed development. This site is also designated as a Special Area of Conservation (SAC). Natural England believes the qualifying bat interest feature of this European site is unlikely to be adversely affected by changes in air quality. This site also lies beyond the 5km distance threshold within which air quality impacts to SSSIs would be considered potentially significant. This site can therefore be scoped out of the detailed assessment.

2.3 Regionally and Locally Important Sites

The EIA will need to consider any impacts upon local wildlife and geological sites. Local Sites are identified by the local wildlife trust, geoconservation group or a local forum established for the purposes of identifying and selecting local sites. They are of county importance for wildlife or geodiversity. The Environmental Statement should therefore include an assessment of the likely impacts on the wildlife and geodiversity interests of such sites. The assessment should include proposals for mitigation of any impacts and if appropriate, compensation measures. Contact the local Wildlife Trust, geoconservation group or local sites body in this area for further information.

2.4 Protected Species - Species protected by the Wildlife and Countryside Act 1981 (as amended) and by the Conservation of Habitats and Species Regulations 2010

The applicant's letter suggests that the site has limited significance for biodiversity and that redevelopment could incorporate measures to enhance biodiversity.

The ES should assess the impact of all phases of the proposal on protected species. Natural England does not hold comprehensive information regarding the locations of species protected by law, but advises on the procedures and legislation relevant to such species. Records of protected species should be sought from appropriate local biological record centres, nature conservation organisations, groups and individuals; and consideration should be given to the wider context of the site for example in terms of habitat linkages and protected species populations in the wider area, to assist in the impact assessment.

The conservation of species protected by law is explained in Part IV and Annex A of Government Circular 06/2005 *Biodiversity and Geological Conservation: Statutory Obligations and their Impact within the Planning System*. The area likely to be affected by the proposal should be thoroughly surveyed by competent ecologists at appropriate times of year for relevant species and the survey results, impact assessments and appropriate accompanying mitigation strategies included as part of the ES.

In order to provide this information there may be a requirement for a survey at a particular time of year. Surveys should always be carried out in optimal survey time periods and to current guidance by suitably qualified and where necessary, licensed, consultants. Natural England has adopted standing advice for protected species which includes links to guidance on survey and mitigation.

2.5 Habitats and Species of Principal Importance
The ES should thoroughly assess the impact of the proposals on habitats and/or species listed as 'Habitats and Species of Principal Importance' within the England Biodiversity List, published under the requirements of S41 of the Natural Environment and Rural Communities (NERC) Act 2006. Section 40 of the NERC Act 2006 places a general duty on all public authorities, including local planning authorities, to conserve and enhance biodiversity. Further information on this duty is available in the Defra publication 'Guidance for Local Authorities on Implementing the Biodiversity Duty'.

Government Circular 06/2005 states that Biodiversity Action Plan (BAP) species and habitats, 'are capable of being a material consideration…in the making of planning decisions'. Natural England therefore advises that survey, impact assessment and mitigation proposals for Habitats and Species of Principal Importance should be included in the ES. Consideration should also be given to those species and habitats included in the relevant Local BAP.

The Cambridgeshire and Peterborough Environmental Records Centre (CPERC) and Cambridgeshire Wildlife Trust should be able to provide the relevant information on the location and type of priority habitat for the area under consideration.

3. Designated Landscapes and Landscape Character

Landscape and visual impacts

The consideration of landscape impacts should reflect the approach set out in the *Guidelines for Landscape and Visual Impact Assessment* (Landscape Institute and the Institute of Environmental Assessment and Management, 2013, 3rd edition), the *Landscape Character Assessment Guidance for England and Scotland* (Scottish Natural Heritage and The Countryside Agency, 2002) and good practice. The assessment should also include the cumulative effect of the development with other relevant existing or proposed developments in the area. In this context, Natural England would expect the cumulative impact assessment to include those proposals currently at Scoping stage. Due to the overlapping timescale of their progress through the planning system, cumulative impact of the proposed development with those proposals currently at Scoping stage would be likely to be a material consideration at the time of determination of the planning application.

The assessment should refer to the relevant National Character Areas which can be found on our website. Links for Landscape Character Assessment at a local level are also available on the same page.

4. Air Quality
Air quality in the UK has improved over recent decades but air pollution remains a significant issue, for example over 97% of sensitive habitat area in England is predicted to exceed the critical loads for ecosystem protection from atmospheric nitrogen deposition (England Biodiversity Strategy, Defra 2011). A priority action in the England Biodiversity Strategy is to reduce air pollution impacts on biodiversity. The planning system plays a key role in determining the location of developments which may give rise to pollution, either directly or from traffic generation, and hence planning decisions can have a significant impact on the quality of air, water and land.

The EIA should take account of the risks of air pollution and how these can be managed or reduced. In particular, impacts to designated sites such as the SSSIs referenced above, which are sensitive to changes in air quality, should be assessed, taking into consideration ammonia emissions and/or the associated contribution to nitrogen deposition.

Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System (www.apis.ac.uk).Further information on air pollution modelling and assessment can be found on the Environment Agency website.

5. Climate Change Adaptation
The England Biodiversity Strategy published by Defra establishes principles for the consideration of biodiversity and the effects of climate change. The ES should reflect these principles and identify how the development's effects on the natural environment will be influenced by climate change, and how ecological networks will be maintained. The NPPF requires that the planning system should contribute to the enhancement of the natural environment 'by establishing coherent ecological networks that are more resilient to current and future pressures' (NPPF Para 109), which should be demonstrated through the ES.

6. Contribution to local environmental initiatives and priorities

Consideration should be given to how the proposal can incorporate biodiversity enhancements which contribute to Cambridgeshire Biodiversity Action Plan targets.

7. Cumulative and in-combination effects
A full consideration of the implications of the whole scheme should be included in the ES. All supporting infrastructure should be included within the assessment.

The ES should include an impact assessment to identify, describe and evaluate the effects that are likely to result from the project in combination with other projects and activities that are being, have been or will be carried out. The following types of projects should be included in such an assessment, (subject to available information):

a. existing completed projects;
b. approved but uncompleted projects;
c. ongoing activities;
d. plans or projects for which an application has been made and which are under consideration by the consenting authorities; and
e. plans and projects which are reasonably foreseeable, ie projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of cumulative and in-combination effects.

APPENDIX 2.5
WRITTEN CLARIFICATIONS

Our ref: MLP/M-627P
Your ref: 17/70223/SCOP

12th March 2018

Mr J Lloyd
Planning Services
Huntingdonshire District Council
Pathfinder House
St Mary's Street
Huntingdon
Cambs, PE29 3TN

BROWN & Co
BARFORDS

St Neots Office

Howard House
17 Church Street
St Neots
Cambs
PE19 2BU

E martin.page@brown-co.com
T 01480 213811
W brown-co.com

EMAIL & POST

Dear Mr Lloyd

SCOPING OPINION REQUEST UNDER REGULATION 15 OF THE TOWN & COUNTRY PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 2017 IN RESPECT OF EXPANSION OF PIG REARING UNIT – REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY, SG19 3BQ

I write with reference to the above and the Scoping Opinion provided in November last year.

We are in the process of preparing the application submission, including the preparation of the Environmental Impact Assessment, and the purpose of my letter is to raise two matters.

1. In your letter you advised that South Cambridgeshire District Council had been consulted on the request but at the time of writing no response had been received. Can you please update us whether any comments were subsequently received from the South Cambs District Council?

2. Following a review of the management of the unit, our clients have decided to increase the number of sows from 1,200, as stated in the Scoping Opinion request, to 2,000. However, this increase is in conjunction with the sale of pigs at an earlier age and therefore the accommodation requirements on the site would not change significantly. Does the increase in the number of sows alter the Scoping Opinion advice?

We would be grateful to receive your clarification as a matter of urgency.

Yours sincerely

Martin Page

MARTIN PAGE MRTPI
For and on behalf of Brown & Co
Property and Business Consultants LLP

Mob: 07989 999568
DDI: 01480 479084

MLP/M-627P HDC Lloyd 12.03.18

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Martin Page

From: Martin Page
Sent: 06 April 2018 15:49
To: 'Lloyd, James (Planning)'
Subject: RE: Redwood Farm, Gt Gransden - Scoping Opinion

Hi James,

Thanks for this again but I have been asked can you please put this in a headed letter. Many thanks.

Regards.

From: Lloyd, James (Planning) [mailto:James.Lloyd@huntingdonshire.gov.uk]
Sent: 05 April 2018 13:40
To: Martin Page <Martin.Page@Brown-co.com>
Subject: Redwood Farm, Gt Gransden - Scoping Opinion

Good afternoon Martin,
Further to your letter (12.03.2018), I can confirm:

1) No response has been received from South Cambridgeshire District Council;
2) The anticipated increase in sows would not affect the advice provided in the Scoping Opinion.

Please advise if a more formal written response is required.

Kind regards,
James

James Lloyd
Development Management Officer
Development Services - Corporate Delivery
Huntingdonshire District Council
Pathfinder House, St Marys Street
Huntingdon
PE29 3TN
DD: 01480 388389

Please visit the Planning Pages of our new website at http://www.huntingdonshire.gov.uk/planning for all planning related enquiries, including full details of the pre-application services we are providing.

Any comments represent the informal opinion of an officer of Huntingdonshire District Council. These comments are made without prejudice to any eventual determination through the planning process.

Huntingdonshire DISTRICT COUNCIL

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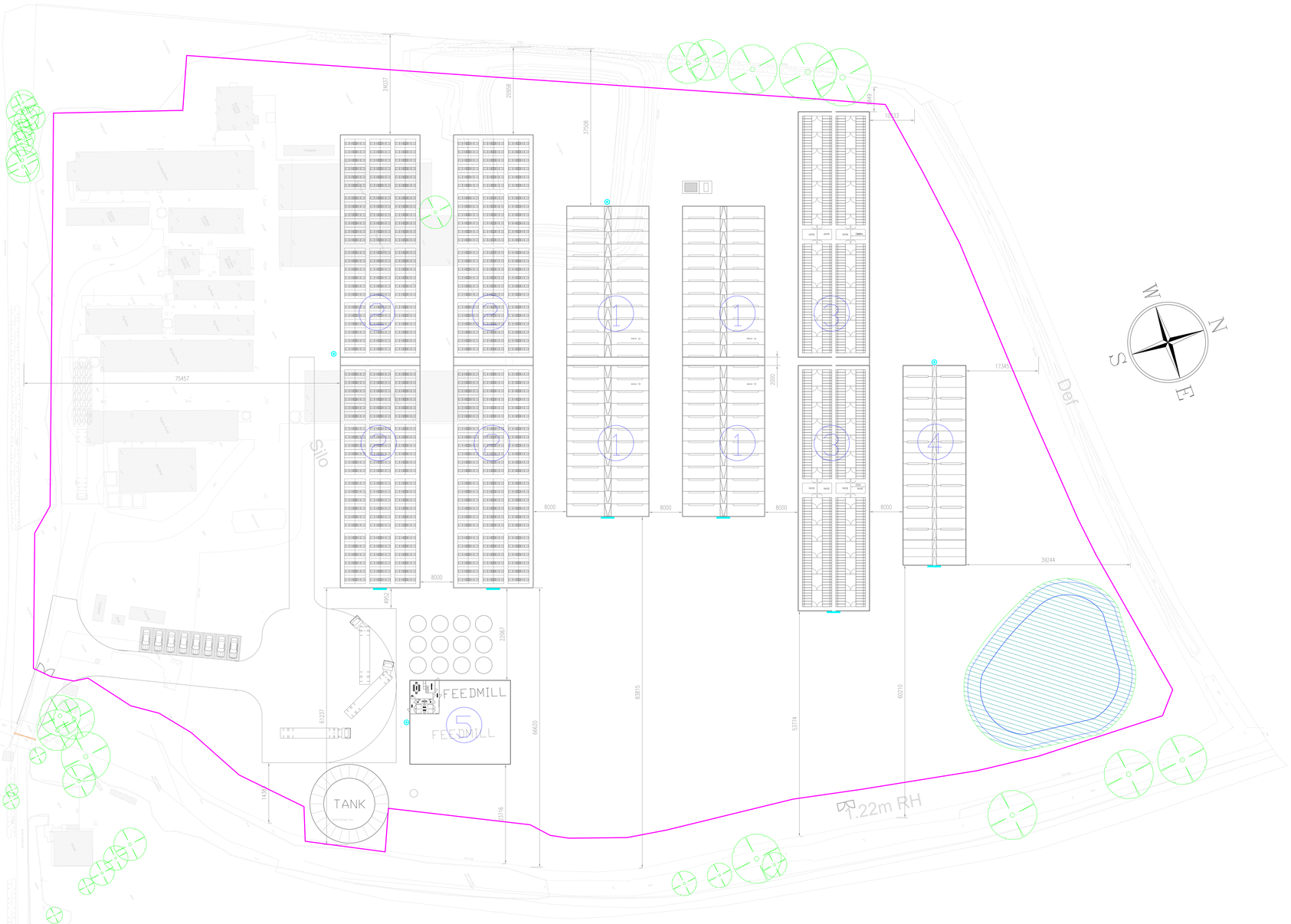
APPENDIX 5.1
PLANNING DRAWINGS

BUILDINGS LEGEND:

1. Dry sows
2. Farrowing
3. Service
4. Grow out
5. Feedmill

Proposed security fence with secure vehicular access gates 2 metre high green chain link



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Quality Equipment

Heath Rd, Woolpit, Bury St Edmunds, Suffolk, IP30 9RH
Telephone: 01359 240529 Facsimile: 01359 242880
www.quality-equipment.co.uk
Email: info@quality-equipment.co.uk

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Rev	Revision note	Date
		14/12/2018

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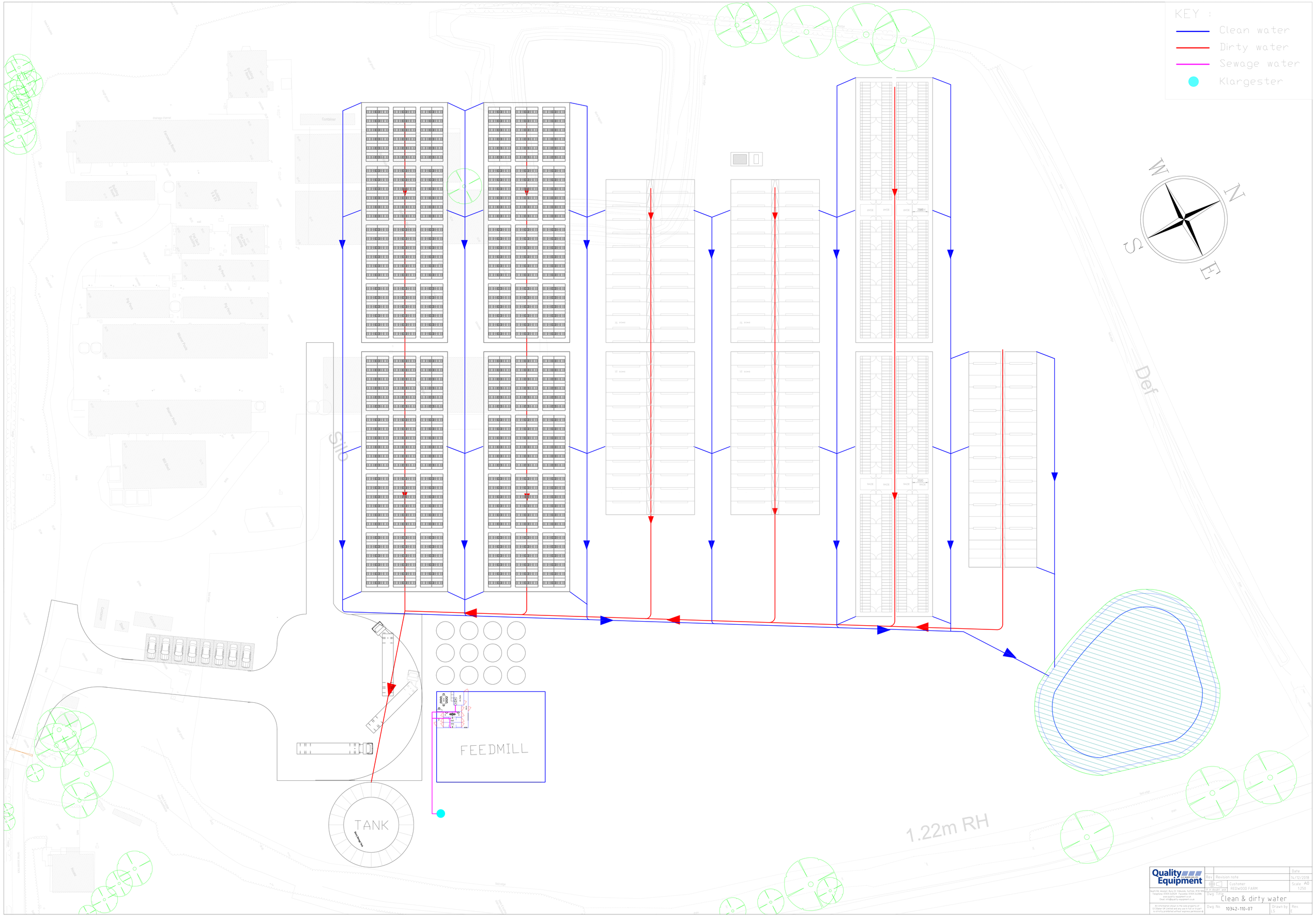
Scale: A0 1:400

Dwg. Title: Block plan

Dwg. No.: 10342-100

Drawn by: LS

Rev: G



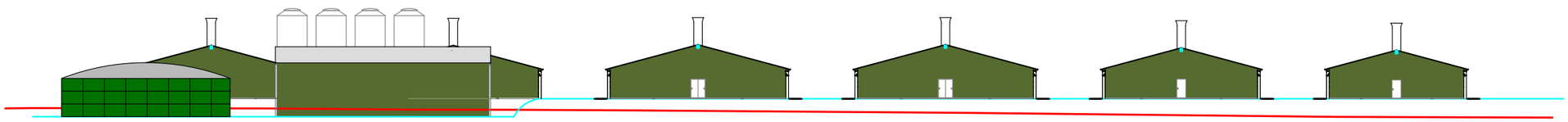
Quality Equipment
Rev | Revision note | Date 14/12/2018
Customer REDWOOD FARM | Scale A0 1:250
Dwg. Title Clean & dirty water
Dwg. No. 10342-110-07 | Drawn by LS | Rev. E

Key :

Existing ground level

New ground level / FFL

East



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Quality Equipment	Rev	Revision note	Date 05/11/2018
North Rd, Westgate, Bury St. Edmunds, Suffolk, IP33 1RN Telephone 01359 242629 Facsimile 01359 242689 www.quality-equipment.co.uk Email: info@quality-equipment.co.uk	If in doubt ask	Customer REDWOOD FARM	Scale A0 1:200
	Dwg. Title	Section drawings - East	
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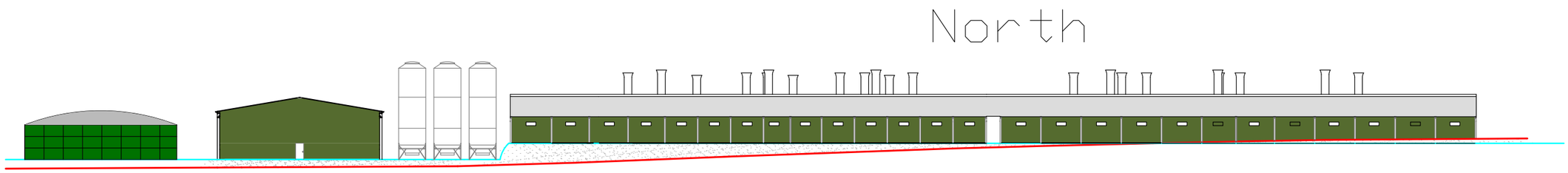
Key :

Existing ground level

New ground level / FFL



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		Customer REDWOOD FARM	Scale A0 1:200
North Rd, Wright, Bury St Edmunds, Suffolk, IP30 9NN Telephone 01359 243029 Facsimile 01359 243086 www.quality-equipment.co.uk Email: info@quality-equipment.co.uk	Dwg. Title Section drawings - North		
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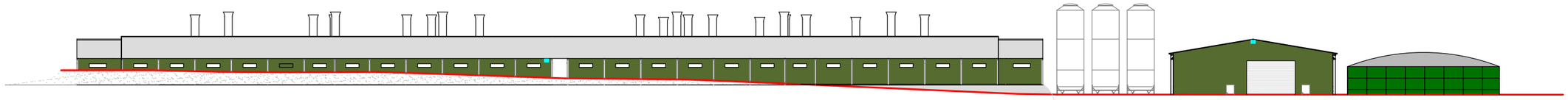
Path (um)
57.2m
Chestnut Lodge
Down ward lighting
Incinerator
Reservoir
Low level lighting
Redwood Farm
Pond
Drain
GRANSDEN ROAD
59.0m
59.1m
TANK
Existing building to be removed
Existing property
Property with planning consent already granted
Scale Bar
0
10m
20m
30m
40m
50m
BUILDINGS LEGEND:
1. Dry sows
2. Farrowing
3. Service
4. Grow out
5. Feedmill
FANS :
500x3000
800x3000
950x3000
Existing buildings to be removed
LED down ward flood light 50W
LED bulk head lighting 18W
Vents 3m high x 0.950 wide
Flood & bulk head lights :
Quality Equipment
Rev
Revision note
Date
27/11/2018
Customer
REDWOOD FARM
Scale
A0
1:500
Dwg. Title
Roof plan
Dwg. No.
10342-110-08
Drawn by
LS
Rev.
D

N
W
E
S
Path (um)
57.2m
Chestnut Lodge
Incinerator
Redwood Farm
Pond
Drain
GRANSDEN ROAD
59.0m
59.1m
TANK
Existing property
Property with planning consent already granted
Scale Bar
0
10m
20m
30m
40m
50m
BUILDINGS LEGEND:
1. Dry sows
2. Farrowing
3. Service
4. Grow out
5. Feedmill
Quality Equipment
Rev
Revision note
Date
27/11/2018
Customer
REDWOOD FARM
Scale A0
1:500
Dwg. Title
Site layout
Dwg. No.
10342-110-01
Drawn by
LS
Rev.
D

South



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Quality Equipment	Rev	Revision note	Date 15/10/2018
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Heath Rd, Weight Ruy St Edmunds, Suffolk, IP30 9NN Telephone 01359 243629 Facsimile 01359 243696 www.quality-equipment.co.uk Email: info@quality-equipment.co.uk	Dwg. Title Section drawings - South		
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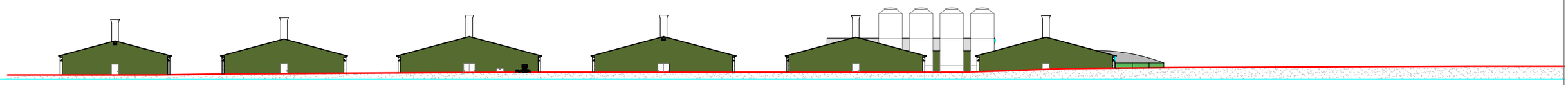
Key :

Existing ground level

New ground level / FFL

West



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Rev	Revision note	Date
		05/11/2018

Customer: REDWOOD FARM		Scale: A0 1:200
Dwg. Title: Section drawings - West		
Dwg. No. 10342-110-02	Drawn by: LS	Rev. C

APPENDIX 5.2
TREE SURVEY, ARBORICULTURAL IMPACT ASSESSMENT, PRELIMINARY ARBORICULTURAL METHOD STATEMENT AND TREE PROTECTION PLAN

HAYDEN'S
Arboricultural Consultants

Tree Survey, Arboricultural Impact Assessment
Preliminary Arboricultural Method Statement & Tree Protection Plan
In Accordance with BS 5837:2012

Proj. No **6746**	**Redwood Farm, Caxton Road, Great Gransden, Sandy, Bedfordshire, SG19 3BQ**		
Client:		Brown & Co (Barfords)	
Date of Report:	16/01/2019	Revision:	B

Tree Survey, Arboricultural Impact Assessment, Preliminary Arboricultural Method Statement & Tree Protection Plan – In Accordance with BS 5837:2012

Summary

The purpose of this report is to provide a preliminary consideration of the arboricultural implications created by the proposed development. In accordance with the feasibility and planning sections of BS5837:2012 *"Trees in relation to design, demolition and construction – Recommendations"*, trees deemed to be within the influencing distance of the projected construction have been evaluated for quality, longevity, and initial maintenance requirements. Where trees do not have to be removed for health and safety reasons, a detailed and objective assessment has been made of the consequences of the intended layout.

In this circumstance it is intended to expand the existing pig rearing unit and improve the access. As a result twenty five individual trees, one group of trees, five areas of trees and seven hedgerows were inspected. The arboricultural related implications of the proposal are as follows:

1 It is necessary to fell six individual trees (T001 – T006) and a short section of one landscape feature (A001) in order to achieve the proposed layout. Additionally, one individual tree (T015) requires limited linear root pruning and one landscape feature (A002) requires minor reduction to permit construction space or access.

2 The alignments of the proposed structures do not encroach within the Root Protection Areas of any trees that are to be retained. In view of this, and as assessed in accordance with BS5837:2012, no specialist foundation designs or construction techniques will be required to prevent damage to tree roots. Specialist foundations may still be required for other reasons, including mitigating the influencing distance of tree roots, subject to expert advice from a structural engineer.

3 The alignment of a new hard surface nominally intrudes within the Root Protection Area of one tree to be retained (T015). This has only minor influence on the Root Protection Area and as such it is considered appropriate to undertake linear root pruning, thus obviating the need for specialist "no dig" construction techniques at this location.

4 This report recommends that specialist advice is obtained by expert practitioners in other disciplines. Such input should always be sought prior to the submission of this report in support of a planning application in order to demonstrate that the techniques and methods hereby proposed are achievable. In this particular circumstance it is necessary to contact the following:

- Structural Engineer (foundation design, item 4.3.1)

5 All trees and landscape features that are to remain as part of the development should suffer no structural damage provided that the findings with this report are complied with in full. This includes ensuring that protective fencing is erected as detailed at items 4.4 and 5.1 of this report.

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6 Post Planning Permission – Subject to achieving Planning Permission, a detailed Arboricultural Method Statement and Tree Protection Plan will be required. This will include the following: fencing type, ground protection measures, access facilitation pruning specification, phasing and an extensive auditable monitoring schedule.

Given the above, there are no overt or overwhelming arboricultural constraints that can be reasonably cited to preclude the proposed construction.

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Contact Details

Client – Brown & Co (Barfords)			
Address Howard House 17 Church Street St Neots PE19 2BU	**Contact** Mr Martin Page	**Tel:** **E-mail:**	01480 213811 martin.page@brown-co.com

Local Planning Authority – Huntingdonshire District Council			
Address Pathfinder House St Mary's Street Huntingdon Cambridgeshire PE29 3TN	**Trees Officer** Ms Tamsin Miles	**Tel:** **E-mail:**	01480 388438 trees@huntsdc.gov.uk

Arboricultural Consultant – Hayden's Arboricultural Consultants Limited			
Address 5 Moseley's Farm Business Centre Fornham All Saints Bury St Edmunds Suffolk IP28 6JY	**Report Author:** Mr Ian Lorman	**Tel:** **E-mail:**	01284 765391 info@treesurveys.co.uk

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1.0 Introduction

1.1 Terms of Reference

1.1.1 Hayden's Arboricultural Consultants Limited has been commissioned by Brown & Co (Barfords) to prepare a Tree Survey, Arboricultural Impact Assessment, Preliminary Arboricultural Method Statement and Preliminary Tree Protection Plan for the existing trees at Redwood Farm, Caxton Road, Great Gransden, Sandy, Bedfordshire, SG19 3BQ.

1.1.2 The site survey was carried out on 26th April 2018. The relevant qualitative tree data was recorded in order to assess the condition of the existing trees, their constraints upon the prospective development and the necessary protection and construction specifications required to allow their retention as a sustainable and integral part of the completed development.

1.1.3 Information is given on condition, age, size and indicative positioning of all the trees, both on and affecting the site. This is in accordance with the British Standard 5837:2012 *Trees in relation to design, demolition and construction - Recommendations.*

1.2 Scope of Works

1.2.1 The survey of the trees and any other factors are of a preliminary nature. The trees were inspected on the basis of the Visual Tree Assessment (VTA) method as developed by Mattheck and Breloer (1994). The trees were inspected from ground level with no climbing inspections undertaken. It is not always possible to access every tree and as such some measurements may have to be estimated. Trees with estimated measurements are highlighted in the schedule of trees. No samples have been removed from the site for analysis. The survey does not cover the arrangements that may be required in connection with the removal of existing underground services.

1.2.2 Whilst this is an arboricultural report, comments relating to non arboricultural matters are given, such as built structures and soil data. Any opinion thus expressed should be viewed as provisional and confirmation from an appropriately qualified professional sought. Such points are clearly identified within the body of the report.

1.2.3 An intrinsic part of tree inspection in relation to development is the assessment of risk associated with trees in close proximity to persons and property. Most human activities involve a degree of risk with such risks being commonly accepted, if the associated benefits are perceived to be commensurate. In general, the risk relating to trees tends to increase with the age of the trees concerned, as do the benefits. It will be deemed to be accepted by the client that the formulation of the recommendations for all tree management will be guided by the cost-benefit analysis (in terms of amenity), of the tree work.

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2.0 The Site

2.1 Overview

2.1.1. The site is Redwood Farm, Caxton Road, Great Gransden, Sandy, Bedfordshire.

2.2 Soils

2.2.1 The soils type commonly associated with this site are lime rich loams and clays with impeded drainage. They are of high fertility and support base-rich pastures, and classic 'chalky boulder clay' ancient woodland type habitats. This soil type constitutes approximately 5.3% the total English land mass.

2.2.2 The data given was obtained from a desk top study which provides indications of likely soil types. By definition, this information is not comprehensive and therefore any decisions taken with regards the management, usage or construction on site should be based on a detailed soil analysis.

2.2.3 Further to item 2.2.2, this report provides no information on soil shrinkability. It may be necessary for practitioners in other disciplines (e.g. engineers considering foundation design) to obtain this data as required.

2.3 Statutory Tree Protection

2.3.1 Hayden's Arboricultural Consultants Limited have been informed that at the *date of the tree inspection* the trees concerned were not located within a Conservation Area or the subject of a Tree Preservation Order. As such, no written permission would be required from the local planning authority Huntingdonshire District Council to commencing works to trees. It should be noted however, that Huntingdonshire District Council have the power to serve Tree Preservation Orders very rapidly, and therefore it is incumbent upon owners, managers or any persons wishing to undertake work to any trees to contact the local planning authority prior to commencing works to ensure that the situation has not changed.

2.3.2 Felling Licence

All trees within the United Kingdom are protected under the Forestry Acts. In general, anyone felling more than 5 cubic metres of timber in any calendar quarter requires a Felling Licence from the Forestry Commission. There are exemptions however and these are as follows:-

A Felling License is not required in the following instances:

- To fell trees in a garden, an orchard, a churchyard, or a designated open space (Commons Act 1899).
- To carry out surgery operations such as pruning, reduction, dead wooding or pollarding.
- To fell less than 5 cubic metres in a calendar quarter. (Please note that not more than 2 cubic metres in a calendar quarter may be sold).
- To fell trees that are 8 centimetres or less in diameter when measured 1.3 metres from the ground. Trees removed for thinning may have a diameter of up to 10 centimetres and trees managed under a coppice regime may have a diameter of up to 15 centimetres.
- To fell trees previously approved for removal under a Dedication Scheme, or where Detailed Planning Permission has been granted.

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Substantial fines exist for not complying with the requirements of a Felling Licence.

2.3.3 **Hedgerow Regulations and Inclosure Act**

Certain hedgerows within the United Kingdom are protected under The Hedgerow Regulations 1997. The regulations apply to any hedgerow growing in, or adjacent to, any common land, protected land (local nature reserves and SSSI‟s), or land used for agriculture, forestry or the breeding or keeping of horses, ponies or donkeys, if it: (a) has a continuous length of, or exceeding 20m; or (b) it has a continuous length of less than 20m and, at each end, meets another hedgerow. The regulations do not apply to hedgerows within the curtilage of, or marking a boundary of the curtilage of, a dwelling house.

Anybody wishing to remove or destroy a hedge must apply to their Local Planning Authority (LPA) for consent. Substantial fines exist for not complying with the requirements The Hedgerow Regulations.

Older hedges could be protected by old Inclosure Acts. These Acts may require that hedges are retained and managed in perpetuity.

It is recommended professional legal advice be sought before removing hedgerows to determine whether the hedgerow might be protected by the Inclosure Act. Details of the Inclosures Act are held by the Local Records Office.

3.0 Tree Survey

3.1 As part of this survey a total of twenty five individual trees, one group of trees, five areas of trees and seven hedgerows have been identified. These have been numbered T001 – T025, G001, A001 – A005 and H001 – H007 respectively.

3.2 A topographical survey was provided which showed the position of the trees on site. It should be noted however that topographical surveys are not always comprehensive and sometimes it is considered appropriate to record details of trees and landscape features omitted from or beyond the scope of the plan. If this circumstance occurs, the location of the individual tree or landscape feature is estimated. The position of each tree is shown on the attached drawing no. 6746-D-AIA Rev B.

3.3 In order to provide a systematic, consistent and transparent evaluation of the trees included within this survey, they have been assessed and categorised in accordance with the method detailed in item 4.3 of *BS 5837:2012 “Trees in Relation to Design, Demolition and Construction - Recommendations”*. For further information, please see the attached Explanatory Notes.

3.4 The detailed assessment of each tree and its work requirements with priorities are listed in the attached Schedule of Trees.

3.5 Several items would benefit from tree surgery or additional investigation, be it for health and safety, cultural, aesthetic, or structural reasons as detailed in the attached Schedule of Trees. Including the trees recommended for felling, the items requiring the **most urgent** intervention are as follows:

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As soon as possible:

G001	Fell.
T025	Re-Pollard.

Within six months:

T016	Consider pollarding at 3 metres or lower due to defective stem.
T017	Coppice.
T018	Coppice.
T019	Coppice.
T020	Coppice.
T021	Coppice.
T024	Consider heavy reduction back to main trunk to create monolith or leave alone to collapse naturally depending on proposed land use.

3.6 In accordance with item 4.2.4 (c) of BS 5837:2012, the items inspected and detailed within this report have been selected for inclusion due to the likely influence of any proposed development on the trees, rather than strictly adhering to the curtilage of the site. However, it must be understood that there may be trees beyond the site and not included in this survey which may exert an influence on the development. Where works for cultural, health and safety, quality of life, or development purposes have been recommended on trees outside the ownership of the site, these can only progress with the agreement of the owner, except where it involves portions of the trees overhanging the boundary.

4.0 Arboricultural Impact Assessment

4.1 The Proposal

4.1.1 The proposal is to expand the existing pig rearing unit and improve the access within the curtilage of the site. It is assumed that any minor variation of the existing layout compared to the proposal (e.g. correlation with current features such as access roads, boundaries and landscape items) is due to the conceptual nature of the submission.

4.2 Construction Access

4.2.1 Site access is unencumbered by the Root Protection Areas (RPA) of any trees to be retained. Therefore, and from a purely arboricultural perspective, it will not be necessary to install a proprietary temporary load bearing road to protect tree roots.

4.3. Construction

4.3.1 Construction of foundations or structural supports for new buildings are not shown to encroach within the RPA of any trees to be retained. Therefore from an arboricultural perspective, no specialised construction or foundation techniques will be required to protect tree roots. However, dependent on the soil type, species and topography, trees may have an influence on the soil beyond their calculated RPA. Given the proximity of the proposed construction to the trees to be retained, it is recommended that a Structural Engineer is consulted to assess the implications of the tree retention on the required foundation design.

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4.3.2 Installation of new a new hard surface encroaches within a small portion of the RPA of the T015. Given the minor extent of the intrusion at this location it is considered appropriate to undertake linear root pruning as part of the access facilitation pruning (AFP) works. This operation will obviate the need for "no dig" construction methods in this situation.

4.3.3 The improved junction with Gransden Road requires the felling of T001, T002, T003, T004, T005, T006 and a section of A001. Once these items are removed as shown on drawing no. 6746-D-AIA Rev B there will be no specific requirements for construction methods to protect the retained items in the vicinity (ie A001 – the remaining section, A002 and H001).

4.4 Implications of Sloping Ground

4.4.1 The arboricultural implications of the proposed structures are based on an assumption that level changes will not occur within the RPA of trees that are shown to be retained. If such actions are necessary and these works cannot be excluded from the calculated RPA of retained trees, a reappraisal of the arboricultural implications will be required.

4.5 Requirement for Tree Barrier Fencing

4.5.1 Prior to the commencement of any demolition and immediately after the completion of the necessary tree surgery and felling work, protective fencing will be erected on site. This must be fit for purpose (including any ground protection if necessary) in full accordance with the requirements of BS 5837:2012 and positioned as shown on the attached Preliminary Arboricultural Impact Assessment & Tree Protection drawing. Full details of fencing will be supplied by Hayden's Arboricultural Consultants in the detailed Arboricultural Method Statement & Tree Protection Plan.

4.6 Compound

4.6.1 The site provides adequate internal space to locate a construction compound outside the RPA of any trees and landscape features that are to be retained.

4.7 Phasing

4.7.1 The proposal involves the integration of a number of complex aspects that affect tree protection (e.g. – but not exclusively – access, movement of materials and the installation of services). For this reason the project must be carefully phased to ensure the highest level of protection for retained trees at all times. As part of the detailed Arboricultural Method Statement & Tree Protection Plan, Hayden's Arboricultural Consultants will produce an in depth phasing recommendation to cover the major operations on site as they affect retained trees.

4.8 Monitoring

4.8.1 In accordance with item 6.3 of BS 5837:2012, the site and associated development should be monitored regularly by a competent Arboriculturalist to ensure that the arboricultural aspects of the planning permission are complied with. As part of the detailed Arboricultural Method Statement & Tree Protection Plan, Hayden's Arboricultural Consultants will produce an extensive auditable monitoring schedule to assess the progress of key site events/activities.

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4.9 Cultural Implications for Retained Trees

4.9.1 Low. Details of specific works are listed in the attached Schedule of Works to Permit Development.

4.10 Landscape Implications

4.10.1 In addition to trees and landscape features necessitating removal for health and safety, cultural or quality of life reasons, (as detailed in the attached Schedule of Works - Irrespective of Development) the items listed in the table below require felling to permit the proposed development to proceed: -

Feature No	Reason for Removal	BS * Category	Visual Amenity Assessment*
A001	Necessary to fell the section that conflicts with new access onto Gransden Road.	C	High
T001	Conflicts with access improvements onto Gransden Road.	C	High
T002	Conflicts with access improvements onto Gransden Road.	C	High
T003	Conflicts with access improvements onto Gransden Road.	C	High
T004	Conflicts with access improvements onto Gransden Road.	C	Low
T005	Conflicts with access improvements onto Gransden Road.	B	Moderate
T006	Conflicts with access improvements onto Gransden Road.	B	Moderate

4.11 Post Development Implications

4.11.1 No adverse arboricultural implications are considered reasonably foreseeable for the trees that remain provided that the recommendations of this report are complied with in full.

4.11.2 Due to the dynamic nature of trees and their interaction with the environment, their health and structural integrity is liable to change over time. Because of this it is recommended that all trees on or adjacent to the site be inspected on an annual basis.

4.11.3 As stated in BS 5837:2012, regular maintenance of newly planted trees is of particular importance for at least three years during the critical post-planting period and might, where required by site conditions, planning requirements or legal agreement, be necessary for five years or more. Therefore, the designer of the new landscaping should, in conjunction with the landscape design proposals, prepare a detailed maintenance schedule covering this period, and appropriate arrangements made for its implementation.

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5.0 Design Advice, Preliminary Arboricultural Method Statement & Tree Protection Plan

5.1 Securing of Tree Structure and Root Protection Areas (RPA)

5.1.1 The trees to be retained will be protected by the use of stout barrier fencing erected in the positions indicated on the attached Preliminary Arboricultural Impact Assessment & Tree Protection drawing no. 6746-D-AIA Rev B. This fencing will be in accordance with the requirements of BS 5837:2012 including any necessary ground protection.

5.1.2 All fencing provided for the safeguarding of trees will be erected prior to any demolition or development commencing on the site, therefore ensuring the maximum protection. This fencing, which must have all weather notices attached stating “Construction Exclusion Zone – No Access” will be regarded as sacrosanct and, once erected, will not be removed or altered without the prior consent of the Local Planning Authority.

5.1.3 Where footpaths, access drives, or parking bays are constructed within the RPA of retained trees, careful attention will be paid to the type of surface treatment used in these areas, details of which are given in item 5.8, below. If possible, these should be installed as a final phase of the project, thereby protecting the RPA throughout the major construction phase of the proposed development.

5.1.4 Where fencing is impractical, consideration must be given to other forms of effective above ground tree structure protection. An example of this would be a combination of Barksavers to secure the stems and a temporary load bearing surface to shield the ground.

5.2 Location of Site Office, Compound and Parking

5.2.1 The position of the office, compound and parking will be agreed in writing with the Local Planning Authority prior to commencement of any permitted development works. Any proposed re-location of these items through the various phases of development will be agreed prior to re-siting with the Local Planning Authority.

5.3 On Site Storage of Spoil and Building Materials

5.3.1 Prior to and during all construction works on site, no spoil or construction materials will be stored within the RPA of any tree on, or adjacent to the site, even if the proposed development is to be within the RPA. This is to reduce to a minimum the compaction of the roots of the trees. Details of the RPA for each tree where no spoil or building materials will be stored are indicated on the attached Preliminary Arboricultural Impact Assessment & Tree Protection drawing no. 6746-D-AIA Rev B. Any encroachment within this protected area will only be with the prior agreement of the Local Planning Authority.

5.3.2 Any facilities for the storage of oils, fuels or chemicals shall be sited on impervious bases and surrounded by impervious bund walls. The volume of the bund compound shall be at least equivalent to the capacity of the tank plus 10%. If there is a multiple tankage, the compound shall be at least equivalent to the capacity of the largest tank, or the combined capacity of interconnected tanks, plus 10%. All filling points, vents, gauges and sight glasses shall be located within the bund. The drainage system of the bund shall be sealed with no discharge to any watercourse, land or underground strata.

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Associated pipe-work shall be located above ground and protected from accidental damage. All filling points and tank overflow pipe outlets shall be detailed to discharge downwards into the bund.

5.3.3 All material storage facilities and work areas must consider the effects of sloping ground on the movement of potentially harmful liquid spillages towards or into protected areas.

5.4 Programme of Works

5.4.1 All tree surgery works, once approved by the Local Planning Authority, will be carried out prior to any other site works. Once completed, the proposed protective fencing will be erected along the lines indicated above. All of this will be carried out prior to commencement of any development works on the site. Outline details of the proposed programme are given in the Design and Construction and Tree Care flow chart attached (Appendix G-1).

5.5 Tree Surgery

5.5.1 All tree work will be agreed with the Local Planning Authority and will be carried out in line with BS 3998:2010 (Recommendations for Tree Works). An arboricultural contractor approved by the Local Planning Authority will carry out the work. Any alterations to the proposed schedule of works will be agreed with the Local Planning Authority prior to commencement of works.

5.6 Levels

5.6.1 Other than for any specific exception which may be referred to at item 4.0, no alterations to soil levels within the RPA of retained trees are envisaged. However, if it is necessary for these to occur, appropriate measures must be taken to prevent or minimise any detrimental effects on the affected root systems as detailed in 5.6.2 and 5.6.3 below.

5.6.2 If it is necessary to excavate so close to trees that roots greater than 50mm diameter are likely to be encountered, particular care will be taken to avoid damage. Excavation in these areas will be undertaken by hand or using an air spade, avoiding any damage to the bark. The roots will be surrounded with sharp sand prior to the replacing of any soil or other material in the vicinity.

5.6.3 If it is necessary to raise levels, it is essential that adequate supplies of water and oxygen pass through the soil to the trees' roots. Therefore, where necessary, a granular material will be used which will not inhibit gaseous diffusion. Possible options are no-fines gravel, cobbles or, Type 2 road-stone. All hard surfaces will be of suitable specification to allow such gaseous diffusion, e.g. brick pavers.

5.7 Services

5.7.1 At the time of writing this report, no details on proposed services were available. However, the following principles should be adhered to when planning for their installation.

5.7.2 It is proposed that all underground service runs will be placed outside the RPA of the trees on or adjacent to the site. Where it is not possible to do this, the proposed length infringing the RPA will be hand dug 'broken trenches' (NJUG 4 paragraph 4) to ensure the maximum protection of the trees' roots.

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The trenches may also be excavated using an air spade, or trenchless technology can be employed if this methodology is considered appropriate by the relevant service company (thus allowing services to pass below and through the roots without the need for traditional excavation). If it is necessary to cut any small roots as part of any of these processes, they should be severed in such a way as to ensure that the final wound is as small as possible and free from ragged, torn ends.

5.7.3 All routes for overhead services will aim to avoid the trees. Where this is not possible, any tree work will be agreed prior to commencement with the Local Planning Authority.

5.7.4 All service providers (Statutory Authorities) will be consulted prior to commencement of works with the aim of minimising the number of service runs on the site.

5.7.5 All service runs/trenches where they encroach within the RPA of retained trees will be agreed with the Local Planning Authority prior to commencement of works.

5.8 Hard Surface Types & Construction within the Root Protection Area

5.8.1 If it is necessary to construct footpaths, driveways, non adoptable roads, and other hard surfaces within the RPA as calculated in accordance with BS 5837:2012 (item 4.6.1), it is proposed that the design will comply with the 'no-dig' principles of the Arboricultural Advisory Information Services (AAIS) Practice Note 12 "*Through the Trees to Development*" - the only difference being that instead of a geo-grid, a geo-textile base is provided, and the no-fines road stone is incorporated in and retained by a geo-web cellular confinement system. Given the individual requirements of each site, it is essential that a specialist engineer is consulted to specify the construction detail. Where it is necessary to remove any existing hard surface, or lower the ground level within the RPA, this may expose roots. This operation must be undertaken using hand tools or an air spade. Any roots found should be treated with the greatest care and surrounded by sharp sand to provide a level base. Please note that 'no-dig' surfaces are not always considered acceptable for adoption.

5.8.2 If it is shown that the construction of a boundary wall or dwelling encroaches within the RPA of a retained tree, the foundations of the wall or dwelling will be designed in such a manner so as to minimise the detrimental effect of the construction on the tree's roots. In these situations any excavations within the RPA of an affected tree will only be undertaken following exploration of the existing root system with an air spade (or by hand digging if soil conditions preclude) and the necessary root pruning undertaken to allow excavation without unnecessary pulling and tearing of the roots to be retained. This will ensure minimal damage to tree roots where pad and beam or cantilever foundations are considered appropriate. Should a piling rig be required to create piles, any access facilitation pruning or felling necessary to allow access must be undertaken before the commencement of works and only with prior consent of the Local Planning Authority.

5.8.3 If boundary fencing is to be erected within the RPA of retained trees, it is proposed that the fence posts will be secured by the use of "Met-Posts" or similar design in order to keep the disturbance and damage of the roots of the trees to a minimum.

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5.9 **Reporting and Monitoring Procedures**

5.9.1 In accordance with item 6.3 of BS 5837:2012, the site and associated development should be monitored regularly by a competent arboriculturalist to ensure that the arboricultural aspects of the planning permission (e.g. the installation and maintenance of protective measures and the supervision of specialist working techniques) are implemented. Furthermore, regular contact between the Site Manager and the Arboriculturalist allows them to effectively deal with and advise on any tree related problems that may occur during the development process. This system should be auditable. Should any issues arise during the arboricultural monitoring of the development the Arboriculturalist will contact the Local Planning Authority and appropriate action taken only with the prior permission of Brown & Co (Barfords) and the Local Planning Authority.

6.0 Recommendations

6.1 It is recommended that the measures outlined in this report are implemented in full to provide retained trees with the highest level of protection during the processes of demolition and construction.

6.2 Subject to achieving Planning Permission, it is recommended that a detailed Arboricultural Method Statement & Tree Protection Plan should be provided. This will include the following: fencing type, ground protection measures, access facilitation pruning specification, project phasing and an extensive auditable monitoring schedule.

6.3 Tree surgery should be completed as detailed in the Schedule of Trees. Where this has been identified for reasons other than to permit development, this work should be completed within the advised timescales irrespective of any development proposals.

6.4 The tree surgery works proposed as part of this Survey are recommended to mitigate any identified problems that may be caused by trees in close proximity to the proposed development. To this end, should these recommendations be overruled, this Survey stands as the opinion of Hayden's Arboricultural Consultants Limited, and therefore any damage or injury caused by trees recommended by this practice for felling or tree surgery works, to which the proposed schedule of works has been altered or the tree has been requested to be retained by the Local Planning Authority, cannot be the responsibility of this practice.

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7.0 Limitations & Qualifications

Tree inspection reports are subject to the following limitations and qualifications.

General exclusions

Unless specifically mentioned, the report will only be concerned with above ground inspections. No below ground inspections will be carried out without the prior confirmation from the client that such works should be undertaken.

The validity, accuracy and findings of this report will be directly related to the accuracy of the information made available prior to and during the inspection process. No checking of independent third party data will be undertaken. Hayden's Arboricultural Consultants Limited will not be responsible for the recommendations within this report where essential data are not made available, or are inaccurate.

This report will remain valid for one year from the date of inspection, but will become invalid if any building works are carried out upon the property, soil levels altered in any way close to the property, or tree work undertaken. It must also be appreciated that recommendations proposed within this report may be superseded by extreme weather, or any other unreasonably foreseeable events.

If alterations to the property or soil levels are carried out, or tree work undertaken, it is strongly recommended that a new tree inspection be carried out.

It will be appreciated, and deemed to be accepted by the client and their insurers, that the formulation of the recommendations for the management of trees will be guided by the following:-

1. The need to avoid reasonable foreseeable damage.
2. The arboricultural considerations - tree safety, good arboricultural practice (tree work) and aesthetics.

The client and their insurers are deemed to have accepted the limitation placed on the recommendations by the sources quoted in the attached report. Where sources are limited by time constraints or the client, this may lead to an incomplete quantification of the risk.

Signed:

January 2019…….
For and on Behalf of Hayden's Arboricultural Consultants Limited

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8.0 References

British Standards Institute. (2010). *Recommendations for Tree Work* BS *3998:2010* BSI, London.

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9.0 Appendices

Appendix	**A**	Species List & Tree Problems
Appendix	**B**	Schedule of Trees
Appendix	**C**	Schedule of Works - Irrespective of Development
Appendix	**D**	Preliminary Schedule of Works to Allow Development
Appendix	**E**	Explanatory Notes
Appendix	**F**	Tree Preservation Order Enquiry/Response
Appendix	**G**	Advisory Information & Sample Specifications

1. BS 5837:2012 Figure 1 - Flow Chart – Design and Construction & Tree Care
2. European Protected Species and Woodland Operations Checklist (v.4)
3. BS 5837:2012 Figure 2 - Default specification for protective barrier
4. BS 5837:2012 Figure 3 - Examples of above-ground stabilizing systems

Appendix	**H**	Drawing No 6746-D-AIA Rev B

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Appendix A - Species List & Tree Problems

Species List:

Apple	*Malus sp*
Ash	*Fraxinus excelsior*
Blackthorn	*Prunus spinosa*
Berberis	*Berberis sp*
Cherry	*Prunus sp*
Crack Willow	*Salix fragilis*
Elder	*Sambucus nigra*
Elm	*Ulmus sp*
European Lime	*Tilia x europaea*
Golden Leyland Cypress	X *Cuprocyparis leylandii 'Gold Rider'*
Hawthorn	*Crataegus monogyna*
Hazel	*Corylus avellana*
Leyland Cypress	*X Cuprocyparis leylandii*
Norway Spruce	*Picea abies*
Scots Pine	*Pinus sylvestris*
Silver Birch	*Betula pendula*

Tree Problems:

This gives a brief description of the problems identified in the attached Tree Survey.

Name: **Basal Suckers**	
Symptoms/Damage Type:	A profusion of shoots emanating from the base of the main stem close to ground level. Several species of trees but most notably Limes produce suckers as part of their naturalised habit however in some species this can be an indicator of elevated stress upon the tree.
Consequence:	Suckers do not cause direct harm to the tree in their self however they can be problematic where they impede free use of space such as where a tree is adjacent to a footpath or roadway. Where suckers are established they can impede visibility of the basal area of the stem and prevent identification of more significant defects such as decay cavities or fungal growths. If left unchecked the suckers can establish to become large limbs in their own right and spoil the form of the tree and presenting issues for future management as removal would leave large wounds around the stem base providing opportunity for ingress of decay.
Control Measures:	Regular pruning away of new sucker growth is recommended to prevent the development of the issues mentioned above dependent upon the implications and the trees location.

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Name: **Deadwood**	
Symptoms/Damage Type:	This relates to dead branches in the crown of the tree. In the majority of cases, this is caused by the natural ageing process of the tree or shading due to its close proximity to neighbouring trees. However, in some situations, it may be related to fungal, bacterial or viral infection.
Consequence:	Depending upon the location and mass of dead wood removal of the affected tissue may be necessary to prevent harm to persons or property as the wood will become unstable as it decays and in some circumstances is likely to fall from the tree with little or no warning.
Control Measures:	Detailed monitoring should be undertaken on those trees showing signs of excessive deadwood production to identify the underlying cause.

Name: **Dutch Elm Disease** (*Ophiostoma ulmi)*	
Symptoms/Damage Type:	The first symptom is the yellowing of the leaves from July onwards. It spreads rapidly often causing death in the same season - it is very rare for a tree to survive once the fungus has occurred. Dark brown streaks are evident when the bark and outer wood are peeled from the infected branches. Brown blotches may also be seen on infected branches if they are cut cleanly in a transverse section. The tree is infected by the Elm Bark Beetle which carries the disease. Once active in the tree, the fungus produces yeast like cells in the wood which are transported within the trees water conducting tissues. These cause blockages of the tissue and hence both the wilting of the leaves and the brown staining of the infected wood mentioned above.
Consequence:	This is the most serious disease in Elm trees and is still common in Britain. Infected trees decline and die rapidly.
Control Measures:	Control by fungicidal injections has been successful in specimen trees of high value however the cost of this recurrent procedure usually outweighs the value of the affected tree.

Name: **Ivy (Hedera helix)**	
Symptoms/Damage Type:	Ivy may grow to varying degrees on all areas of a tree from the base to the upper crown. It is possible that in doing so it will out-compete the host tree for available light thereby suppressing the host.
Consequence:	This is generally only harmful to the tree on already unhealthy specimens which may be constricted by large ivy stems around the trunk or may have their top growth suppressed by a mass of flowering shoots in the crown.
Control Measures:	Ivy should only be removed if absolutely necessary because it provides abundant cover to wildlife and then by severing twice close to the ground and removing a length of stem thereby causing the gradual dying away of the aerial parts of the plant providing extended benefit to wildlife whist relieving the pressure on the tree.

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Appendix B

Schedule of Trees

SCHEDULE OF TREES (AIA)

Redwood Farm, Caxton Road, Great Gransden, Sandy, Bedfordshire

Surveyed By: Ian Lorman Date: 26/04/2018

Managed By: David Carmichael

TreeNo	Species	DBH	Height		Visual	Crown Spread	Problems / Comments	BS Cat	Work Required (TS)	Priority (TS)	Work Required (AIA)	Priority (AIA)
		Min Dist	Crown Base	Lowest Branch	Age	Water Demand						
On site		RPA (m^2)	Aspect	Aspect	SULE	Ground Cover						
A001	Elm	200	10		High	N3, E3, S6, W3	Row of Elms regenerated as suckers from root system of parent tree/s growing within hedge line. Likely at any time to contract Dutch Elm Disease and die as a result. Physiological condition – Good	C2	No works required.	4	Fell section as shown on drawing no. 6746-D-AIA Rev B to permit development.	0
		2.4	5		EM	High						
Yes		18.1			10+ years	Hedge						
A002	Elm	200	10		High	N6.5, E3, S3, W3	Row of Elms regenerated as suckers from root system of parent tree/s growing within hedge line. Likely at any time to contract Dutch Elm Disease and die as a result. Physiological condition – Good	C2	No works required.	4	Undertake reduction as shown on drawing no. 6746-D-AIA Rev B to permit development.	0
		2.4	5		EM	High						
Yes		18.1			10+ years	Hedge						
A003	Norway Spruce	250	10		Moderate	N3, E3, S3, W3	Defunct plantation of Norway Spruce (Christmas trees) growing within a bramble thicket. Appear stunted for their age (at least 30 years old). Of little or no interest or value. Physiological condition: Poor	C2	No works required.	4		
		3	1		EM	Moderate						
Yes		28.3			20+ years	Bare Soil						
A004	Ash and Elm	650	16		High	N6.5, E7.5, S5.5, W7	Row of lapsed coppice woodland edge Ash trees within an under storey of Elm hedge and smaller Elm sucker trees. Physiological condition: Poor to Moderate.	C2	No works required	4		
		7.8	5		M	Moderate/High						
Yes		191.1			20+ years	Hedge						
A005	Elm	300	15		High	N6, E6, S6, W6	Visually impressive, dense cluster of Elms (in excess of 50 in number) with drawn-up form (etiolated) and forming a Single aerodynamic unit. Stems straddle either side of ditch / site boundary. The trees will be suckers arisen from the root system of parent tree/s long since died from Dutch Elm Disease. Likely at any time to contract Dutch Elm Disease and die as a result (resulting in the 'C' category). Physiological condition: Good	C2	No works required.	4		
		3.6	1		EM	High						
Yes		40.7			10+ years	Bare Soil						

TreeNo	Species	DBH	Height		Visual	Crown Spread	Problems / Comments	BS Cat	Work Required (TS)	Priority (TS)	Work Required (AIA)	Priority (AIA)
		Min Dist	Crown Base	Lowest Branch	Age	Water Demand						
On site		RPA (m^2)	Aspect	Aspect	SULE	Ground Cover						
G001	Leyland Cypress x9	400	16		Low	N3.5, E3, S3.5, W3	Group of 9x trees, with at least 3 or 4 dead trees in the centre of the group (indeterminate cause of death but most likely root disease /ground conditions). Remaining trees likely to die and /or become unstable in this exposed position. Physiological condition – Dead to Moderate.	U	Fell.	1		
		4.8	1		M	High						
Yes		72.4			<10 years	Bare Soil						
H001	Hawthorn, Elder and Hazel		1				Tightly trimmed hedge of Hawthorn with occasional Elder and Hazel. Physiological condition: Good	C2	No works required.	4		
					M							
Yes					40+ years							
H002	Golden Leyland Cypress		3				Short length of regularly sided and topped hedge. Physiological condition: Moderate.	C2	No works required.	4		
					M							
Yes					20+ years							
H003	Barberry (Berberis Species)		2				Tightly trimmed and immaculately maintained dense Berberis hedge. Physiological condition: Good.	C2	No works required.	4		
					M							
Yes					20+ years							
H004	Hawthorn, Blackthorn and Elder		3				Unmaintained and very gappy hedgerow remnant. Physiological condition: Poor.	C2	No works required.	4		
					M							
Yes					10+ years							
H005	Hawthorn, Blackthorn and Elder		5				Unmaintained and very gappy hedgerow remnant. Physiological condition: Poor.	C2	No works required.	4		
					M							
Yes					10+ years							
H006	Elm		4				Elm Suckers tightly trimmed back to field edge, forming an effective hedgerow. Physiological condition: Moderate.	C2	No works required.	4		
					M							
Yes					20+ years							

TreeNo	Species	DBH	Height		Visual	Crown Spread	Problems / Comments	BS Cat	Work Required (TS)	Priority (TS)	Work Required (AIA)	Priority (AIA)
		Min Dist	Crown Base	Lowest Branch	Age	Water Demand						
On site		RPA (m^2)	Aspect	Aspect	SULE	Ground Cover						
H007	Elder and Hawthorn		6				Old, overgrown Hawthorn hedge that has become overwhelmed by Elder and has deteriorated into an amorphous thicket that is spreading in all directions. It is beyond renovation. Physiological condition: Poor.	C2	No works required.	4		
					OM							
Yes					10+ years							
T001	Elm	400	12		High	N6, E8, S3, W5.5	Ivy becoming established on trunk. Pruning wounds from crown lifting over access. Physiological condition- Moderate	C2	No works required.	4	Fell to permit development.	0
		4.8			EM	High						
Yes		72.4			10+ years	Grass						
T002	Elm	620	12		High	N6, E6.5, S6.5, W4	Multi-stemmed at base. Physiological condition - Moderate.	C2	No works required.	4	Fell to permit development.	0
		7.44			EM	High						
Yes		173.9			10+ years	Weeds						
T003	Elm	250	9		High	N2.5, E1, S5, W4	Asymmetrical crown due to light competition. Physiological condition - Moderate.	C2	No works required.	4	Fell to permit development.	0
		3			EM	High						
Yes		28.3			10+ years	Weeds						
T004	Scots Pine	150	8		Low	N2, E0.1, S0.1, W1.5	Very stunted due to competition. Very sparse foliage and foliated on north side only. Physiological condition - Poor	C2	No works required.	4	Fell to permit development.	0
		1.8			EM	Moderate						
Yes		10.2			10+ years	Weeds						
T005	Scots Pine	200	10		Moderate	N3.5, E1, S2, W2.5	Asymmetrical due to light competition. Physiological condition - Moderate.	B2	No works required.	4	Fell to permit development.	0
		2.4			EM	Moderate						
Yes		18.1			40+ years	Weeds						
T006	Scots Pine	200	10		Moderate	N2, E1.5, S3.5, W3	Good quality specimen. Physiological condition - Good.	B2	No works required.	4	Fell to permit development.	0
		2.4			EM	Moderate						
Yes		18.1			40+ years	Bare Soil						
T007	Ornamental Cherry	150	5		Low	N3, E3, S3, W2.5	Located within group of large shrubs. Physiological condition - Good.	C2	No works required.	4		
		1.8			M	Moderate						
Yes		10.2			10+ years	Bare Soil						

TreeNo	Species	DBH	Height		Visual	Crown Spread	Problems / Comments	BS Cat	Work Required (TS)	Priority (TS)	Work Required (AIA)	Priority (AIA)
		Min Dist	Crown Base	Lowest Branch	Age	Water Demand						
On site		RPA (m^2)	Aspect	Aspect	SULE	Ground Cover						
T008	Apple	100	3.5		Low	N2, E2, S2.5, W3.5	Typical pruned fruit tree. Physiological condition - Moderate.	C2	No works required.	4		
		1.2			M	Moderate						
Yes		4.5			10+ years	Grass						
T009	Apple	150	3.5		Low	N3, E3, S2, W1.5	Typical pruned fruit tree. Low vigour. Physiological condition - Moderate.	C2	No works required.	4		
		1.8			M	Moderate						
Yes		10.2			10+ years	Grass						
T010	Apple	320	5.5		Low	N4, E5, S4, W4	Typical pruned fruit tree. Low vigour. Moderate deadwood throughout. Physiological condition - Moderate.	C2	No works required.	4		
		3.84			M	Moderate						
Yes		46.3			10+ years	Grass						
T011	Ash	600	15		Moderate	N6, E1, S6, W7	Heavily pruned on east side by utility company to clear overhead lines. Physiological condition - Moderate.	C1	No works required.	4		
		7.2			M	Moderate						
Yes		162.9			20+ years	Bare Soil						
T012	Silver Birch	100	8		Low	N2.5, E3.5, S1, W2	Leaning east due to wind. Physiological condition - Moderate.	C2	No works required.	4		
		1.2			Y	Low						
Yes		4.5			20+ years	Bare Soil						
T013	Silver Birch	80	7		Low	N1.5, E2, S1, W1	Leaning east due to wind. Physiological condition - Moderate.	C2	No works required.	4		
		0.96			Y	Low						
Yes		2.9			20+ years	Bare Soil						
T014	Ornamental Cherry	310	9		Low	N3, E6, S4, W1	Large surface root west side has damaged bark due to vehicular parking. Asymmetrical due to light competition Physiological condition - Moderate	C2	No works required.	4		
		3.72			M	Moderate						
Yes		43.5			10+ years	Bare Soil						
T015	Lime	440	9.5		Moderate	N3.5, E3.5, S5, W6.5	Bifurcates into a pair of co-dominant stems at 1 metre. Physiological condition - Good.	B2	No works required.	4	Undertake limited linear root pruning as showing on drawing 6746-D-AIA Rev B to permit development.	0
		5.28			M	Moderate						
Yes		87.6			40+ years	Bare Soil						

TreeNo	Species	DBH	Height		Visual	Crown Spread	Problems / Comments	BS Cat	Work Required (TS)	Priority (TS)	Work Required (AIA)	Priority (AIA)
		Min Dist	Crown Base	Lowest Branch	Age	Water Demand						
On site		RPA (m^2)	Aspect	Aspect	SULE	Ground Cover						
T016	Lime	540	10		Moderate	N6, E5, S4, W6	Divides into three co-dominant stems at 1 metre. Western co-dominant stem has longitudinal split on upper side at 2 metres. Physiological condition - Moderate	C2	Consider pollarding at 3 metres or lower due to defective stem.	2		
		6.48			EM	Moderate						
Yes		131.9			40+ years	Bare Soil						
T017	Ash	560	11		Moderate	N6, E5, S5.5, W5	Multi-stemmed at base (lapsed coppice). Low vigour. Moderate deadwood throughout. Physiological condition - Poor.	C2	Coppice.	2		
		6.72			M	Moderate						
Yes		141.9			10+ years	Hedge						
T018	Ash	680	16		High	N7, E6, S8, W6	Multi-stemmed at base (lapsed coppice). Crown-lifted over field for farm equipment. Historical large branch failure and multiple branch tears on stems. Low vigour. Moderate deadwood throughout Physiological condition - Poor	C2	Coppice.	2		
		8.16			M	Moderate						
Yes		209.2			10+ years	Hedge						
T019	Ash	560	16		High	N6, E7.5, S6.5, W6	Multi-stemmed at base (lapsed coppice). Split in easterly stem at 10 metres just below fork. Large deadwood throughout. Low vigour. Physiological condition - Poor.	U2	Coppice.	2		
		6.72			M	Moderate						
Yes		141.9			10+ years	Hedge						
T020	Ash	540	16		High	N5, E7, S6.5, W5	Multi-stemmed at base (lapsed coppice). Crown lifting over field. Several branch tears on stems. Physiological condition - Moderate.	C2	Coppice.	2		
		6.48			M	Moderate						
Yes		131.9			20+ years	Hedge						
T021	Ash	430	16		High	N6, E7.5, S5, W6	Twin stems at base with included bark union (lapsed coppice). Ivy becoming established in mid-crown. Physiological condition - Poor	C2	Coppice.	2		
		5.16			M	Moderate						
Yes		83.6			20+ years	Hedge						
T022	Ash	520	12		Moderate	N5.5, E6, S6, W6.5	Multi-stemmed at base. Low vigour. Moderate deadwood throughout. Physiological condition - Poor.	C1	No works required.	4		
		6.24			M	Moderate						
Yes		122.3			10+ years	Weeds						
T023	Ash	730	13		Moderate	N6, E7, S6, W6	Multi-stemmed at base. Low vigour. Physiological condition - Poor.	C1	No works required.	4		
		8.76			M	Moderate						
Yes		241.1			10+ years	Bare Soil						

TreeNo	Species	DBH	Height		Visual	Crown Spread	Problems / Comments	BS Cat	Work Required (TS)	Priority (TS)	Work Required (AIA)	Priority (AIA)
		Min Dist	Crown Base	Lowest Branch	Age	Water Demand						
On site		RPA (m^2)	Aspect	Aspect	SULE	Ground Cover						
T024	Ash	700	14		Moderate	N7, E7, S8, W8	Massive deadwood and dieback throughout with stag-headed appearance. Physiological condition - Moribund.	U	Consider heavy reduction back to main trunk to create monolith or leave alone to collapse naturally depending on proposed land use.	2		
		8.4			OM	Moderate						
Yes		221.7			<10 years	Bare Soil						
T025	Crack Willow	1000	14		Moderate	N0.1, E5, S14, W10	Massive stem wound from ancient collapse of co-dominant stem leaving massive decay. Also incipient failure of main leader leaning south. Physiological condition - Poor. 'A' category due to veteran status.	A1	Re-Pollard.	1		
		12			V	High						
Yes		452.4			10+ years	Bare Soil						

Appendix C

Schedule of Works - Irrespective of Development

SCHEDULE OF WORK IRRESPECTIVE OF DEVELOPMENT

Redwood Farm, Caxton Road, Great Gransden, Sandy, Bedfordshire

Surveyed By: Ian Lorman
Surveyed: 26/04/2018
Managed By: David Carmichael

Tree No.	Species	Work required	Priority
G001	Leyland Cypress x9	Fell.	**1**
T025	Crack Willow	Re-Pollard.	**1**
T016	Lime	Consider pollarding at 3 metres or lower due to defective stem.	**2**
T017	Ash	Coppice.	**2**
T018	Ash	Coppice.	**2**
T019	Ash	Coppice.	**2**
T020	Ash	Coppice.	**2**
T021	Ash	Coppice.	**2**
T024	Ash	Consider heavy reduction back to main trunk to create monolith or leave alone to collapse naturally depending on proposed land use.	**2**

Appendix D

Preliminary Schedule of Works to Allow Development

SCHEDULE OF WORKS (AIA)

Redwood Farm, Caxton Road, Great Gransden, Sandy, Bedfordshire

Surveyed By: Ian Lorman
Surveyed: 26/04/2018
Managed By: David Carmichael

Tree No.	Species	Work required	Priority
A001	Elm	Fell section as shown on drawing no. 6746-D-AIA Rev B to permit development.	**0**
A002	Elm	Undertake reduction as shown on drawing no. 6746-D-AIA Rev B to permit development.	**0**
T001	Elm	Fell to permit development.	**0**
T002	Elm	Fell to permit development.	**0**
T003	Elm	Fell to permit development.	**0**
T004	Scots Pine	Fell to permit development.	**0**
T005	Scots Pine	Fell to permit development.	**0**
T006	Scots Pine	Fell to permit development.	**0**
T015	Lime	Undertake limited linear root pruning as showing on drawing 6746-D-AIA Rev B to permit development.	**0**

Appendix E

Explanatory Notes

Explanatory Notes

HAYDEN'S Arboricultural Consultants

Categories

Below is an explanation of the categories used in the attached Tree Survey.

No Identifies the tree on the drawing.

Species Common names are given to aid understanding for the wider audience.

BS 5837 Main Category Using this assessment (BS 5837:2012, Table 1), trees can be divided into one of the following simplified categories, and are differentiated by cross-hatching and by colour on the attached drawing:

Category A - Those of high quality with an estimated remaining life expectancy of at least 40 years;

Category B - Those of moderate quality with an estimated remaining life expectancy of at least 20 years;

Category C - Those of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm;

Category U - Those trees in such condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years.

BS 5837 Sub Category Table 1 of BS 5837:2012 also requires a sub category to be applied to the A, B, C, and U assessments. This allows for a further understanding of the determining classification as follows:

Sub Category 1 - Mainly arboricultural qualities;

Sub Category 2 - Mainly landscape qualities;

Sub Category 3 - Mainly cultural values, including conservation .

Please note that a specimen or landscape feature may fulfil the requirements of more than one Sub Category.

DBH (mm) Diameter of main stem in millimetres at 1.5 metres from ground level. Where the tree is a multi-stem, the diameter is calculated in accordance with item 4.6.1 of BS 5837:2012.

Age Recorded as one of seven categories:

Y Young. Recently planted or establishing tree that could be transplanted without specialist equipment, i.e. less than 150 mm DBH.

S/M Semi-mature. An established tree, but one which has not reached its prospective ultimate height.

E/M Early-mature. A tree that is reaching its ultimate potential height, whose growth rate is slowing down but if healthy, will still increase in stem diameter and crown spread.

M Mature. A mature specimen with limited potential for any significant increase in size, even if healthy.

O/M Over-mature. A senescent or moribund specimen with a limited safe useful life expectancy. Possibly also containing sufficient structural defects with attendant safety and/or duty of care implications.

V Veteran. An over-mature specimen, usually of high value due to either its age, size and/or ecological significance

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D Dead.

Height	Recorded in metres, measured from the base of the tree.
Crown Base	Recorded in metres, the distance from ground and aspect of the lowest branch material.
Lowest Branch	Recorded in metres, the distance from ground and aspect of the emergence point of the lowest significant branch.
Life Expectancy	Relates to the prospective life expectancy of the tree and is given as 4 categories: 1 = 40 years+; 2 = 20 years+; 3 = 10 years+; 4 = less than 10 years.
Crown Spread	Indicates the radius of the crown from the base of the tree in each of the northern, eastern, southern and western aspects.
Minimum Distance	This is a distance equal to 12 times the diameter of the tree measured at 1.5 metres above ground level for single stemmed trees and 12 times the average diameter of the tree measured at 1.5 metres above ground level tree for multi stemmed specimens. (BS 5837:2012, section 4.6).
RPA	This is the Root Protection Area, measured in square metres and defined in BS5837:2012 as "a layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority". The RPA is shown on the drawing.. Ideally this is an area around the tree that must be kept clear of construction, level changes of construction operations. Some methods of construction can be carried out within the RPA of a retained tree but only if approved by the Local Planning Authority's tree officer.
Water Demand	This gives the water demand of the species of tree when mature, as given in the NHBC Standards Chapter 4.2 "Building Near Trees".
Visual Amenity	Concerns the planning and landscape contribution to the development site made by the tree, hedge or tree group, in terms of its amenity value and prominence on the skyline along with functional criteria such as the screening value, shelter provision and wildlife significance. The usual definitions are as follows: Low — An inconsequential landscape feature. Moderate — Of some note within the immediate vicinity, but not significant in the wider context. High — Item of high visual importance.
Problems/ Comments	May include general comments about growth characteristic, how it is affected by other trees and any previous surgery work; also, specific problems such as deadwood, pests, diseases, broken limbs, etc.
Work Required (TS)	Identifies the necessary tree work to mitigate anticipated problems and deal with existing problems identified in the "Problems/comments" category.

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Work Required (AIA)	Identifies the tree work specifically necessary to allow a proposed development to proceed.
Priority	This gives a priority rating to each tree allowing the client to prioritise necessary tree works identified within the Tree Survey. **1** Urgent – works required immediately; **2** Works required within 6 months; **3** Works required within 1 year; **4** Re-inspect in 12 months, **0** Remedial works as part of implementation of planning consent.

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BS 5837:2012 Terms and Definitions

Access Facilitation Pruning	One-off tree pruning operation, the nature and effects of which are without significant adverse impact on tree physiology or amenity value, which is directly necessary to provide access for operations on site.
Arboricultural Method Statement	Methodology for the implementation of any aspect of development that is within the root protection area, or has the potential to result in loss of or damage to a tree to be retained.
Arboriculturist	Person who has, through relevant education, training and experience, gained expertise in the field of trees in relation to construction.
Competent Person	Person who has training and experience relevant to the matter being addressed and an understanding of the requirements of the particular task being approached. *NOTE - a competent person is expected to be able to advise on the best means by which the recommendations of this British Standard may be implemented.*
Construction	Site-based operations with the potential to affect existing trees.
Construction Exclusion Zone	Area based on the root protection area from which access is prohibited for the duration of a project.
Root Protection Area (RPA)	Layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority.
Service	Any above or below ground structure or apparatus required for utility provision. **NOTE** - examples include drainage, gas supplies, ground source heat pumps, CCTV and satellite communications.
Stem	Principal above ground structural component(s) of a tree that supports its branches.
Structure	Manufactured object, such as a building, carriageway, path, wall, service run, and built or excavated earthwork.
Tree Protection Plan	Scale drawing, informed by descriptive text where necessary, based upon the finalized proposals, showing trees for retention and illustrating the tree and landscape protection measures.
Veteran Tree	Tree that, by recognized criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. **NOTE** - these characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem.

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Appendix F

Tree Preservation Order Enquiry/Response

Melanie McKenzie

From: Begum Miah, Taslima (Planning Serv) [Taslima.BegumMiah@huntingdonshire.gov.uk]
Sent: 09 May 2018 12:21
To: Melanie McKenzie
Subject: RE: TPO Enquiry - 6746 - Redwood Farm, Caxton Road, Great Gransden, Sandy, Bedfordshire, SG19 3BQ

Good Afternoon,

Thank you for your email.

I have had a look on our system, and I can confirm that the site does not fall in a conservation area and does not have any TPO's.

I hope this helps.

Kind Regards,

Taslima Begum-Miah
Administrative Assistant
Development Services
Corporate Delivery
Huntingdonshire District Council
Pathfinder House, St Marys Street
Huntingdon
PE29 3TN

DDI: 01480 388 418
Email: taslima.begummiah@huntingdonshire.gov.uk

Please visit the Planning Pages of our new website at http://www.huntingdonshire.gov.uk/planning for all planning related enquiries, including full details of the pre-application services we are providing.

Any comments represent the informal opinion of an officer of Huntingdonshire District Council. These comments are made without prejudice to any eventual determination through the planning process.

Huntingdonshire DISTRICT COUNCIL

From: Melanie McKenzie [mailto:MelanieMcKenzie@TreeSurveys.co.uk]
Sent: 09 May 2018 11:51
To: Trees
Subject: TPO Enquiry - 6746 - Redwood Farm, Caxton Road, Great Gransden, Sandy, Bedfordshire, SG19 3BQ

Mimecast Attachment Protection has deemed this file to be safe, but always exercise caution when opening files.

Dear Sir/Madam,

Could you please advise if the above mentioned site is covered by TPO or is located within a Conservation Area? I have attached a map for your use.

I look forward to hearing from you.

Kind Regards

Melanie McKenzie
Administrator

(Please note my working hours are: 9am - 3pm term times and 9am - 1pm school holidays)

HAYDEN'S
Arboricultural Consultants

Tel: 01284 765391 DD: 01284 715014 info@treesurveys.co.uk **www.treesurveys.co.uk**

Head Office: 5 Moseley's Farm Business Centre, Fornham All Saints, Bury St. Edmunds, Suffolk, IP28 6JY
South West Office: Unit 7, Enterprise House, Cherry Orchard Lane, Salisbury, Wiltshire, SP2 7LD

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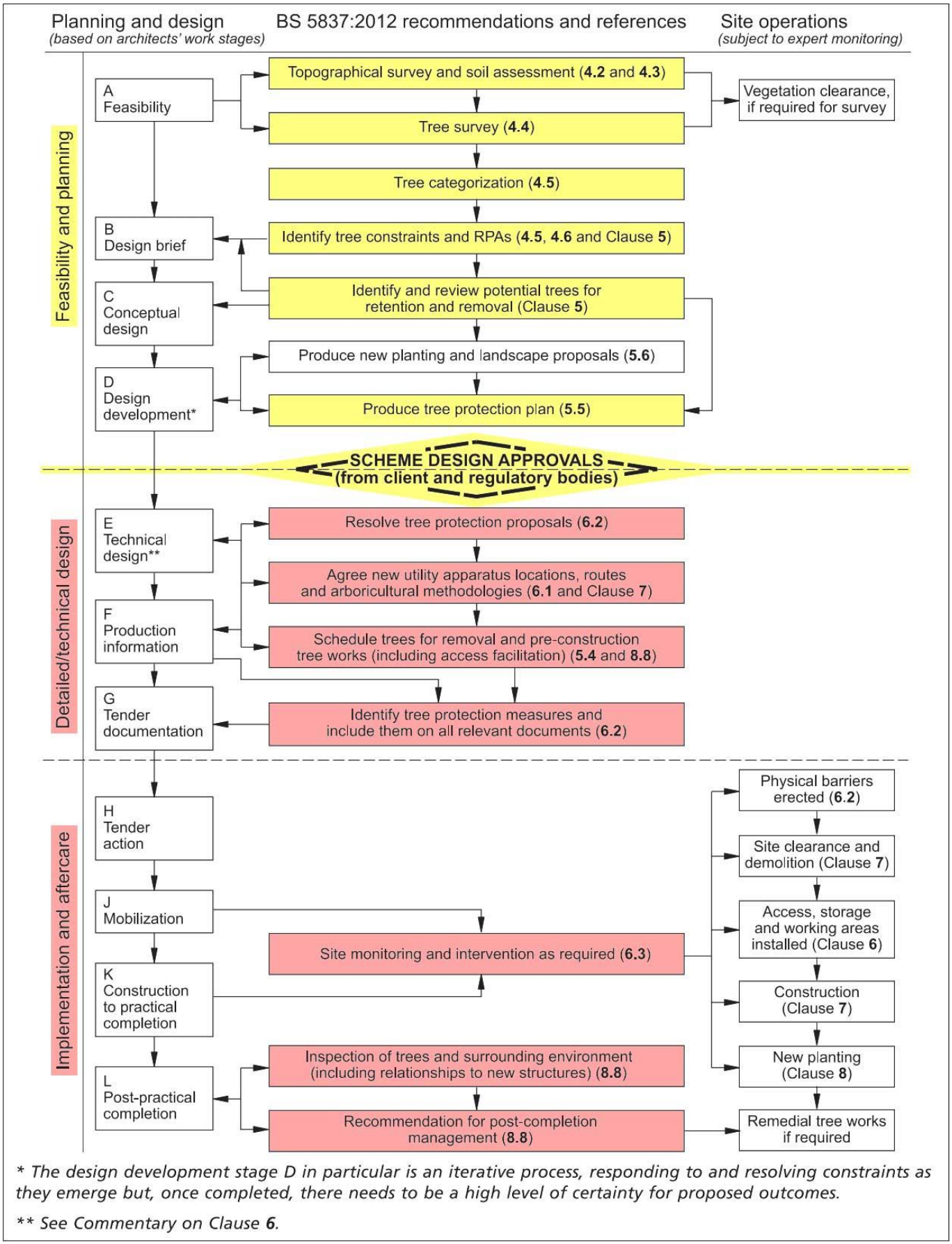
Appendix G

Advisory Information & Sample Specifications

1. BS 5837:2012 Figure 1 - Flow Chart – Design and Construction & Tree Care



** The design development stage D in particular is an iterative process, responding to and resolving constraints as they emerge but, once completed, there needs to be a high level of certainty for proposed outcomes.*

*** See Commentary on Clause **6**.*

2.

European Protected Species and woodland operations. (V4)

Complete all sections of the Checklist

✔

Checklist

1 **Are you within, or close to, the known mapped range of any of the protected species OTHER THAN BATS which are potentially everywhere? Tick any that apply.**
See distribution maps in the Good Practice Guidance for each species -

- ☐ Dormice
- ☐ Otters
- ☐ Great crested newts
- ☐ Sand lizards
- ☐ Smooth snakes

YES ☐ NO ☐

2 **Does your wood contain any of the following habitats? Tick any that apply.**

- ☐ Old trees with holes and crevices which might be used bats
- ☐ Species rich scrub/coppice, early growth stage plantations and forest interfaces
- ☐ Rivers on which otters might be found
- ☐ Ponds which might be occupied by great crested newts
- ☐ Open areas on heathy soils

YES ☐ NO ☐

3 **Have any of the protected species been recorded in this wood or on adjoining sites? Tick any that apply.**
Indicate which sources of information you have checked:

- ☐ National Biodiversity Network (www.nbn.org.uk)
- ☐ Local Biological Records Centre
- ☐ Local Wildlife Trust
- ☐ Other

Specify Other:

YES ☐ NO ☐

4 **Have your inspections or any expert surveys found any of the following signs or evidence? Tick any that apply.**

- ☐ Signs (e.g. otter spraint, nuts gnawed by dormice, leaves folded by newts)
- ☐ Sightings (or echo-location)
- ☐ Potential breeding or roosting sites (e.g. veteran trees, old trees with crevices, riverside hollow trees, ponds, timber stacks, large fallen deadwood)
- ☐ Confirmed breeding or roosting sites (i.e. evidence of sites actually being used)

Details:

YES ☐ NO ☐

Details

Name of Wood:

Grid Reference:

Area: (ha) .

Date of Assessment:

Name of Assessor:

CHECK POINT

If you have answered NO to ALL of the above then only bats need to be considered in your operations.

If you have answered YES to any of the above then the species concerned must be considered as well as bats.

Notes

5 **Do the operations comply with Good Practice for bats and any other species found (or likely to be found in your wood) or can the operations be modified to do so?**
Details: Use reverse of form to expand as required:

YES ☐ A licence is not required but continue to sections 6 and 7 below

NO ☐ You will need to obtain a licence BEFORE carrying out the work (see EPS Licence Application Forms and Notes)

6 **Whether or not a licence is required...**
Has the information been communicated to operators (including the location of breeding sites and sensitive areas)? Tick any that apply.

- ☐ Included in documentation (e.g. contract, letter of instruction, site assessment or other management plan)
- ☐ Shown to operators and/or their supervisor
- ☐ Marked with paint or hazard tape
- ☐ Shown on the site plan

Other means:

YES ☐

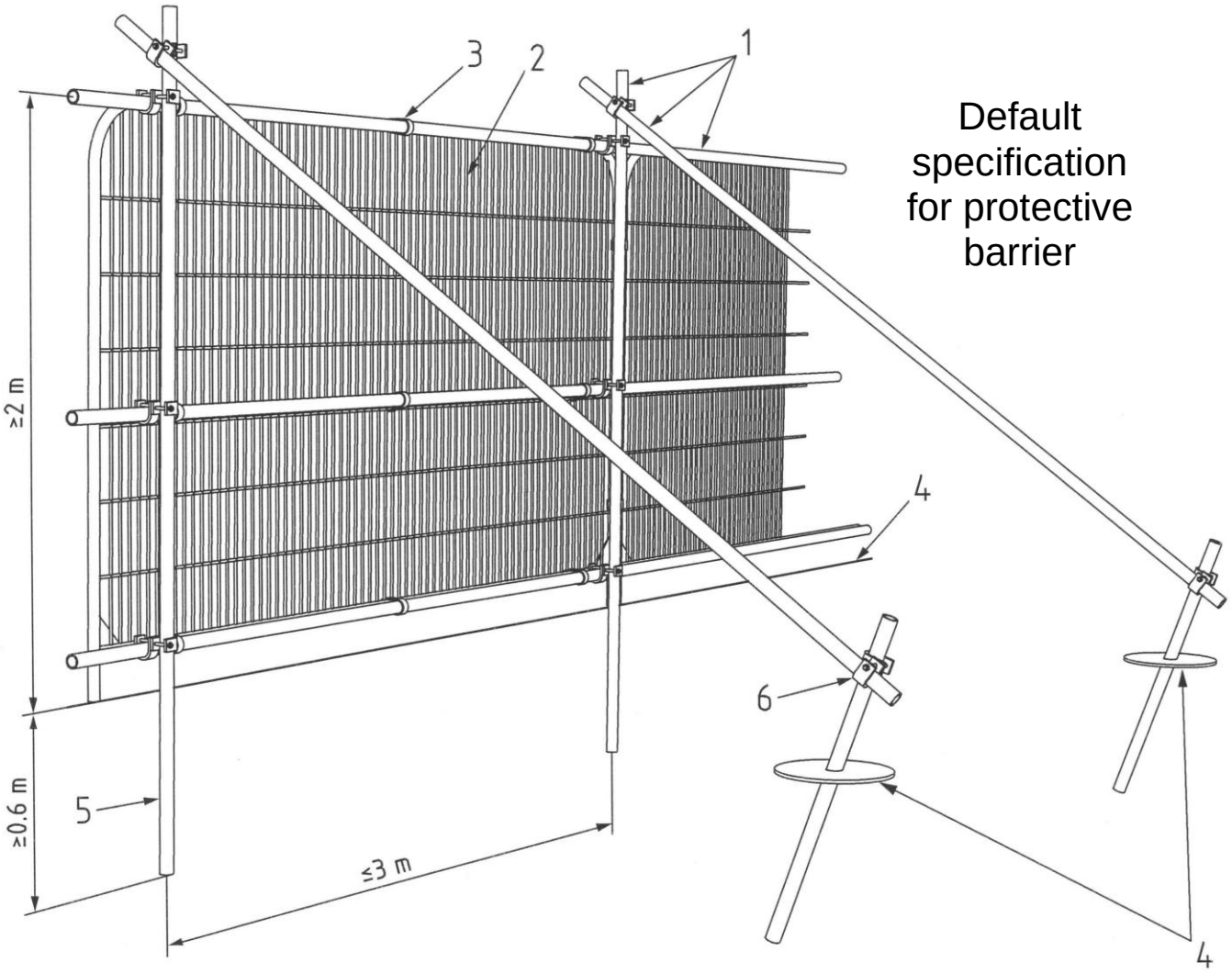
NO ☐ You may commit an offence if you do not tell your operators about the protected species in your wood.

7 **Have arrangements for supervision been made to ensure Good Practice guidance is complied with during the operations?**
Details:

YES ☐

NO ☐ You may commit an offence if you do not take steps to ensure that your operators comply with the Good Practice guidance.

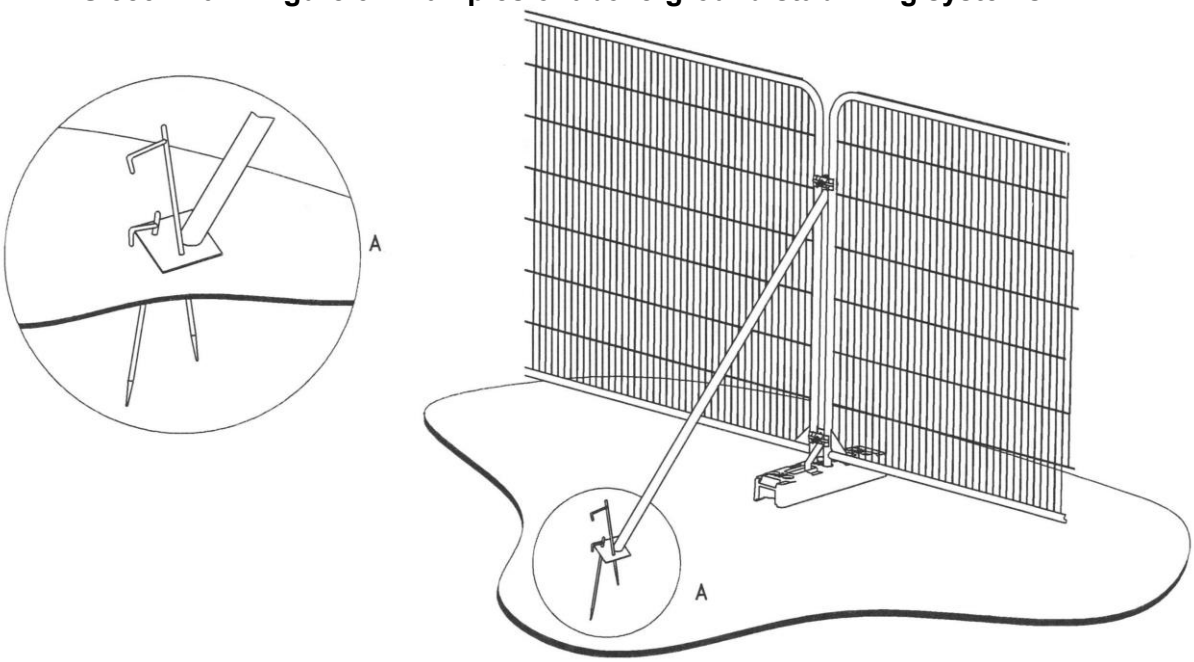
3. BS 5837:2012 Figure 2: Default specification for protective barrier



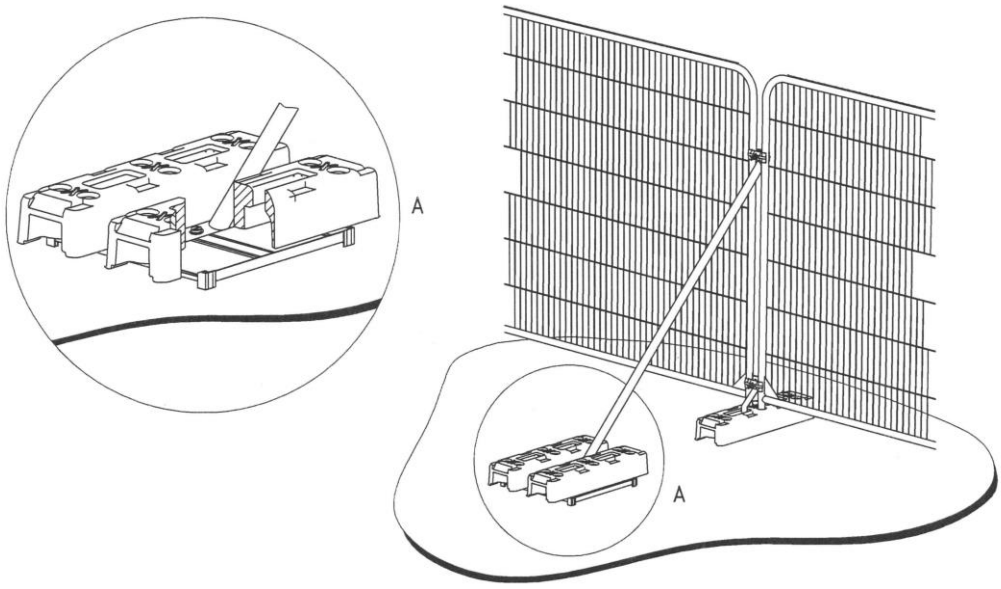
Key

1	Standard scaffold pole
2	Heavy gauge 2m tall galvanised tube and welded mesh infill panels
3	Panels secured to uprights and cross-members with wire ties
4	Ground level
5	Uprights driven into the ground until secure (minimum depth 0.6m
6	Standard scaffold clamps

4. BS 5837:2012 Figure 3: Examples of above-ground stabilizing systems



a) Stabilizer strut with base plate secured with ground pins



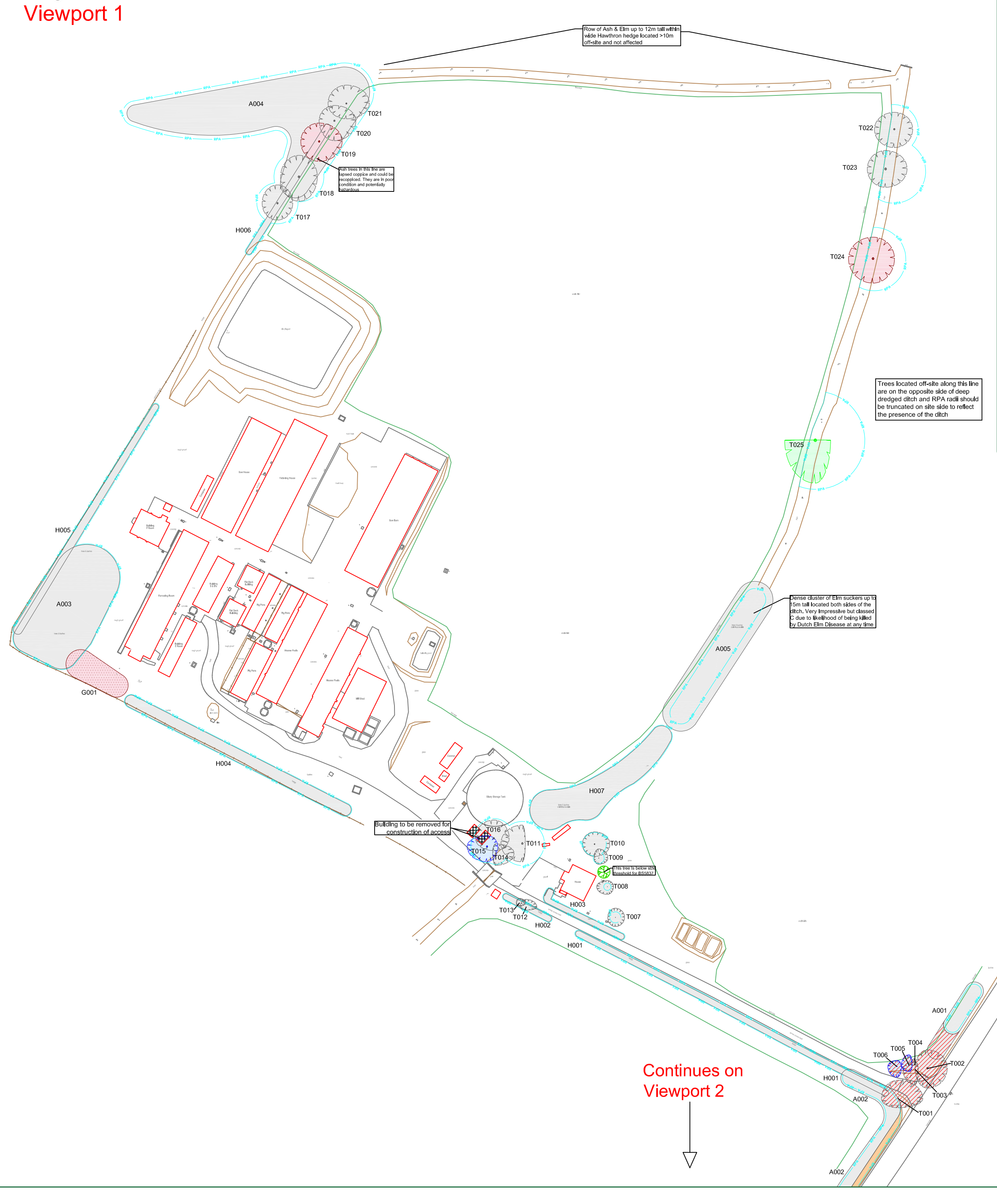
b) Stabilizer strut mounted on block tray

Appendix H

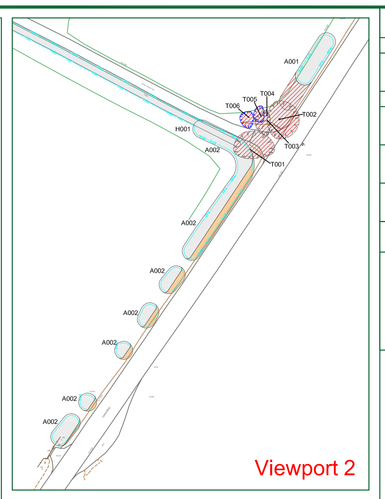
Hayden’s Drawing

Existing Site Plan

Viewport 1

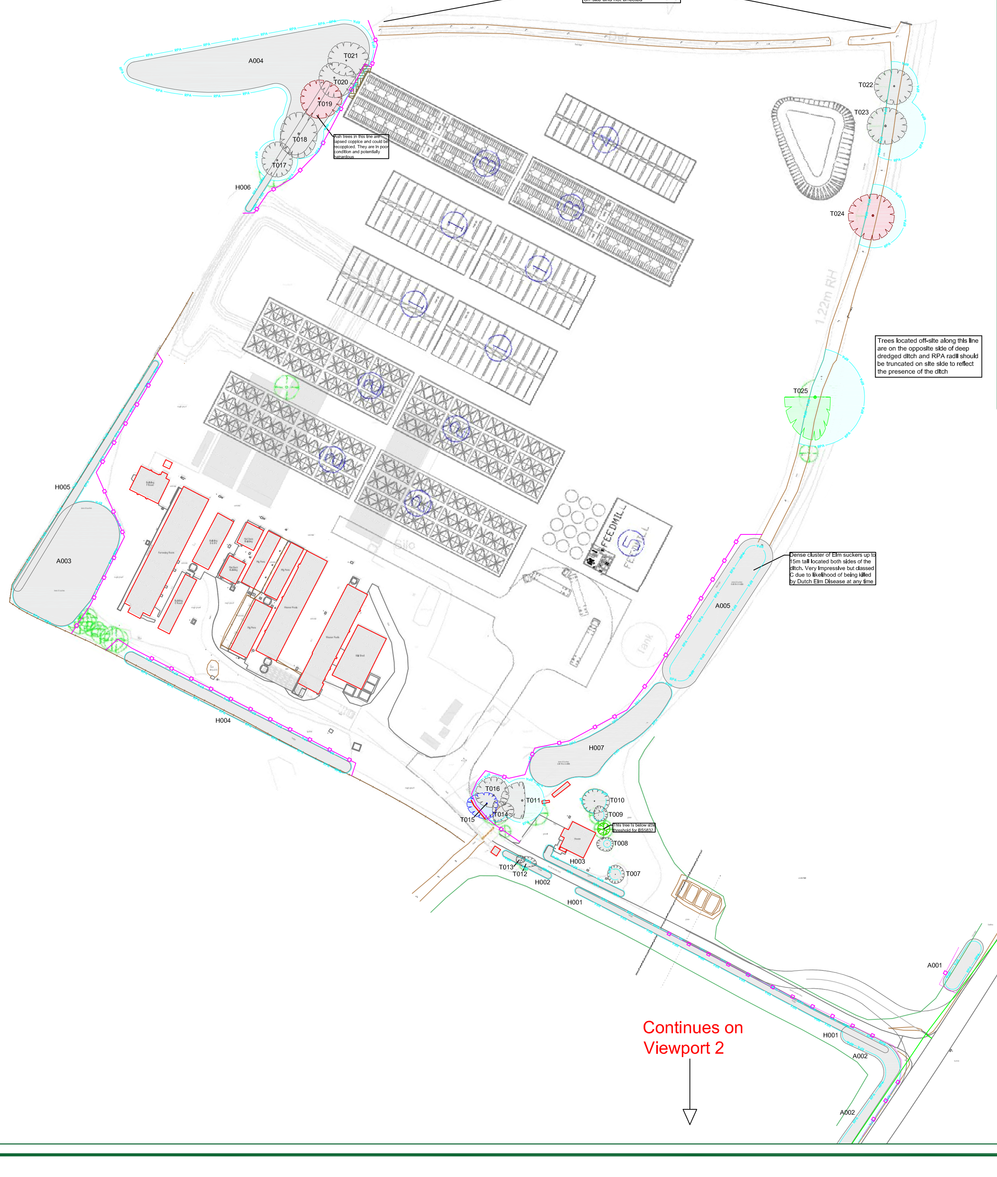


Viewport 2

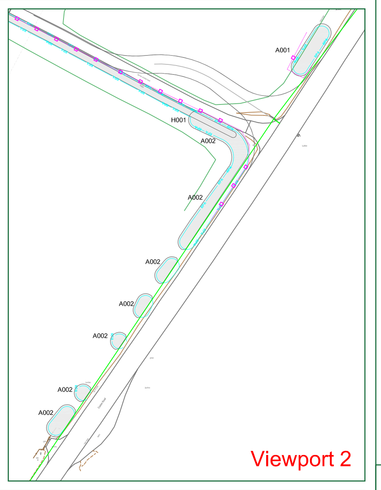


Proposed Site Plan

Viewport 1



Viewport 2



CATEGORY AND DEFINTION

Trees unsuitable for retention	
Category U	Those in such condition that they cannot realistically be retained as living trees in the current land use for longer than 10 years
Trees to be considered for retention	
Category A	**Trees of high quality** with an estimated remaining life expectancy of at least 40 years
Category B	**Trees of moderate quality** with an estimated remaining life expectancy of at least 20 years
Category C	**Trees of low quality** with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm

NOTE:

Hayden's Arboricultural Consultants were provided with a Topographical Survey but these do not always show the positions of all the trees/features on site. The locations of any additional features have been fixed using GPS. As such the position of the trees/landscape features should not be taken as exact but gives a fair distribution of their locations on site.

North (Indicative)

LEGEND

- Existing Tree/Hedge BS 5837:2012 Category A
- Existing Tree/Hedge BS 5837:2012 Category B
- Existing Tree/Hedge to be removed to allow for development BS 5837:2012 Category B
- Existing Tree/Hedge BS 5837:2012 Category C
- Trees which require crown reduction to facilitate the prospective development
- Existing Tree/Hedge to be removed to allow for development BS 5837:2012 Category C
- Existing Tree/Hedge BS 5837:2012 Category U
- Line of Root Protection Area (RPA) - calculated following guidelines set in BS 5837:2012
- Existing Tree/Hedge to be Removed BS 5837:2012 Category U
- Additional feature which doesn't meet BS 5837: 2012 categorisation but is included for reference
- Dead or Dying Tree
- Line of proposed Root Pruning
- Line of proposed temporary protective barrier
- Area of temporary Ground Protection

Rev:	Date:	By:	Revision:
B	14.01.19	NT	Layout update
A	25/06/18	JF	Includes upgraded site access from MTC Engineering drawing no, 2110-02
-	10.05.18	NT	Based on ASC GEAMATICS Topographical Survey referenced as Redwood Farm, Great Gransden - ASC.17.601 - 604 & Quality Equipment drawing referenced as Buildings layout drawing no 10342-100

The position, condition, and dimensions of the trees are based on a site survey undertaken on 26/04/18

"The original of this drawing was produced in colour - a monochrome copy should not be relied upon"

Scale 1:500

0m 10m 20m 30m 40m 50m

0m 20m 40m 60m 80m 100m

Scale 1:1000

HAYDEN'S Arboricultural Consultants

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Client:	Drawing Title:
Brown & Co (Barfords)	TS & AIA / TPP

Site: Redwood Farm, Caxton Road, Great Gransden, Sandy

Date:	Drawn By:	Cad File Ref:
14.01.19	NT	C\Pro\6746-D-AIA-Redwood Farm, Great Gransden.dwg

Scale:	Checked By:	Drawing No:	Rev:
1:1000 (A1)	DC	6746-D-AIA	B

- Arboricultural Impact Assessments
- Arboricultural Method Statements
- Tree Constraints Plans
- Arboricultural Feasibility Studies
- Shade Analysis
- Picus Tomography
- Arboricultural Consultancy for Local Planning Authority
- Quantified Tree Risk Assessment
- Health & Safety Audits for Tree Stocks
- Tree Stock Survey and Management
- Mortgage and Insurance Reports
- Subsidence Reports
- Woodland Management Plans
- Project Management
- Ecological Surveys

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APPENDIX 7.1
ECOLOGICAL IMPACT ASSESSMENT TECHNICAL APPENDIX 7

Green
Environmental
Consultants

REDWOOD FARM
CAXTON ROAD
GREAT GRANSDEN
SANDY
SG19 3BQ

ECOLOGICAL ASSESSMENT

September 2018

for:

Brown & Co Barfords
Howard House
17 Church Street
St Neots
Cambridgeshire
PE19 2BU

Report number: 1239/1

Green Environmental Consultants Ltd

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This report is formatted for double-sided printing and as a result has some blank pages.

LIMITATIONS AND EXCEPTIONS

Limitations of Surveys

This report records wildlife found during the survey and anecdotal evidence of some species. Access, seasonality and weather conditions may affect survey results. It does not record any animals or plants that may appear at other times of the year and were therefore not evident at the time(s) of the visit(s). Habitats outside the site boundary were only visited where considered appropriate and where access was available.

The behaviour of animals can be unpredictable and may not conform to standard patterns recorded in current scientific literature. Many species are highly mobile and can occupy a site which has previously held no potential for them and factors such as increasing habitat pressure can cause animals to occupy areas that were previously unoccupied, or which might be considered far from suitable. This report therefore cannot predict with absolute certainty that animal species will occur in apparently suitable locations or that they will not occur in locations or habitats which appear to be unsuitable.

Limitations of Report

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

The Executive Summary, Conclusions and Recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon until considered in the context of the whole report.

Interpretations and recommendations contained in the report represent our professional opinions, which were arrived at in accordance with currently accepted industry practices at the time of reporting and based on current legislation in force at that time.

Where the data available from previous reports, or for other subject matter supplied by the Client, have been used, it has been assumed that the information is correct. No responsibility can be accepted by ourselves for inaccuracies within the data supplied.

The copyright in this report and other plans and documents prepared by Green Environmental Consultants is owned by Green Environmental Consultants Ltd and no such report, plan or document may be reproduced, published or adapted without their written consent. Complete copies of this report may, however, be made and distributed by the Client as an expedient in dealing with matters related to its commission.

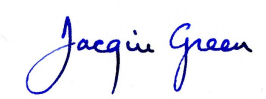
This report is prepared and written in the context of the proposals stated in the introduction to this report and should not be used in a differing context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to us for re-assessment and, if necessary, reappraisal.

Scientific survey data will be shared with local biological records centre in accordance with the CIEEM professional code of conduct.

Please note that Green Environmental Consultants Ltd is an ecological consultancy. Any information relating to legal matters in this report is provided in good faith but does not purport in any way to give any advice on or interpretation of the law whatsoever. Professional legal advice should always be sought.

The data, advice and opinion which we have prepared and provided is true, and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management's Code of Professional Conduct. I confirm that the opinions expressed are my true and professional *bona fide* opinions.

This ecological information is supplied in accordance with BS 42020 2013.



Jacqui Green BSc(Hons), MSc, CEcol, FCIEEM

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REDWOOD FARM, CAXTON ROAD, GREAT GRANSDEN, SANDY, SG19 3BQ
ECOLOGICAL ASSESSMENT
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0 EXECUTIVE SUMMARY

This report has been prepared by Green Environmental Consultants and relates to the proposed expansion of a pig breeding unit at Redwood Farm, Caxton Road, Great Gransden, Sandy, SG19 3BQ, hereafter called the 'Site'. It is located at grid reference TL 2942 5760.

Results

The main area of the Site was a single large field bounded on two sides by fencing and/or hedging, on one by a ditch (north side) and on the south-eastern side by a stream (Gascote Dean). Also within the Site, between the field and Caxton Road was an access track and a triangle of land with a dwelling and garden. The main area of the field was cropped (haylage) and in one corner were agricultural buildings and related infrastructure including slurry pits. The Site had: buildings and hard-standing; grassland (amenity and species-poor semi-improved grass); tall ruderal vegetation; hedges, scrub, tree lines, a small conifer plantation; and arable. All were considered to be species poor and of little ecological value.

Surrounding fields were all cereal crops. The Gascote Dean was a narrow and mostly shaded small brook with no emergent vegetation and water levels were generally low. There was scrub and some trees on each bank.

Scoping:- Great Crested Newt Habitat Suitability Indices were derived for a pond more than 200m away, the Gascote Dean and the northern boundary ditch. These were good, average and average respectively. The brook and ditch were tested for Great Crested Newt DNA which was negative. As any newts in the pond (if any) would have to cross hostile terrain and one of these two water courses to reach the Site, Great Crested Newts were scoped out. No buildings were suitable for bats and trees were located on the boundaries and would be unaffected; no bat surveys were considered to be necessary.

Species surveys:- No reptiles were found during survey. No evidence of Water Voles was found on the brook or ditch. Badger prints were found once, on the brook bank top; no evidence of their residence was found.

Evaluation - The Site was ecologically very poor and has been valued at Zone of Influence (Site and immediate surroundings only) level.

Impacts - Minor impacts are expected on: a small section of the Gascote Dean to install an outfall; removal of a small area of hedgerow/scrub to improve visibility at the road junction; construction impacts could occur to Badgers. No additional nitrogen deposition or ammonia impacts on Local Wildlife Sites, Sites of Special Scientific Interest or sites of European importance (SACs) within 5kms are predicted.

Mitigation and Enhancement - standard construction precautions will remove potential impacts on Badgers. Enhancement of hedgerows and planting of new hedges and tree belts will increase the area of green corridor and provide new and improved bat fight lines.

Conclusions - The Site has been identified as being habitat and species-poor and of low ecological value. It is already affected by pig farming and expansion of these activities will mainly impact on the haylage field (part of the Site) by loss to buildings. The expansion of the business provides the opportunity to use the latest building designs for such activities, incorporating the latest pollution control mechanisms, including that of odour control and nitrogen deposition, to minimise any impacts on adjacent or nearby habitats.

1 INTRODUCTION AND OBJECTIVES

This report has been prepared by Green Environmental Consultants Ltd on behalf of Brown & Co - Barfords. The report relates to the proposed expansion of an existing pig breeding unit at Redwood Farm, Caxton Road, Great Gransden, Sandy, SG19 3BQ, hereafter called the 'Site'. It is located at grid reference TL 2942 5760. The purpose of this assessment is to inform a planning application and to assess the constraints to development that may arise from ecological issues.

Figure 1239/1/1 Redwood Farm Location Aerial Photograph.

Green Environmental Consultants were appointed in 2018 to undertake a Preliminary Ecological Appraisal and scoping. The potential for a number of protected species to be resident on or using the Site was identified and species surveys have been undertaken. This document reports the findings of those surveys.

The surveys were undertaken and the report written by Jacqui Green BSc(Hons), MSc, CEcol, FCIEEM. In the following report binomial scientific names are given after the first mention of a species only; plant names follow Stace 2010 nomenclature.

The objectives were:

- To undertake an extended Phase survey of the proposed application area; and
- to undertake a scoping for protected or biodiversity species; and
- to undertake selected specialist species surveys as identified above (amphibian; reptile, Badger); and
- to undertake an assessment of the Site's ecological value; and
- to advise on constraints and mitigation.

2 EVALUATION CRITERIA

2.1 Baseline Ecological Conditions

The ecological baseline was established through a desk study and site survey as outlined in chapter 3. The results were evaluated against a hierarchy of protection ranging from the highest level (internationally protected) to no statutory protection but which receive consideration under planning legislation. These factors have been assessed against ecological evaluation criteria developed by the Chartered Institute of Ecology and Environmental Management.

2.2 Legislation

2.2.1 European Protected Species and Habitats (Great Crested Newts, Dormice, bats and others)

European Protected Species (EPS) are protected under the EC Council Directive on the Conservation of Natural Habitats and Wild Fauna and Flora (the Habitats and Species Directive). This legislation is enacted under the Conservation of Habitats & Species Regulations 2017 (the 2017 Regulations). Works which involve impacts on EPS are likely to require a Natural England licence.

2.2.2 Wildlife & Countryside Act Protected Species (Water Voles, Barn Owls, reptiles and others)

2.2.2.1 *General*

A number of species receive protection at a national level, usually against injury and killing, but may also include destruction of a resting place, collection and sale (the latter may also apply to selected named plants). These are listed under the Wildlife & Countryside Act 1981 (as amended) (WCA 1981).

2.2.2.2 *Water Voles*

Water Voles are fully protected under the provisions of the Wildlife & Countryside Act 1981. Under this Act it is an offence to: intentionally kill, injure or take Water Voles; intentionally or recklessly damage or destroy or obstruct access to any structure or place used for shelter or protection; intentionally or recklessly disturb Water Voles whilst occupying a structure or place used for that purpose; other offences not listed here.

2.2.2.3 *Reptiles*

The more common species of reptile - Grass Snake *Natrix natrix*, Slow-worm *Anguis fragilis*, Viviparous (Common) Lizard *Lacerta vivipara* and Adder *Vipera berus* - have partial protection. They are listed under the Wildlife and Countryside Act 1981, part of Section 9(1) and all of Section 9(5); that is, they are protected against intentional killing and injuring (but not 'taking'), and against sale *etc*. They are also Species of Principal Importance (SPI).

2.2.3 Other Species Legislation

Certain species are protected under other legislation eg the Protection of Badgers Act 1992 gives special protection against harm to Badgers or their setts. This is elaborated on in appendix I.

2.2.4 Biodiversity Species and Habitats

A number of species and habitats which do not merit national protection are nevertheless threatened or endangered at a more localised scale, usually at a county level, or have been discovered to have undergone a rapid decline. These are listed on the UK Species/Habitats of Principal Importance (S41) list (see under '*The England Biodiversity List*' in section 2.3), or county

(Local) Biodiversity Action Plans (BAPs) and would be considered to be part of the National Planning Policy Framework lower tier.

Further lists are provided for eg Birds of Conservation Concern BoCC (Red Lists) and species of conservation concern eg Red Data lists. There may also be local or county lists.

2.2.5 Birds - General

All nesting birds are protected under Section 1(1)(b) of the Wildlife and Countryside Act (1981) (*ibid*). It is an offence to:

> *... intentionally take, damage or destroy the nest of any wild bird while that nest is in use or being built; or take or destroy an egg of any wild bird.*

As a consequence no scrub or tree clearance or management should be undertaken during the nesting season, unless works to make the habitats unsuitable are first undertaken, or a detailed examination before clearance starts declares the area free. The nesting season is generally taken to be between mid-March and August if second broods are present, but warm seasons may extend this period to between February and September.

2.3 Planning

2.3.1 General

Government Circular 06/2005 (ODPM 2005) was produced as guidance to PPS9 but remains valid in relation to the NPPF. Paragraph 98 states that……

> *'The presence of a protected species is a material consideration when a planning authority is considering a development proposal that, if carried out, would be likely to result in harm to the species or its habitat. Local authorities should consult Natural England before granting planning permission. They should consider attaching appropriate planning conditions or entering into planning obligations under which the developer would take steps to secure the long-term protection of the species.'*

The Revised National Planning Policy Framework (RNPPF) (MHCLG 2018) sets out the Government's planning policies for England and how these are expected to be applied. The RNPPF continues to highlight, as with the NPPF, that the purpose of the planning system is to contribute to the achievement of sustainable development. It goes on to state that there are three dimensions to sustainable development: economic, social and environmental. The RNPPF continues with the principle that there is a "*presumption in favour of sustainable development*"; however, paragraph 11 states that planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise.

National policy on the protection of nature conservation interests and enhancing biodiversity through the planning system is primarily set out under section 15 of the RNPPF, 'Conserving and enhancing the natural environment'. This requires projects to achieve biodiversity benefits, not simply to avoid negative impacts. National policies are reflected in the preparation and adoption of development planning documents at the local level and are also of material worth in considering individual planning applications.

Paragraph 171 says:

> *'Plans should: distinguish between the hierarchy of international, national and locally*

designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework; take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure; and plan for the enhancement of natural capital at a catchment or landscape scale across local authority boundaries.'

Paragraph 175 says;

'When determining planning applications, local planning authorities should apply the following principles:

- *if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;*
- *development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and*
- *development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.'*

The Natural Environment and Rural Communities Act (OPSI 2006) (section 40(1)) states that:

'Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity.'

2.3.2 Species/Habitats of Principal Importance and Biodiversity

To aid assessment and evaluation of impacts on biodiversity, a list of Species of Principal Importance (SPI) has been produced. Natural England have produced standing advice (*Purpose and use of the England Biodiversity List*) regarding SPI as follows:

The S41 list will be used to *guide* decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006 "*to have regard*" to the conservation of biodiversity in England, when carrying out their normal functions (author's italics).

Defra guidance for local authorities and public bodies on implementing the biodiversity duty in the NERC Act draws attention to the S41 list, emphasising that local authorities and public bodies have a role to play in ensuring the protection of these species and habitats.

It is clear that the list is not intended to be prescriptive. It is a guide to identifying the species and habitats which require particular attention, after protected species. The presence of an SPI on a site is not necessarily a reason to refuse planning permission. However, there may be reasons for extra consideration in certain circumstances. For example, if the population was especially important in a Local context, or the population was a stepping stone between other populations, or the last surviving within a given area, it may become more important to protect it.

Cambridgeshire and Peterborough are also home to important populations of some species not on the UK Priority list, but still special and in need of conservation. For example, these may be

nationally rare species for which Cambridgeshire holds a large proportion of the entire UK population. As these are not UK Priority Species, they are not covered by the requirements in national and local planning policies and there is no specific obligation to consider them. However, consultation with local experts has identified them as valuable in a local context; they may also be considered as targets for conservation efforts where appropriate. The Cambridgeshire and Peterborough Biodiversity Partnership, working with local specialists and recorders, has produced a list of these additional species of interest.

2.4 Ecological Evaluation

It is important to put records and results into context using criteria such as designation, rarity, vulnerability, threat, location in a linkage of sites or features, importance at a given scale (eg national, local, parish) etc.

Evaluation criteria based on those developed by the Chartered Institute of Ecology and Environmental Management are given below:

Table 2.1 Ecological Valuation Levels

Level of Value	Comment
International	Sites, habitats or species protected under international legislation eg. Habitats and Species Directive. These include, amongst others: Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar Sites, Biosphere Reserves, plus undesignated sites supporting populations of internationally important species.
National	Sites, habitats or species protected under national legislation e.g. Wildlife & Countryside Act 1981 and amendments. Sites include Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNRs), Marine Reserves, plus areas supporting significant areas of UK Habitats of Principal Importance, or breeding populations of rare (Red Data Book) species.
Regional	Sites, habitats or species which may have regional importance, but which are not protected under legislation (although Local Plans may specifically identify them) e.g. viable areas or populations of Regional Biodiversity Action Plan habitats or species; regionally important invertebrate assemblages etc.
County	Sites, habitats or species meeting the criteria for Local (County, Metropolitan or Unitary Authority area) designation e.g. Local Wildlife Site. This category includes designated Local Nature Reserves, which have statutory protection. Sites containing viable areas or populations of Species of Principal Importance (SPIs) or County Biodiversity Action Plan habitats or species, local Red Data Book species etc.
District	Undesignated sites or features which enhance or enrich the local area (Borough, District etc). Sites containing viable areas or populations of local SPIs or HPIs, local Red Data Book species etc.
Local or Parish	Undesignated sites or features, which enhance or enrich the wildlife resource at a Parish or neighbourhood level.
Zone of influence	Includes nil or low ecological value but which form a function within the site or immediate surroundings.

3 METHODOLOGY

3.1 Desk Study

A desk study was undertaken to gather existing ecological records in relation to the site and the surrounding area, in order to provide ecological context for the site and to inform an assessment of the potential ecological constraints to development. A 2km search was undertaken from Cambridgeshire & Peterborough Environmental Records Centre; a wider search was conducted through the MAGIC website.

As some species are listed under a number of categories eg a protected specie may also be a Species of Principal Importance, they are reported in the results section under the highest ranking category as this is the one which provides the greatest protection to the specie (except for those protected under the Wildlife and Countryside Act against sale only and which are also SPIs as in that case the opposite applies).

3.2 Habitat Survey

A Phase 1 habitat survey of the site was conducted. The survey followed the 'Preliminary Ecological Appraisal' methodology as set out in CIEEM (2017) *Guidelines for Preliminary Ecological Appraisal*, 2nd Edition Chartered Institute of Ecology and Environmental Management, Winchester, which is a development of the method described in the 'Handbook for Phase 1 Habitat Survey – a technique for environmental audit' (Joint Nature Conservation Committee, 2010). In addition notes were made of dominant or uncommon species; observations of unusual flora or faunal activity were noted also.

Species were recorded according to the DAFOR scale. The relative frequency and cover of each species identified, as they are distributed in each habitat is estimated using the following scale:

D - Dominant - >75% cover
A - Abundant – 51-75% cover
F - Frequent – 26-50% cover
O - Occasional – 11-25% cover
R - Rare – 1-10% cover

When used in this context 'rare' does not mean a plant is nationally rare or even unusual, it refers to the small number of plants or its cover recorded in that particular area only. A map (figure 1239/1/2) showing the main features is given in appendix II to aid the description.

The survey was undertaken by Jacqui Green BSc(Hons), MSc, CEcol, FCIEEM who has forty years of survey experience. This survey was conducted on 27 March 2018 when the weather was dull and overcast.

Survey Limitations

A part of the Site (western corner) was still an active pig breeding unit with strict disease control measures in place. The agricultural buildings were not examined closely to avoid entering this area. It was however, possible to see all the perimeter of the Site and to view the existing intensive agricultural units from its boundaries and confirm no wildlife interest in that area of hard-standing and agricultural buildings which would require further investigation.

3.3 Scoping for Protected & Biodiversity Species

Information from the habitat survey was used to scope (look for indicative habitats, niches or

other signs) for protected or biodiversity habitats and species, which may require more detailed survey. Adjacent land was included in this scoping to assess if any protected species might be present on land nearby and which might be indirectly affected or which could use the Site transiently. Maps and aerial photographs were also used to identify features which might be hidden by vegetation or fencing.

3.4 Amphibian Survey

3.4.1 General

The Caxton area (and potentially including Redwood Farm although its address is Great Gransden) is known to have a good population of Great Crested Newts. Almost every pond within Caxton village surveyed by this author for other projects, has a positive record for this species. When assessing the potential for Great Crested Newts to be present, the Site habitats are taken in to account but also the presence of other ponds within either 250m or 500m.

The Caxton ponds lie in excess of 300m from the Site, across arable fields. Ponds at Hardwicke Farm to the south-west are also in excess of 300m across arable fields. There is one pond approximately 215m due east across a flowing brook, an arable field and a road. From a desk exercise it was considered unlikely that Great Crested Newts would use the Site but it was not possible to eliminate that possibility at the scoping stage. It was decided to employ two techniques to further determine the potential for Great Crested Newts to be using the Site - Habitat Suitability Index and eDNA sampling.

3.4.2 Habitat Suitability Index

The Habitat Suitability Index (HSI) for the Great Crested Newt was developed by Oldham et al. (2000). HSI scoring systems were originally developed by the US Fish and Wildlife Service as a means of evaluating habitat quality and quantity. An HSI is a numerical index, between 0 and 1, where 0 indicates unsuitable habitat, and 1 represents optimal habitat. The HSI for the Great Crested Newt incorporates ten suitability indices, all of which are factors thought to affect Great Crested Newts. This methodology/index has been amended by the Herpetological Conservation Trust's National Amphibian and Reptile Recording Scheme (NARRS) which is used below.

The HSI for Great Crested Newts is a measure of habitat suitability. In general, ponds with high HSI scores are more likely to support Great Crested Newts than those with low scores. However, the system is not sufficiently precise to allow the conclusion that any particular pond with a high score will support newts, or that any pond with a low score will not do so.

The scoring system used to calculate the HSI for water bodies present on site is summarised below:

SI 1 - Location A (optimal) 1 B (marginal) 0.5 C (unsuitable) 0.01

SI 2 Pond area Measure pond surface area (m^2) and round to nearest 50 m^2

SI 3 Pond drying

Never	1.0	Never dries
Rarely	0.9	Dries no more than two years in ten or only in drought
Sometimes	0.5	Dries between three years in ten to most years
Annually	0.1	Dries annually

SI 4 Water quality

Good	1.0	Abundant and diverse invertebrate community.

Moderate	0.67	Moderate invertebrate diversity
Poor	0.33	Low invertebrate diversity, few submerged plants
Bad	0.01	Clearly polluted, only pollution-tolerant invertebrates, no submerged plants.

SI 5 Shade Estimate percentage perimeter shaded to a least 1m from shore. Read value off graph.

SI 6 *Water fowl*

Absent	1.0	No evidence of water fowl (although moorhen may be present)
Minor	0.67	Waterfowl present, but little sign of impacts
Major	0.01	Severe impact of waterfowl

SI 7 Fish

Absent	1.0	No records of fish stocking and no fish revealed during survey.
Possible	0.67	No evidence of fish, but local conditions suggest that they may be present.
Minor	0.33	Small numbers of crucian carp, goldfish or stickleback known to be present.
Major	0.01	Dense populations of fish known to be present.

SI 8 Pond density

Number of ponds within 1 km of survey pond, not separated by major barriers, divided by 3.14.

SI 9 Terrestrial habitat

Good	1.0
Moderate	0.67
Poor	0.33
None	0.01

SI 10 Macrophytes

Estimate the percentage of the pond surface area occupied by macrophyte cover (between May and the end of September).

The score obtained using the above criteria is used to calculate the suitability of the pond for Great Crested Newt using the following scale:

HSI Score

<0.5	poor
0.5 – 0.59	below average
0.6 – 0.69	average
0.7 – 0.79	good
>0.8	excellent

An HSI score was derived for the only pond (off-site) which lay within 250m, the ditch which ran along the northern Site boundary and which had impounded water and the Gascote Brook which, although flowing, did have impounded areas and could be crossed by a Great Crested Newt if they survived a trek across an arable field.

3.4.3 eDNA Tests

A new tool for field ecologists is testing for DNA of animals in droppings etc. Recently a methodology for testing for environmental DNA left by Great Crested Newts in ponds has been developed (Biggs, Ewald, Valentini, Gaboriaud, Griffiths, Foster, Wilkinson, Arnett, Williams and Dunn 2014). This works by collecting samples of water in a controlled manner between mid-April and mid-June, which are then tested in laboratory conditions. The test is over 95% reliable. If a negative result is obtained than no further action is required. But if a positive result is obtained then a full survey will be required.

As any newts in the off-site pond entering the Site would have to cross the Gascote Brook or the ditch to enter the Site, it was decided to eDNA test those water bodies only.

3.4.4 Pond Survey

A detailed pond survey would only be required if the above "sifting" indicated further investigation was required.

3.4.5 Survey Limitations

The HSI should ideally be undertaken in May when emergent vegetation is at its best and a realistic assessment of its cover can be gained. But leaving it so long in the season does not allow sufficient time for follow-up surveys if the HSI indicates that it is necessary. Therefore it is common to do an HSI assessment earlier in the season. An experienced pond surveyor can make allowances/adjustments for a slightly differing scenario in May from the end of March and in this case any "borderline" features were raised to the next, higher, level to err on the side of caution.

As the Gascote Brook was flowing at the time of survey, eDNA sampling sections were chosen where the flow was impeded by, for example, fallen tree boughs.

Results from the amphibian surveys are therefore considered to be valid for the purposes of this study.

3.5 Water Vole Survey

The Water Vole *Arvicola amphibius* survey was conducted using a site based methodology devised by R Strachan and described in The Water Vole Mitigation Handbook (Dean, Strachan, Gow, and Andrews 2016). That is, a whole river survey (or the entire length within a site) was undertaken, rather than a short length distribution sampling system employed for larger geographic areas.

Wherever possible, surveys are conducted from the channel bed, looking for signs of activity such as latrines (collections of droppings), holes in the banks, closely cropped vegetation around the holes (lawns), and rafts / larders (distinctively cut lengths of green stems stored for later use). When droppings or holes are located these have to be differentiated from rat signs; droppings can superficially look like rat droppings but can be differentiated from them by their size and smell. It is very difficult to be certain about the identification between Water Vole and rat prints in the absence of other factors. Latrines provide the best information and are usually present between late April and early October (Dean et al 2016).

If access is not possible for reasons of safety, surveys can be undertaken from each bank, using binoculars, mirrors and poles to search under over-hanging vegetation.

At Redwood Farm the Gascote Brook and the northern boundary ditch where they formed

boundaries to the Site, and were surveyed from within the channel.

At the same time, an Otter survey was conducted in a similar manner, looking for signs of Otter spraints (droppings), holts (dens) and lying-up places. Otter spraints can be distinguished from Mink by their distinctive smell.

The survey was undertaken by Jacqui Green BSc(Hons), MSc, CEnv, FCIEEM who has over fifteen years experience of conducting Water Vole surveys. The survey was conducted on 29th April 2018 when it was cold and windy.

Survey Limitations

Water Voles are active for long periods of time, and seasonality is less critical for aquatic mammal surveys than some other species. However, there is sometimes a problem in seeing signs when vegetation is long and dense. The recommended methodology suggests undertaking two surveys per season, one early and one later, at times when Water Voles most frequently produce latrines. For this project only one survey was conducted at the beginning of the season. As the only impacts on the water course would be within a very restricted location, for an outfall, additional surveys were not considered to be necessary.

3.6 Reptile Survey

The reptile survey was undertaken by Jacqui Green CEcol, FCIEEM according to good practice guidelines and in suitable reptile weather conditions. Further explanation is given below.

The methodology employed follows that described in Gent A & Gibson S 1998, *Herpetofauna Workers Manual*, and also described in Froglife 1999, *Reptile Survey: An Introduction to Planning, Conducting and Interpreting Surveys for Snake and Lizard Conservation*.

Reptiles can best be observed by two methods:- one by laying down mats or refugia which they use to shelter under and warm up in the cool of the day; the second by walking the area in a repeatable transect looking ahead for movement in the grass and visually searching suitable habitats for signs of reptile activity.

The reptile survey season is usually considered to be late March to June, and September and October, with the optima being May, June and September; July and August are usually avoided as being too hot in most years. Surveys can continue outside these recommended dates when weather conditions (especially air temperature) are suitable. It is worth noting that subsequent to the published guidelines more evidence has been accumulated to indicate that some reptile species, especially Slow-worms, are easier to find in hotter weather, although the guidance has not been updated. Seven survey visits are recommended for a presence or absence survey (Froglife 1999).

Mats of roofing felt and/or carpet tiles measuring 0.5 x 0.5 m each were laid around the Site, at a density of at least 10 mats per hectare in suitable reptile habitat. In particular weedy banks around slurry pits were concentrated on as providing sunny areas for basking which were generally in short supply on the Site. South, east and west facing banks were included. In addition a group of mats was placed along the bank of the Gascote Brook. Although this was west facing, this grassy margin was included as Grass Snakes are known to prefer areas near water courses. A total of 60 refugia was used.

On each survey session, the site was walked between each refugia location, visually searching for evidence of reptiles, followed by a search of refugia. The survey dates were as follows:

Table 3.1 - Reptile Survey Dates 2018

Visit	Date	Weather Conditions
0	10 April	Refugia set-up visit and transect walk.
1	15 April	Temp 13.7 C. Wind 0 km/h. Overcast.
2	17 April	Temp 18 C. Wind gusting to 6 km/h.
3	22 April	Temp 18.1 C. Wind max 8.1 km/h; av. 5.5 km/h. Sunny.
4	29 April	Temp 18.7 C. Wind max 11 km/h; av. 6.4 km/h. overcast, dull.
5	02 May	Temp 14.8 C. Wind 0 km/h. After heavy rain; sunny; 20% cloud.
6	11 May	Temp 18 C. Wind max 4 km/h. Warm & sunny; 30% cloud.
7	16 May	Temp 16 C. Wind gusting to 10 km/h. Overcast, cloud 90%.

Survey Limitations

The recommended reptile survey months are given to avoid cold weather, and the hottest summer months (usually July and August). In 2018 the weather was unpredictable with a few days in April of very hot weather but many days of heavy rain and exceptionally cold conditions. The survey dates were selected, as far as was possible, to be within the recommended survey temperatures, but also after poor weather so that reptiles would be expected to require more use of artificial warming sites.

3.7 Badger Survey

The survey has been carried out in accordance with best practice guidance published by Natural England and Harris *et al*. Badgers *Meles meles* can be located by searching for signs of activity such as holes, latrines, paths, bedding etc. Paths are often the first thing seen, and in such cases, are followed to try to find other evidence such as setts or latrines. In some cases they cannot be followed into, for example, dense scrub, or where they move onto neighbouring land for which access is not available. Rabbits (*Oryctolagus cuniculus*) frequently leave scattered droppings, and Foxes (*Vulpes vulpes*) occasionally do; Badgers rarely leave their distinctive droppings outside of latrines.

Mammal paths are often used by a number of species such as Rabbits *Oryctolagus cuniculus* and Foxes *Vulpes vulpes*. In these instances other signs were investigated, for example, where mammal paths cross boundaries such as fences these can be examined for hairs which might be caught on wire thus showing which animal had passed along that path, or prints which may be left in muddy patches.

A subjective assessment of the foraging potential of the habitats within the site boundary and on adjacent land was made during the assessment. Good habitat provides Badgers with a variety of foraging habitats throughout the year (e.g. short grassland, hedgerows). Moderate habitat provides foraging opportunities that are limited by seasonal management (e.g. fallow arable fields, woodland and scrub, back gardens). Poor habitat provides few foraging opportunities (e.g. cereal crops, heath land, moorlands and wetlands).

The survey was undertaken on 26th April 2018 when the weather was cool but clear. It was conducted by Jacqui Green BSC(Hons), MSc, CEcol, FCIEEM who has forty years experience of undertaking Badger surveys.

Survey Limitations

Again the area around the existing agricultural buildings was avoided for reasons of disease control, but that area held no potential Badger habitat and this was not considered to be a limitation.

4 RESULTS

4.1 Desk Study

4.1.1 Sites

4.1.1.1 *Statutory Sites*

The following four Sites of Special Scientific Interest lie within 5kms (all of these are designated for broad-leaved woodland habitat):-

Hayley Wood SSSI is one of the largest Oxlip *Primula elatior* woods on the chalky Boulder Clay in Britain. Most of the wood is primary and has a recorded history of over 700 years.

Waresley Wood SSSI is of ancient origin and of the ash-maple community type which has a national distribution restricted to lowland England. Since 1945 such woodlands have declined in extent, particularly in the more intensively farmed regions and the fraction which remain relatively unmodified are therefore of high nature conservation value. The diverse flora typical of such woodland is here further enriched by the underlying geology, the Lower Greensand being evident along with the more typical extensive Boulder Clay.

Elsworth Wood SSSI is the surviving fragment of a curious ring-shaped wood unusually situated on a ridge between two valleys. This wood has probably existed since the late 13th Century. Three types of woodland are represented, all of which are nationally uncommon. It is the best example in Cambridgeshire of a wood whose canopy is dominated by Field Maple *Acer campestre*. This type of woodland appears not to be known on the continent and therefore has international significance. In addition there is a good population of Oxlip *Primula elatior* which is restricted to ancient woodlands in parts of East Anglia and the East Midlands. The wood is also known to be of importance for its invertebrate fauna and a number of nationally uncommon beetles have been recorded.

Kingston Wood and Outliers SSSI is an example of the ash-maple ancient woodland type which is characteristic of the chalky Boulder Clay of eastern England. It is one of the largest and most intact Medieval coppice woodlands in the county, and as such the trees and associated plant and animal communities probably have their origins as far back as the original wildwood. The distribution of trees, and other plants, therefore, largely represent the natural response of these species to natural environmental conditions. Additionally, the scientific value of the woods is enhanced by the existence of plant records dating back over 300 years.

In addition, Eversden and Wimpole Wood SSSI SAC lies in excess of 5kms but is a Special Area of Conservation (SAC). It is an important ancient semi-natural woodland of a type now localised in extent and rare in lowland England. The habitats present also support a nationally important summer maternity roost for the Barbastelle bat, *Barbastella barbastellus*.

4.1.1.2 *Non-Statutory Sites*

There is one Local or County Wildlife Site within 2km:

Caxton Moats CWS TL295586 - Supports 24 neutral grassland indicator species including 10 strong indicators.

4.1.2 Protected Species

4.1.2.1 *General*

Records of protected species can be confidential for a number of reasons. To safeguard this information the list is not included in full in this report. Information which might be relevant to this Site is itemised below.

4.1.2.2 *European Protected Species*

Bats: Pipistrelle bats *Pipistrellus sp*; Brown Long-eared *Plecotus auritus*; Natterer's Bat *Myotis nattereri*; Western Barbastelle *Barbastella barbastellus* maternity roost (within 10kms).

Records of Great Crested Newt *Triturus cristatus* are known from Caxton village, the nearest pond about 400m away. Records include from Tate's Farm, Church Farm and Firs Farm.

4.1.2.2 *UK Protected Species*

Reptiles - Reptile records are sparse. Grass Snake *Natrix natrix* has been recorded sporadically from Caxton Moats and one or two other locations, but none nearby.

Mammals - There are a number of Badger records in the area but none are local. Water Voles are reported from the Bourne Brook on the opposite side of Caxton from the Site.

Birds - Of species listed under the Wildlife and Countryside Act, the following have been recorded: Barn Owl *Tyto alba*; Common Crossbill *Loxia curvirostra*; Fieldfare *Turdus pilaris*; Eurasian Hobby *Falco subbuteo*; Goshawk *Accipiter gentilis*; Common Kingfisher *Alcedo atthis*; Hen Harrier *Circus cyaneus;* Hobby *Falco subbuteo*; Merlin *Falco columbarius*; Peregrine Falcon *Falco peregrinus*; Red Kite *Milvus milvus*.

4.1.3 Species/Habitats of Principal Importance and other Biodiversity Issues

Mammals: None.

Birds: Common Bullfinch *Pyrrhula pyrrhula*; Corn Bunting *Emberiza calandra;* Common Grasshopper Warbler *Locustella naevia*; Common Linnet *Carduelis cannabina;* Grey Partridge *Perdix perdix*; House Sparrow *Passer domesticus*; Lapwing *Vanellus vanellus*; Marsh Tit *Parus palustris*; Reed Bunting *Emberiza schoeniclus*; Skylark *Alauda arvensis*; Song Thrush *Turdus philomelos*; Yellow Wagtail *Motacilla flava*; Yellowhammer *Emberiza citrinella.*

Amphibians: None.

Invertebrates: Small Heath *Coenonympha pamphilus*; White-letter Hairstreak *Satyrium w-album*; Beaded Chestnut *Agrochola lychnidis*; Blood-Vein *Timandra comae*; Buff Ermine *Spilosoma luteum*; Cinnabar *Tyria jacobaeae*; Dusky Brocade *Apamea remissa*; Large Nutmeg *Apamea anceps*; Latticed Heath *Chiasmia clathrata*; Mouse Moth *Amphipyra tragopoginis*; Shaded Broad-bar *Scotopteryx chenopodiata*; Small Square-spot *Diarsia rubi*; White Ermine *Spilosoma lubricipeda*.

Plants: Shepherd's-needle *Scandix pecten-veneris*.

Non-SPI biodiversity species recorded include:

Birds - Swift *Apus apus*; Golden Plover *Pluvialis apricaria*.

Plants: Narrow-leaved Water-plantain *Alisma lanceolatum*; Slender Tare *Vicia parviflora*.

Invasive Non-native Species (INNS) listed on Schedule 9 of the WCA:

> Curley Waterweed *Lagarosiphon major*; Mandarin Duck *Aix galericulata*; Canada Goose *Branta canadensis*; American Mink *Neovison vison*; Egyptian Goose *Alopochen aegyptiacus*.

The absence of records does not mean that a particular species or habitat is not present, but may reflect a lack of recording effort in a given location. However, the general lack of records within 1km of the Site may be genuine as recorders are known to be based in the local area.

4.2 Habitat Survey

4.2.1 The Site

4.2.1.1 *General Description*

Features described below are shown on the habitat map figure 1239/1/2 in appendix II.

The main area of the Site was a single large field bounded on two sides by fencing (south-west and north-west), on one by a ditch (northern side) and on the south-eastern side by a stream known as Gascote Dean. Between this field and Caxton Road was an access track and a triangle of land encompassing a dwelling and garden. Within the field was a large area of crop and to the south-western side, agricultural buildings and related infrastructure.

The Site had: buildings and hard-standing; grassland (amenity and species-poor semi-improved grass); tall ruderal vegetation; hedges, scrub, tree lines and conifer plantation; and arable.

4.2.1.2 *Grassland*

The majority of the grassland was rank, species-poor grass of verges and banks with species such as Cock's-foot *Dactylis glomerata* abundant, and with Perennial Rye-grass *Lolium perenne*, False Oat-grass *Arrhenatherum elatius*, Common Couch *Elytrigia repens*, and Sterile Brome *Anisantha sterilis* all fairly common. Forbs were uncommon but included: Common Nettle *Urtica dioica* and Creeping Thistle *Cirsium arvense*, Creeping Buttercup *Ranunculus repens* and occasional dock *Rumex* spp.

Elsewhere grassland was close mown and maintained as lawn (mapped as amenity grassland on the habitat map figure 1239/1/2).

4.2.1.3 *Woody Habitats*

A hedge lined one side of the access track and was a trimmed thorn hedge. This continued intermittently along the same (south-western) boundary and was mainly Hawthorn *Crataegus monogyna* but with some Ash *Fraxinus excelsior*. In the western corner was a short line of poor quality redwood (*Sequoia* sp.) trees, leading in to a conifer plantation. The ground flora was poor and mostly confined to the edges where some light reached the ground, where species included Lords-and-Ladies *Arum maculatum*, Common Nettle and mosses. There were small piles of inert material also present in this area, and disturbed ground. The outer boundary of the plantation had a hedge, also Hawthorn and which continued along part of the north-west boundary.

Scrub was confined to the banks of the Gascote Dean and was mainly elm *Ulmus* sp with some thorn, Elder *Sambucus nigra* and also Ash. In places some had grown to tree height where Ash dominated.

4.2.1.4 *Tall Ruderal Vegetation*

Weedy vegetation was dominated by Common Nettle. In places where a transition of rank grass to tall ruderal was in progress these areas have been mapped (figure 1239/1/2) as a mixed habitat of both vegetation types. In such cases there were sometimes other species as well as Common Nettle such as Cow Parsley *Anthriscus sylvestris* and Hogweed *Heracleum sphondylium*.

4.2.1.4 *Other Habitats*

There was one large open, embanked, slurry pit on the western boundary. To the east of and close to the agricultural buildings was a second smaller pit into which water collected to be filtered and discharged to the Gascote Dean. Both pits were intermittently emptied throughout the season, with the slurry being spread on the adjacent field.

Along the back of one building (figure 1239/1/2 target note 1) was a ditch which had piles of bricks etc on one side. These were believed to be part of the building foundations when the floor height was raised and left exposed on the outside. Ordinarily such areas of exposed brick work would be considered to be suitable for a range of animals to hide amongst such as amphibians and reptiles. But in this case the "ditch" was filled with slurry and any animals using the brickwork were likely to have to survive in highly adverse conditions.

The crop was haylage and regularly sprayed with slurry to improve the quality and growth rate.

4.2.2 Adjacent Habitats

Surrounding fields were all cereal crops.

The Gascote Dean was a narrow and mostly shaded small brook which ran from south-west to north and formed part of the eastern boundary of the Site. There was no emergent vegetation and water levels were generally low despite heavy rain, but was deeper where fallen boughs reduced the flow. Banks were weedy in places with elm scrub and some trees on both sides.

The northern boundary ditch was typical of the area being deep and narrow but with little water at the bottom; it apparently frequently dries out (J Millard pers com). Cowslips *Primula veris* on the outside bank were apparently natural and not planted (J Millard pers com).

To the north outside the boundary ditch was a broad band of scrub. A further stand of trees/ scrub was located outside the north-western tip of the Site.

Outside the south-eastern part of the Site and on a field edge was disturbed ground which may include foundations of a former building.

4.3 Scoping for Protected and Biodiversity Species

The presence of some habitats such as rough grassland, albeit in confined areas, indicates the potential for species such as reptiles to be using the Site. However, the land-use of intensive pig farming and spraying of slurry on the field immediately adjacent to the Site would be contra-indicative. Reptiles are not common in Cambridgeshire but Grass Snake has been recorded in relation to a water course in Caxton. Therefore, despite the low probability of presence, a reptile survey has been conducted.

Great Crested Newts are common in this part of Cambridgeshire. There were no ponds within the Site (the slurry pits are completely unsuitable for this species) but there was a single pond within 250m. Although any newts using that pond would have to cross a road, an arable field and a water course to enter the Site, which seemed unlikely, their presence could not confidently be ruled out at an early stage[1]. Conducting HSI assessments of water bodies and eDNA sampling was considered to be an appropriate way to scope this matter further to determine whether there was a need for full scale surveying.

The buildings were not examined closely due to disease control restrictions but from an external view, appeared to be totally unsuitable for bats. A small number of trees on two boundaries could potentially be suitable for bats but would not be impacted by the proposals and so no bat survey was considered to be necessary.

Badgers are known to be present on the wider area and a survey has been conducted.

The Bourne Brook which lies on the opposite side of Caxton to the Site, has a healthy population of Water Voles and they could potentially be present in the Gascote Dean and the northern boundary ditch.

Dormice (not present in Cambridgeshire), and significant assemblages of invertebrates and breeding birds have been scoped out and no surveys have been undertaken.

4.4 Amphibian Survey

4.4.1 Water Body Descriptions

The pond by Gransden Road, Caxton[2] was an old field pond roughly rectangular in shape. There were some mature trees on the banks and scrub around the edges. Both submerged and emergent plants were seen and the water was fairly clear. Tree planting had taken place along the road hedgeline and along a ditch around the pond, providing good newt habitat and corridors around the pond.

Gascote Dean (GD) was a flowing brook much shaded on its eastern side, with some scrub and trees on the western (Site) side. The substrate was mostly fine gravel with only a little silt. Fallen wood was common in the channel.

The northern ditch (ND) had grassy banks with a little flowing water at the base. It was said to dry out frequently. Water quality appeared to be good although it is likely to receive, like the Gascote Dean, nitrate rich run-off from the adjacent field. It had a gravel base with exposed clay close to the surface.

4.4.2 HSI Results

The HSI results are given in table 4.1 below.

1 It was only afterwards that the amount of slurry spraying on the haylage field was understood which would have been an additional negative factor in the scoping for Great Crested Newts and other wildlife using the Site.

2 The road leading out of Caxton is called Gransden Road, Caxton. Near to the access to Redwood Farm, it crosses the parish boundary and becomes Caxton Road, Gransden.

Table 4.1. Habitat Suitability Index Results

Pond	Pond	Gascote Dean	Ditch
SI1 Field location	1	1	1
SI2 Pond area	0.12	1	0.67
SI3 Pond drying	1	0.9	0.1
SI4 Water quality	0.67	0.67	0.67
SI5 Shade	1	0.2	1
SI6 Fowl	1	1	1
SI7 Fish	1	0.67	1
SI8 Ponds	1	1	1
SI9 Terrestrial habitat	1	0.67	0.67
SI10 Macrophytes	0.81	0.31	0.31
Suitability score - 10th root	0.76	0.66	0.63
Category	Good	Average	Average

The HSI categories are: Excellent; Good; Average; Below Average; Poor

The HSI results indicate that any of the water bodies could potentially have Great Crested Newts.

4.4.2 eDNA Tests

The eDNA tests conducted by FERA on week commencing 16th April, found no Great Crested Newt eDNA in the samples from the two water courses (Gascote Dean and northern ditch), with no inhibition or degradation of the samples.

4.4.3 Conclusions

Any Great Crested Newts (if any) in the field pond greater than 200m away, would have to cross one of those water courses, as well as arable land and a road, to reach the Site, in a field sprayed with slurry. It is concluded that the eDNA tests were representative of the overall picture of Great Crested Newt activity in the near area and that they were not present on the Site and unlikely to colonise it. Therefore no further surveys have been undertaken.

4.5 Water Vole Survey

No evidence of Water Vole holes or activity was found in the Gascote Dean or the ditch on the northern boundary.

4.6 Reptile Survey

No reptiles were found.

4.7 Badger Survey

No Badger holes or other signs of regular use were found on the Site.

On 22 April 2018 two prints were found in mud on the edge of the field by the Gascote Dean, moving from north to south towards the dwelling. No other signs of Badger activity were found and it is possible that animals are resident to the north and move southwards (or vice versa) to find food supplies at certain times of year.

4.8 Invasive Non-Native Species (INNS)

No evidence of INNS was found.

5 DISCUSSION & ANALYSIS OF RESULTS

5.1 Discussion

The Site is habitat and species-poor with the intensive agricultural usage being a negative factor for many species. Boundary habitats include water courses, and trees and scrub which could attract a small number of species such as bats. Bat use of the area is likely to be low as the Site's internal habitats are poor, but they might use the wooded boundaries, especially the Gascote Dean for commuting. This area might also attract some bird species for feeding or nesting.

The Site is not considered to be an important area for resident or transient species although some, including Badgers were noted to cross it along boundary features.

5.2 Evaluation

Using the ecological evaluation criteria from table 2.1:

Table 5.1 Ecological Valuation for this Site

Level of Value	Comment
International	None recorded. Bats might use a small number of boundary trees and commute along the Gascote Dean corridor. An external view of the agricultural buildings found them to be unsuitable for bats.
National	None.
Regional	None.
County	None.
District	None.
Local or Parish	A water course (a Habitat of Principal Importance (HPI) with some associated trees and scrub not of exceptional value, along one boundary.
Zone of influence	Some SPI and/or Red List birds may use the Site boundaries for feeding and possibly for nesting. Badgers cross the site; not resident within it. Some peripheral woody habitats (poor hedgerows, some scrub and trees) provide green corridors.

Using the above criteria, the current information values the site at Zone of Influence level as it has a low ecological value.

5.3 Potential Impacts

The ecological constraints identified above, were applied to the scheme at the earliest opportunity, and have been used to address lay-out and design. The impact assessment has been undertaken using various figure and documents showing the proposed scheme, its layout and landscaping and including: 10342-110-01 revision C Site Layout; 10342-110-07 Clean & Dirty Water revision C; 10342-110-02 to 05 revision C section drawings; 10342-110-09 revision C Planting.

The following assumptions have been applied:

- The development will occur in stages over an eighteen month period with existing buildings initially retained whilst construction of new buildings takes place.
- Boundary hedges and scrub will be retained and enhanced. There will be significant new planting on adjacent land especially along the road edge where a wide green screen will be planted.
- Design of slurry control, including odours, will utilise latest techniques and be contained within enclosed systems more than the current operation. The ammonia emissions and nitrogen deposition levels (as demonstrated by AS Modelling & Data Ltd 2018 document - '*A Report on the Modelling of the Dispersion and Deposition of Ammonia from the Existing and Proposed Piggeries at Redwood Farm, near Great Gransden in Bedfordshire*.') will be lower than existing on Local Wildlife Sites, Sites of Scientific Interest and Special Areas of Conservation (European protected sites)
- The Gascote Dean and banks/corridor will be unaffected with the exception of a discharge point from the attenuation pond which will be close to the downstream junction with the northern ditch.
- External lighting along green corridors will not be used.

A number of receptors have been identified as potentially being impacted by the Proposed Development and are considered in more detail in the ES Chapter 7. These are: Sites of Special Scientific Interest (SSSIs); European Protected Species (EPS) - bat commuting or foraging routes; UK Protected Species - Badger routes; Species/Habitats of Principal Importance and other Biodiversity - the Gascote Dean brook corridor, hedged boundaries.

Receptors which are not believed to be present or which will receive no or only very minor impacts and which have effectively been scoped out of the impact assessment include: European Protected Species (EPS) - Great Crested Newts; UK Protected Species - Water voles, reptiles.

6 RECOMMENDATIONS

6.1 Further Surveys

No further surveys are considered necessary for this scheme unless a period of years elapses, in which case a resurvey for Badgers, to determine whether they have colonised the Site would inform lay-out. As it is very unlikely, with current land-use, that Great Crested Newts or reptiles would colonise, no further surveys are required for these species.

6.2 Mitigation

6.2.1 General principles

Where a proposed development will have a negative impact on a protected site or protected species, or other major feature the first measures that should be considered are avoidance of activities that will cause an impact, and consideration of alternatives to the development. Where impacts have been identified and avoidance or alternatives are not possible, then there is a restricted range of options available:

- Reduce the impact by utilising less-damaging designs or work methods.
- Translocate the affected habitat or species to another part of the site (or in extreme circumstances off-site).
- Exclude species from developable areas of the site where they exist in habitat that will not be affected by the development works.
- Re-create habitat that has been lost – together with nesting, roosting or resting places – on another part of the site (or in extreme circumstances off-site).
- Clearance should not be undertaken during the nesting season unless works to make the site unsuitable for nesting are first undertaken.

There should be no nett loss of biodiversity and the aim should be to increase biodiversity.

For this Site the following is recommended:-

6.2.2 Bats

Bat use of the area is believed to be low as the Site's internal habitats are poor. They may use the Gascote Dean and possible northern boundary green corridors as commuting routes. To encourage colonisation by bats, boxes can be provided on retained trees, or within nearby woodland with the co-operation of those landowners. Lighting should not illuminate the Gascote Dean.

6.2.4 Badgers

As no Badgers are resident no long term mitigation is required. Retention and enhancement of green boundaries will enable them to continue to use the Site transiently. During the construction phase trenches should either be closed at night or provided with ramps so that any animals which might fall in, can walk out.

6.2.5 Water Voles

No Water Voles are believed to be present and so no mitigation is possible. As they are present on the Bourne Brook some kilometres to the north, it is possible that they could colonise this area. Retention of the Gascote Dean as a flowing brook with shade and other features might encourage them in to this area. Without in-channel vegetation it is unlikely to be attractive to them as a residence, but they might travel along it to alternative areas outside their current distribution.

6.2.6 Birds

It is unlikely that this scheme will require removal of existing vegetation, except where an outfall is required on the Gascote Dean. However, given the legal protection offered to nest sites, it is strongly recommended that all vegetation clearance (where it is possible that birds will be nesting) be undertaken between the months of September and February, outside of the peak nesting bird season (March to August inclusive). Where this strategy is not possible, a targeted watching brief of the removal of key areas of bird habitat must be undertaken both immediately before and during the clearance works. Should an active nest be encountered at this time, the nest site would have to be left undisturbed until such time that any dependent young had fledged and left the area. This could involve delays to any works carried out during these more sensitive periods.

6.3 Enhancement opportunities

- Retention and enhancement of the hedgerows and green corridors around the Site.
- The retention and enhancement of hedgerows and green boundaries as well as provision of new screening belts, will all provide a diversity of bird habitats for use by bird species already present in the area.
- The provision of new bird nesting opportunities will be included as an integral part of the wider landscaping proposals for the Site. A variety of bird boxes placed on retained trees would assist this.

7 CONCLUSIONS

The Site has been identified as being habitat and species-poor and of low ecological value. The Site is already greatly affected by pig farming and expansion of these activities will mainly impact on the haylage field (part of the Site) as a large part of it will be lost to new building.

Potential impacts will be negated or minimised by design, such as protection of boundary features and increased planting to enhance existing green corridors with additional screening elsewhere. Potentially the greatest impacts, of ammonia and nitrogen deposition on sites of national and international importance in the wider area, have been demonstrated not to exist. As these levels would be lower than the levels from the existing business, these impacts can be considered to have been negated or even beneficial to a small degree.

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APPENDIX I

Protected Species Legislation

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EUROPEAN PROTECTED SPECIES (EPS)

BATS, GREAT CRESTED NEWTS, OTTERS, DORMICE

The following is given for guidance only; it is not a legal definition or interpretation and clients are advised to seek legal opinion as to its contents and the law.

Paragraph 98 of Circular 06/2005 which accompanied PPS9, and which is still relevant to the NPPF, states that '*the presence of a protected species is a* ***material consideration*** *when a planning authority is considering a development proposal that, if carried out, would be likely to result in harm to the species or its habitat.*'

EPS are protected under the EC Council Directive on the Conservation of Natural Habitats and Wild Fauna and Flora (the Habitats and Species Directive). This legislation is enacted under '*The Conservation of Habitats and Species Regulations 2017*. Statutory Instrument no. 1012. (SI 2017/1012) Department for Environment, Food & Rural Affairs, TSO, London', (the 2017 Regulations).

Species listed under Annex II of the Habitats Directive are subject to special protection and special offences exist. Under this legislation some disturbance of EPS falls outside the 2010 Regulations, but could potentially fall within the disturbance offence found in the Wildlife and Countryside Act 1981 (WCA).

a) It is an offence to '*damage or destroy a breeding site or resting place of an EPS animal*.'

   This offence exists even if the damage or destruction occurs accidentally. The offence is designed to 'safeguard the continued ecological functionality' of breeding sites and resting places, so such a place may be protected even if not in current use (eg if use is seasonal). Therefore a site or place used only occasionally for breeding or resting purposes is very likely to fall outside the offence. Early and detailed surveys are therefore necessary to determine the continued functionality and the degree of use of such a place. Mitigation which ensures the continued ecological functionality of a site or place would allow the offence to be avoided.

b) It is an offence to '*deliberately disturb wild animals of an EPS including in particular any disturbance which is likely to impair their ability to -*

   i) to survive, to breed or reproduce or to rear or nurture their young; or

   ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate.'

c) Other EPS offences under the 2017 Regulations are:

   i) deliberately capturing, killing or injuring an EPS animal;

   ii) deliberately taking or destroying the eggs of an EPS animal;

   iii) deliberately picking, cutting, uprooting or destroying an EPS wild plant.

   iv) breach of a licence condition.

Where an offence under the 2017 Regulations is likely to be committed, the offence can be derogated by means of a licence. In order to obtain a licence the scheme has to pass three tests. These are:

- Regulation 53(2)(e) states that licences may be granted to '*preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.*'
- Regulation 53(9)(a) states that a licence may not be granted unless Natural England is satisfied '*that*

there is no satisfactory alternative'.

- Regulation 53(3)(b) states that a licence cannot be issued unless Natural England is satisfied that the action proposed '*will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'*.

Whilst an ecologist can assist with these tests, the client is advised to appoint their own legal and/or economic advisors to assist with defining issues such as 'overriding public interest' and 'social or economic nature'. The tests also require considerably more work to be undertaken on the availability of alternative sites, or alternative methodologies for a development so as to avoid impacting on an EPS.

There is a new offence of '*breach of a licence condition*', greater powers of inspection and investigation; and higher penalties including custodial sentences.

If the 2017 Regulations offence is relevant then an EPS licence is required to avoid prosecution; whereas if (in a development context) the WCA offence is relevant no licence is required (or even available), but the client / ecologist has to ensure that he/ she is covered by one of the defences (see WCA v), vi), below).

Wildlife and Countryside Act - EPS offences under the Wildlife and Countryside Act:

v) intentionally or recklessly obstructing access to places used by the listed species for shelter or protection; or

vi) intentionally or recklessly damaging or destroying any structure or place which the listed species use for shelter or protection.

An offence under the WCA as described above, can occur to an EPS, but also other species listed in various schedules (notably schedules 1,5 and 8) of the Act.

Defences under the WCA only:

vii) '*the offence occurred as the incidental result of an otherwise lawful activity, and could not reasonably have been avoided.*'

viii) '*the species was in a dwelling house*'.

These defences would have to be rigorously justified and documented.

Bats

In addition to the EPS legislation described above, all UK bat species are protected under Section 9 Schedule 5 of the Wildlife and Countryside Act 1981 and amendments; they are protected under the Berne Convention, and are given migratory species protection under the Convention of Migratory Species of Wild Animals (known as the Bonn Convention 1980), including its Agreement on the Conservation of Bats in Europe (EUROBATS).

NATIONAL PROTECTION

Water Voles *Arvicola amphibius*

As a result of a national survey in 1989-90 it was reported that Water Voles had been lost from three-quarters of their 1939 sites. Although threatened, they can be common in certain areas, and one of their strongholds is in East Anglia. They are small animals which burrow into river and ditch banks, and have been in decline due to loss of habitat and predation by Mink (Strachan 1998).

Water Voles were added to Schedule 5 of the Wildlife & Countryside Act 1981 in 2008, whereby the animal is protected as well as their place of shelter. They are also listed as a UK priority species for conservation under the UK Biodiversity Action Plan (DoE 1995). As a result the animal is protected, as well as being protected from disturbance whilst in their place of shelter, and from damage or destruction to their place of shelter/protection.

Reptiles

Grass Snakes *Natrix natrix helvetica*, Slow-worms *Anguis fragilis*, Viviparous (Common) Lizards *Zootoca (Lacerta) vivipara* and Adders *Vipera berus* are protected under the Wildlife and Countryside Act 1981, part of Section 9(1) and all of Section 9(5) apply. That is, they are protected against intentionally killing and injuring (but not 'taking'), and against sale *etc*. They are also on the Biodiversity Action Plan Priority List.

Their presence on a site is a material consideration when development proposals are considered and mitigation will be required. Since they are not protected against 'taking', a careful mitigation programme and translocation does not require a licence but is likely to require prior consultation / approval from the Local Planning Authority and / or Natural England.

Amphibians

The more common newt species such as Smooth Newts *Lissotriton vulgaris* and Palmate Newts *Lissotriton helveticus* are only protected from sale under the Wildlife and Countryside Act, but are protected from injury under wildlife welfare legislation. Thus positive management or translocation proposals should be included within site development proposals, but a Natural England licence is not required to move or disturb these creatures.

Birds

All nesting birds are protected under Section 1(1)(b) of the Wildlife and Countryside Act (1981). It is an offence to intentionally take, damage or destroy the nest of any wild bird while that nest is in use or being built; or take or destroy an egg of any wild bird. As a consequence no clearance should be undertaken during the nesting season, unless works to make the habitats unsuitable are first undertaken, or a detailed examination before clearance starts declares the area free. The nesting season is generally taken to be between mid-March and mid-June, with an extension into August if second broods are present, but current warm seasons have extended this period to between February and September.

For species included on Schedule 1 of the Wildlife & Countryside Act 1981 (and as amended) eg Barn Owl, it is also an offence to intentionally disturb them while they are building a nest or when they are in, on or near a nest containing eggs or young, or to disturb their dependent young. Under the Countryside and Rights of Way (CRoW) Act (2000) it is now also an offence to cause 'reckless' as well as intentional disturbance to Schedule 1 species.

Badgers *Meles meles*

Badgers *Meles meles* are protected under the Wildlife and Countryside Act 1981 (and amendments) and given further protection under the 1992 Protection of Badgers Act, which protects not only the animal but also its sett. In 2000 the Countryside and Rights of Way (CRoW) Act gave further enforcement to sett protection.

The following is based on Natural England document:-

BADGERS AND DEVELOPMENT - A Guide to Best Practice and Licensing. Interim Guidance document 09/07.

Badgers are not rare or uncommon, and The Protection of Badgers Act 1992 is based primarily on the need to protect badgers from baiting and deliberate harm or injury (animal welfare). They are not therefore a wildlife issue, except that they more easily fall alongside ecological surveys than other subjects.

All the following are criminal offences:

- to willfully kill, injure, take, possess or cruelly ill-treat a badger;
- to attempt to do so; or
- to intentionally or recklessly interfere with a sett.

Sett interference includes damaging or destroying a sett, obstructing access to a sett, and disturbing a badger whilst it is occupying a sett. It is not illegal, and therefore a licence is not required, to carry out disturbing activities in the vicinity of a sett if no badger is disturbed and the sett is not damaged or obstructed.

Since development operations may take place over a protracted period, Natural England recommends that plans consider the effect of the development on seasonally-used setts as well as currently occupied setts. If a sett has shown signs of occupation within the past few months, it could be in use by badgers when development starts and should therefore be taken into account during the survey and any planning stages of the development. Where interference with a sett showing signs of use cannot be avoided during the development, a licence should be sought from Natural England.

Work close to Badger setts is only normally permitted between July and November.

Penalties for offences can be severe with fines of up to £5,000 plus up to six months imprisonment, for each illegal sett interference, or badger death or injury. The legislation does, however, recognise the need for a range of legitimate activities to be carried out and allows licences to be granted for certain purposes permitting work that would otherwise be illegal.

The licensing authority in England is Natural England.

APPENDIX II

Photographs

1239/1/2 Habitat Map

Species list

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PHOTOGRAPHS

Photograph 1 - the driveway looking south-east towards the road. Field hedge to right and introduced species hedge to dwelling boundary on the left.

Photograph 2 - the main farm buildings showing unsuitability for bats or other wildlife.

Photograph 3 - view across the field towards the farm buildings from the north-east corner (junction of Gascote Dean and northern ditch which are behind the photographer).

Photograph 4 - northern boundary ditch. Band of scrub on the left is outside the Site.

Photograph 5 - the Gascote Dean (brook) which formed much of the eastern Site boundary.

Photograph 6 - small slurry pit showing poor quality water and general unsuitability for wildlife.

Photograph 7 - large pit. Slightly better quality water but poor overall. Rough grass banks potentially suitable for reptiles.

Photograph 8 - Field pond potentially suitable for Great Crested Newts. It was over 200m away from the Site boundary. Newts would have to cross a road, arable field and water course, then cross a slurry sprayed field to reach slurry pits (the only water bodies on the Site).

SPECIES LIST

Scientific Name	Common Name	Habitat	DAFOR
Agrostis capillaris	Common Bent	Grassland	O
Agrostis stolonifera	Creeping Bent	Grassland	O
Anisantha sterilis	Sterile Brome	Grassland	O/LF
Arrhenatherum elatius	False Oat-grass	Grassland	F
Bromus hordeaceus	Soft Brome	Grassland	O
Dactylis glomerata	Cock's-foot	Grassland	A
Festuca rubra	Red Fescue	Grassland	O
Holcus lanatus	Yorkshire-fog	Grassland	R
Lolium perenne	Perennial Rye-grass	Grassland	F
Anthriscus sylvestris	Cow Parsley	Grassland	LF
Arum maculatum	Lords-and-Ladies	Woodland/scrub edge	O
Cirsium arvense	Creeping Thistle	Grassland	R
Cirsium vulgare	Spear Thistle	Grassland	R
Dipsacus fullonum	Teasel	Grassland	R
Galium aparine	Cleavers	Ruderal	R
Heracleum sphondylium	Hogweed	Ruderal	F
Plantago lanceolata	Ribwort Plantain	Grassland	R
Rumex sp	Dock	Grassland	O
Taraxacum officinale	Dandelion	Grassland	R
Urtica dioica	Common Nettle	Grassland/ruderal	LA
Crataegus monogyna	Hawthorn	Hedge/scrub	A
Fraxinus excelsior	Ash	Hedge/scrub/tree lines	O
Prunus spinosa	Blackthorn	Scrub	R
Rubus fruticosus	Bramble	Scrub/plantation edge	O
Sambucus nigra	Elder	Scrub	R
Ulmus sp	Elm	brookside scrub	LF

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TARGET NOTES:

1 - Ditch along back of building with rubble banks but filled with slurry. Unsuitable for amphibians and reptiles.

2 - Possible foundations of a former building on field edge.

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Broad-leaved tree line	Water course - brook	A Amenity grass
Coniferous tree plantation	Water course - ditch	A Arable
Scrub - continuous	Ditch - dry	Building
x Scrub - scattered	Tall ruderal vegetation	Other built feature
Introduced shrub/tree	Mixed tall ruderal/rank grass	Fence
Hedgerow - species-poor	SI Semi-improved species-poor grassland	Bare ground
Water body		1 Target note

Project:
REDWOOD FARM,
GREAT GRANSDEN

Client:
Brown & Co-Barfords

Scale: nts
Drawn by: JG
Date: 28.04.2018
Rev:

Drawing:

1239/1/2
HABITAT MAP

Green Environmental Consultants
22 Heath Road, Swaffham Bulbeck,
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APPENDIX 8.1
A DISPERSION MODELLING STUDY OF THE IMPACT OF ODOUR FROM THE EXISTING AND PROPOSED PIGGERIES AT REDWOOD FARM, NEAR GREAT GRANSDEN IN BEDFORDSHIRE

A Dispersion Modelling Study of the Impact of Odour from the Existing and Proposed Piggeries at Redwood Farm, near Great Gransden in Bedfordshire

Prepared by Steve Smith

AS Modelling & Data Ltd.

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21st August 2018

1. Introduction

AS Modelling & Data Ltd. has been instructed by Martin Page of Brown & Co., on behalf of B&S Farming Ltd., to use computer modelling to assess the impact of odour emissions from the existing and proposed piggeries at Redwood Farm, Great Gransden, Sandy, Bedfordshire. CB23 3PL.

Odour emission rates from the existing and proposed piggeries have been assessed and quantified based upon emission rates obtained from available published research and measured emissions rates from the existing piggery. The odour emission rates so obtained have then been used as inputs to an atmospheric dispersion model which calculates odour exposure levels in the surrounding area.

This report is arranged in the following manner:

- Section 2 provides relevant details of the site and potentially sensitive receptors in the area.
- Section 3 provides some general information on odour; details of the method used to estimate odour emissions from the existing and proposed piggeries; relevant guidelines and legislation on exposure limits and where relevant, details of likely background levels of odour.
- Section 4 provides some information about ADMS, the dispersion model used for this study and details the modelling parameters and procedures.
- Section 5 contains the results of the modelling.
- And Section 6 provides a discussion of the results and conclusions.

2. Background Details

Redwood Farm is in a rural area approximately 650 m to the south-west of the village of Caxton in Cambridgeshire (the farm itself is in Bedfordshire). The surrounding land is used largely for arable farming although there are some isolated wooded areas and meadows. The farm is at an elevation of around 57 m with the land falling gently towards the Bourn Brook to the north-east and rising gently towards higher ground to the south-west.

The existing farm comprises of a number of buildings of varying age and design which are used to accommodate approximately 2,600 pigs. The farm is primarily a breeding unit, producing high quality weaner pigs for transfer to other farm; however, a number of pigs are also reared for slaughter. The buildings are primarily naturally ventilated with solid floors and straw bedding; however, there are also some houses with partially slatted floors. Spent litter and manure from the solid floored houses is scraped into a manure storage area and slurries and dirty water are stored in a lagoon and a storage tank.

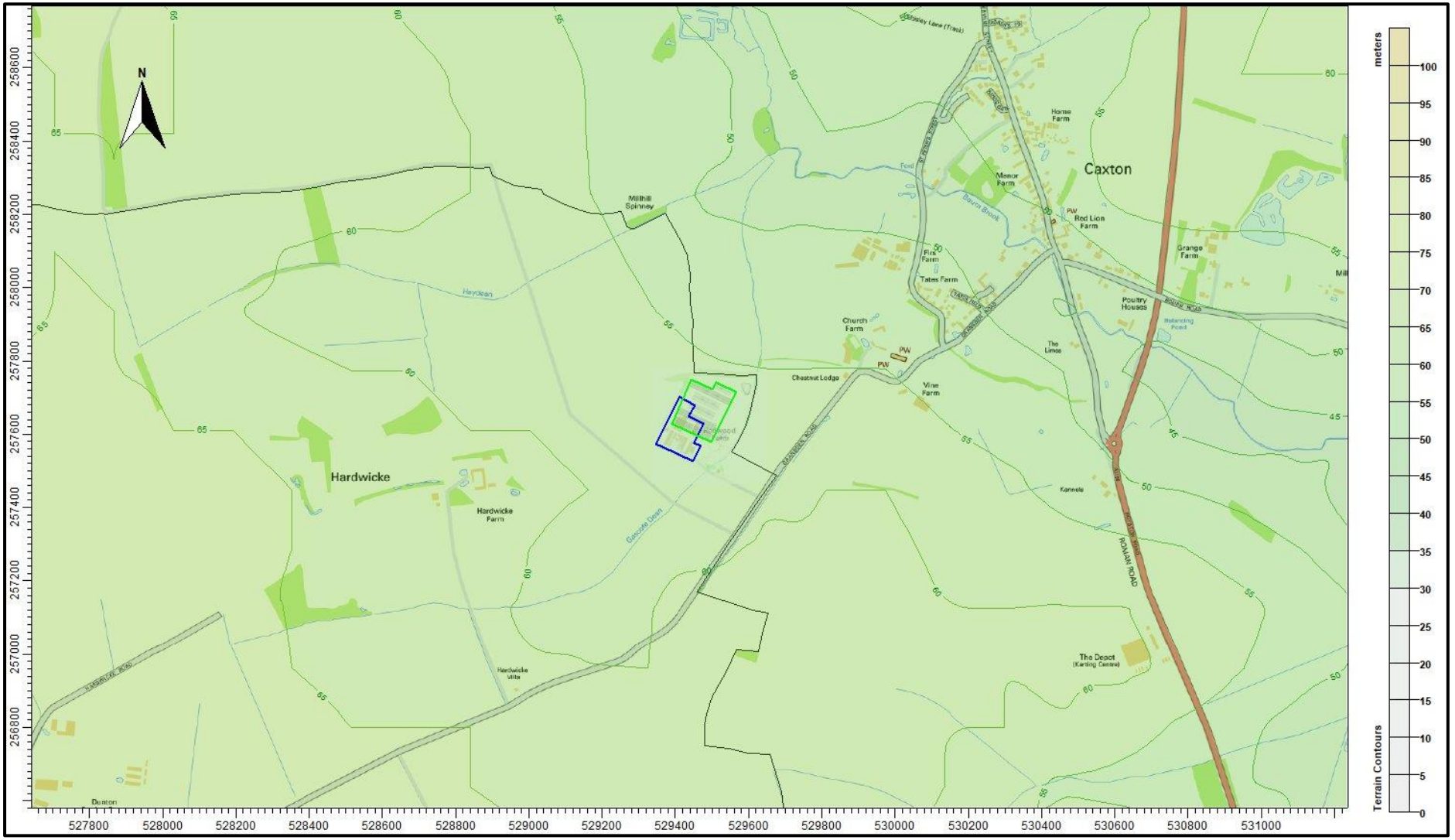
It is proposed that the existing pig housing be replaced by an entirely new piggery comprising eleven state-of-the-art pig houses. The new pig houses would be built on and to the north-east of the site of the existing houses. The new pig houses would house up to 2,998 pigs, 2,000 of which would be breeding sows, with the remainder being a few boar pigs and pigs being grown to replace the breeding sows; under the proposal, there would be no finisher pigs for slaughter at the farm. All the houses would have slatted flooring and slurry would be flushed and pumped into a sealed storage tank. The pig houses would be ventilated using uncapped high speed ridge/roof mounted fans each with a short chimney.

There are some residences and commercial properties in the area surrounding the site of the existing/proposed piggery. Excluding the residence at Redwood Farm itself, the closest residences are:

- Chestnut Lodge, which is approximately 400 m to the north-east of the existing piggery and would be approximately 300 m from the proposed piggery.
- Church Farm, approximately 500 m to the north-east of the existing piggery and approximately 400 m from the proposed piggery.
- Vine Farm, approximately 540 m to the east-north-east of the existing piggery and approximately 450 m from the proposed piggery.
- Residences in Caxton, on St Peter's Street/Gransden Road, the closest of which is approximately 700 m to the north-east of the existing piggery and approximately 600 m from the proposed piggery.
- Hardwicke Farm, approximately 480 m to the south-west of the existing piggery and approximately 510 m from the proposed piggery.

A map of the surrounding area is provided in Figure 1; the site of the existing pig rearing houses at Redwood Farm is outlined in blue and the site of the proposed pig rearing houses is outlined in green.

Figure 1. The area surrounding the site of the proposed pig houses at Redwood Farm



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3. Odour, Emission Rates, Exposure Limits & Background Levels

3.1 Odour concentration, averaging times, percentiles and FIDOR

Odour concentration is expressed in terms of European Odour Units per metre cubed of air (ou_E/m^3). The following definitions and descriptions of how an odour might be perceived by a human with an average sense of smell may be useful; however, it should be noted that within a human population there is considerable variation in acuity of sense of smell.

- 1.0 ou_E/m^3 is defined as the limit of detection, in laboratory conditions.
- At 2.0 – 3.0 ou_E/m^3, a particular odour might be detected against background odours in an open environment.
- When the concentration reaches around 5.0 ou_E/m^3, a particular odour will usually be recognisable, if known, but would usually be described as faint.
- At 10.0 ou_E/m^3, most would describe the intensity of the odour as moderate or strong and if persistent, it is likely that the odour would become intrusive.

The character, or hedonic tone, of an odour is also important and typically, odours are grouped into three categories;

Most offensive:

- Processes involving decaying animal or fish remains.
- Processes involving septic effluent or sludge.
- Biological landfill odours.

Moderately offensive:

- Intensive livestock rearing.
- Fat frying (food processing).
- Sugar beet processing.
- Well aerated green waste composting.

Less offensive:

- Brewery.
- Confectionery.
- Coffee roasting.
- Bakery.

Dispersion models usually calculate hourly mean odour concentrations and Environment Agency guidelines and findings from UK Water Industry Research (UKWIR) are also framed in terms of hourly mean odour concentration.

The Environment Agency guidelines and findings from UKWIR use the 98th percentile hourly mean; this is the hourly mean odour concentration that is equalled or exceeded for 2% of the time period considered, which is typically one year. The use of the 98th percentile statistic allows for some consideration of both frequency and intensity of the odours.

At some distance from a source, it would be unusual if odour concentration remained constant for an hour and in reality, due to air turbulence and changes in wind direction, short term fluctuations in concentration are observed. Therefore, although average exposure levels may be below the detection threshold, or a particular guideline, a population may be exposed to short term concentrations which are higher than the hourly average. It should be noted that a fluctuating odour is often more noticeable than a steady background odour at a low concentration. It is implicit that within the models hourly averaging time and the Environment Agency guidelines and findings from UKWIR that there would be variation in the odour concentration around this mean i.e. there would be short periods when odour concentration would be higher than the mean, or lower than the mean.

The FIDOR acronym is a useful reminder of the factors that will determine the degree of odour pollution.

- **F**requency of detection.
- **I**ntensity as perceived.
- **D**uration of exposure.
- **O**ffensiveness.
- **R**eceptor sensitivity.

3.2 Environment Agency guidelines

In April 2011, the Environment Agency published H4 Odour Management guidance (H4). In Appendix 3 – Modelling Odour Exposure, benchmark exposure levels are provided. The benchmarks are based on the 98th percentile of hourly mean concentrations of odour modelled over a year at the site/installation boundary. The benchmarks are:

- 1.5 ou_E/m^3 for most offensive odours.
- 3.0 ou_E/m^3 for moderately offensive odours.
- 6.0 ou_E/m^3 for less offensive odours.

Any modelled results that project exposures above these benchmark levels, after taking uncertainty into account, indicates the likelihood of unacceptable odour pollution.

3.3 UK Water Industry Research findings

The main source of research into odour impacts in the UK has been the wastewater industry. An in-depth study of the correlation between modelled odour impacts and human response was published by UKWIR in 2001. This was based on a review of the correlation between reported odour complaints and modelled odour impacts in relation to nine wastewater treatment works in the UK with on-going odour complaints. The findings of this research and subsequent UKWIR research indicated the following. Based on the modelled 98th percentile of hourly mean concentrations of odour:

- At below 5.0 ou_E/m^3, complaints are relatively rare, at only 3% of the total registered.
- At between 5.0 ou_E/m^3 and 10.0 ou_E/m^3, a significant proportion of total registered complaints occur, 38% of the total.
- The majority of complaints occur in areas of modelled exposures of greater than 10.0 ou_E/m^3, 59% of the total.

3.4 Choice of odour benchmarks for this study

Odours from pig rearing are usually placed in the moderately offensive category. Therefore, for this study, the Environment Agency's benchmark for moderately offensive odours, a 98th percentile hourly mean of 3.0 ou_E/m^3 over a one year period, is used to assess the impact of odour emissions from the proposed pig unit at potentially sensitive receptors in the surrounding area.

3.5 Quantification of odour emissions

Odour emission rates from pig houses depend on many factors and are highly variable. At the beginning of a growth cycle, when the pigs are smaller, litter/flooring is clean and only minimum ventilation is required, the odour emission rate may be small. Towards the end of the growth cycle, odour production within the pig housing increases rapidly, the pigs are larger and ventilation requirements are greater; therefore, emission rates are considerably greater than at the beginning of a growth cycle.

Peak odour emission rates are likely to occur when the housing is cleared of manure and spent litter and/or stored slurry is removed. There is little available information on the magnitude of these peak emissions, but they are likely to be greater than any emission that might occur otherwise. At the existing piggery, spent litter and manure is removed from the housing and scraped to the middens on a daily basis and slurry storage is open to the atmosphere and thus such operations are likely to be a major contribution to the overall odour emissions. However, at the proposed piggery, all slurry transfers would be within a sealed system and therefore such emissions would be a minimal part of overall emissions.

Odour emissions from a variety of sources at the existing piggery have been measured by Silsoe Odours Ltd (Robert Sneath. "Odour Emissions from Redwood Farm, Great Gransden, 8 May 2018"). Where measured emission rates are available, these have been used.

Otherwise, the estimated emission rates used in this report are based upon emission data obtained from available research and are based upon an emission rate of 225 ou_E/livestock-unit/s (one livestock-unit is 500 kg) and assume a standard growth rate. It should be noted that although the specific emission factors used are not the highest reported, they are somewhat greater than the average/median of reported figures. The intention of using a value that is higher than the average/median is to allow for variation around the average that might affect the 98th percentile statistic and to allow for the possibility of higher than average emissions generally.

Emissions from soiled surfaces and slurry storage assume a specific emission rate of 2.5 $ou_E/m^2/s$.

Details of the pig numbers and weights and odour emission rates are provided in Table 1a (Existing Piggery) and 1b (Proposed Piggery).

Table 1a. Details of Pig numbers, weights, manure slurry management, ventilation type and odour emission rates – Existing Piggery

Source/ADMS ID	Housing type	Ventilation type	Pig type	Weights	Animal numbers	Baseline emission factor (ou_E/animal/s)	Odour emission rate (ou_E/s)
FLAT_DECK	STRAW	Capped Fans/Natural	Weaners	7-20	400	6.075	2,430.0
FARROW	PSF	Capped Fans	Sows	~200	16	55	880.0
SERVICE	STRAW	Natural	Sows	~200	80	55	4,400.0
BREEDING	STRAW	Natural	Sows	~200	80	55	4,400.0
			Boars	~300	6	100	600.0
FINISHER	PSF	Natural	Finishers	80-130	182	47.25	8,599.5
GROWERS	STRAW	Natural	Growers	20-50	600	15.75	9,450.0
GROW_FIN	STRAW	Natural	Growers/Finishers	35-110	720	32.625	23,490.0
BOARS	STRAW	Natural	Boars	~300	5	100	500.0
FIN_GILTS	STRAW	Natural	Sows	~200	100	55	5,500.0
			Finishers	110	200	49.5	9,900.0
FARROW_B1	STRAW	Natural	Sows	~200	10	55	550.0
FARROW_B2	STRAW	Natural	Sows	~200	40	55	2,200.0
FINISHER_B3	STRAW	Natural	Finishers	35-110	240	32.625	7,830.0
Source/ADMS ID	Area (m^2)					Specific emission factor ($ou_E/m^2/s$)	Odour emission rate (ou_E/s)
MIDDENS	348.4					2.5	871.0
TANK	324.0					2.5	810.0
YARD1	404.0					2.5	1,009.9
YARD2	305.2					2.5	763.0
YARD3	515.2					2.5	1,288.0
SLURRY	913.5					2.5	2,283.7

Table 1b. Details of Pig numbers, weights, manure slurry management, ventilation type and odour emission rates – Proposed Piggery

Source/ADMS ID	Housing type	Ventilation type	Pig type	Weights	Animal numbers	Specific emission factor (ou_E/animal/s)	Odour emission rate (ou_E/s)
DRY1	FSF	Uncapped ridge/roof fans	Dry Sows	~200	288	55	15,840.0
DRY2	FSF	Uncapped ridge/roof fans	Dry Sows	~200	288	55	15,840.0
DRY3	FSF	Uncapped ridge/roof fans	Dry Sows	~200	288	55	15,840.0
DRY4	FSF	Uncapped ridge/roof fans	Dry Sows	~200	288	55	15,840.0
FAR1	FSF	Uncapped ridge/roof fans	Farrowers	~200	52	55	2,860.0
FAR2	FSF	Uncapped ridge/roof fans	Farrowers	~200	52	55	2,860.0
FAR3	FSF	Uncapped ridge/roof fans	Farrowers	~200	52	55	2,860.0
FAR4	FSF	Uncapped ridge/roof fans	Farrowers	~200	52	55	2,860.0
SER1	FSF	Uncapped ridge/roof fans	Sows	~200	320	55	17,600.0
			Boars	~300	4	100	400.0
SER2	FSF	Uncapped ridge/roof fans	Sows	~200	320	55	17,600.0
			Boars	~300	4	100	400.0
GRO	FSF	Uncapped ridge/roof fans	Weaner	7-30	270	8.33	2,249.1
			Grow out	30-150	720	40.5	29,160.0

4. The Atmospheric Dispersion Modelling System (ADMS) and model parameters

The Atmospheric Dispersion Modelling System (ADMS) ADMS 5 is a new generation Gaussian plume air dispersion model, which means that the atmospheric boundary layer properties are characterised by two parameters; the boundary layer depth, and the Monin-Obukhov length rather than in terms of the single parameter Pasquill-Gifford class.

Dispersion under convective meteorological conditions uses a skewed Gaussian concentration distribution (shown by validation studies to be a better representation than a symmetrical Gaussian expression).

ADMS has a number of model options including: dry and wet deposition; NO_x chemistry; impacts of hills, variable roughness, buildings and coastlines; puffs; fluctuations; odours; radioactivity decay (and γ-ray dose); condensed plume visibility; time varying sources and inclusion of background concentrations.

ADMS has an in-built meteorological pre-processor that allows flexible input of meteorological data both standard and more specialist. Hourly sequential and statistical data can be processed, and all input and output meteorological variables are written to a file after processing.

The user defines the pollutant, the averaging time (which may be an annual average or a shorter period), which percentiles and exceedance values to calculate, whether a rolling average is required or not and the output units. The output options are designed to be flexible to cater for the variety of air quality limits, which can vary from country to country, and are subject to revision.

4.1 Meteorological data

Computer modelling of dispersion requires hourly sequential meteorological data and to provide robust statistics the record should be of a suitable length; preferably four years or longer.

The meteorological data used in this study is obtained from assimilation and short term forecast fields of the Numerical Weather Prediction (NWP) system known as the Global Forecast System (GFS). The GFS is a spectral model and data are archived at a horizontal resolution of 0.25 degrees, which is approximately 25 km over the UK (formerly 0.5 degrees, or approximately 50 km). The GFS resolution adequately captures major topographical features and the broad-scale characteristics of the weather over the UK. Smaller scale topological features may be included in the dispersion modelling by using the flow field module of ADMS (FLOWSTAR). The use of NWP data has advantages over traditional meteorological records because;

- Calm periods in traditional observational records may be over represented, this is because the instrumentation used may not record wind speed below approximately 0.5 m/s and start up wind speeds may be greater than 1.0 m/s. In NWP data, the wind speed is continuous down to 0.0 m/s, allowing the calms module of ADMS to function correctly.

- Traditional observational records may include very local deviations from the broad-scale wind flow that would not necessarily be representative of the site being modelled; these deviations are difficult to identify and remove from a meteorological record. Conversely, local effects at the site being modelled are relatively easy to impose on the broad-scale flow and provided horizontal resolution is not too great, the meteorological records from NWP data may be expected to represent well the broad-scale flow.

- Information on the state of the atmosphere above ground level which would otherwise be estimated by the meteorological pre-processor may be included explicitly.

A wind rose showing the distribution of wind speeds and directions in the GFS derived data is shown in Figure 2a. Wind speeds are modified by the treatment of roughness lengths (see Section 4.7) and because terrain data is included in the modelling, the raw GFS wind speeds and directions will be modified. The terrain and roughness length modified wind rose for Redwood Farm is shown in Figure 2b. Note that elsewhere in the modelling domain, modified wind roses may differ more markedly and that the resolution of the wind field is 100 m.

Figure 2a. The wind rose for the raw GFS derived data for 52.201N, 0.106 W, 2014 – 2017

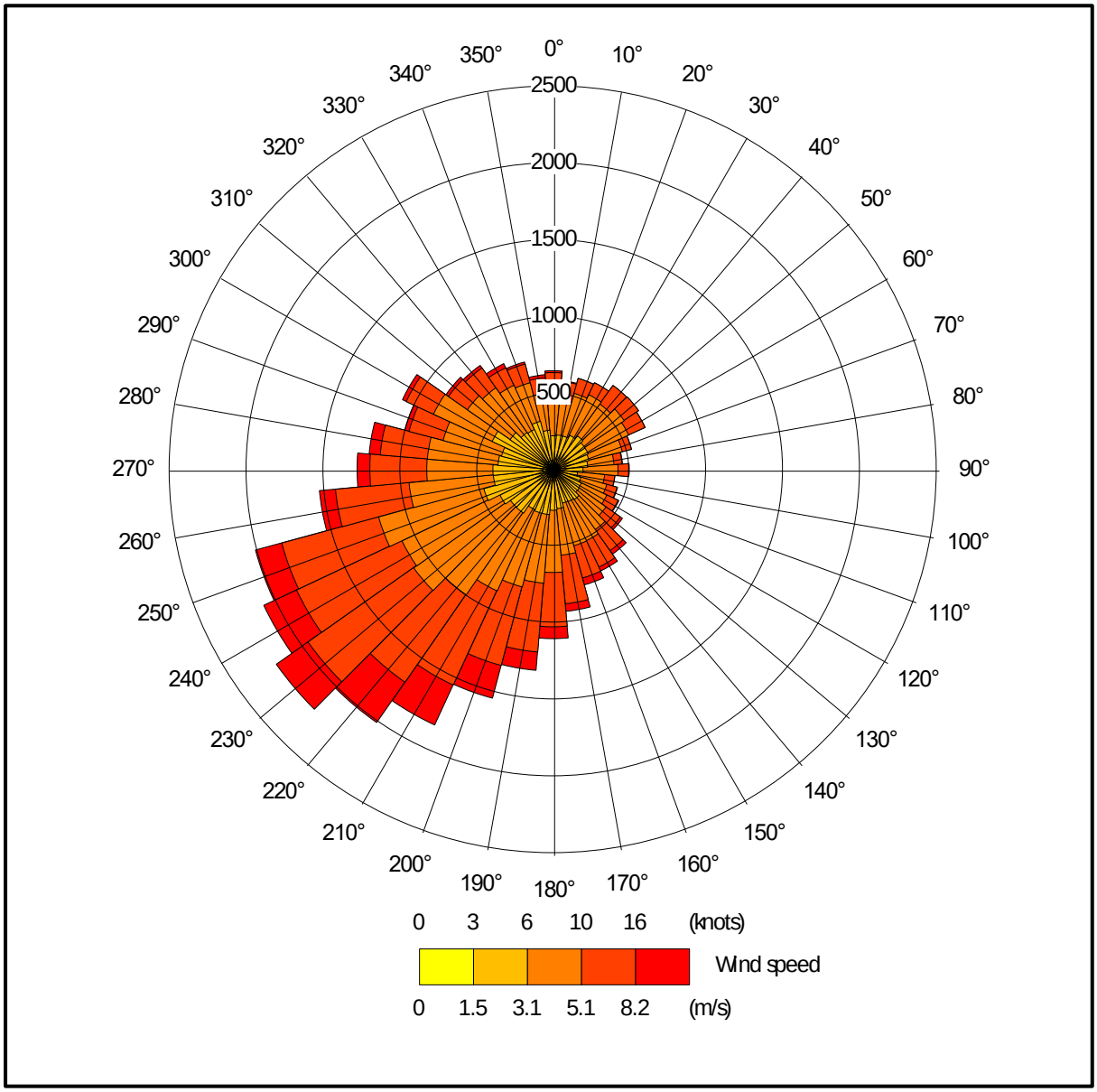
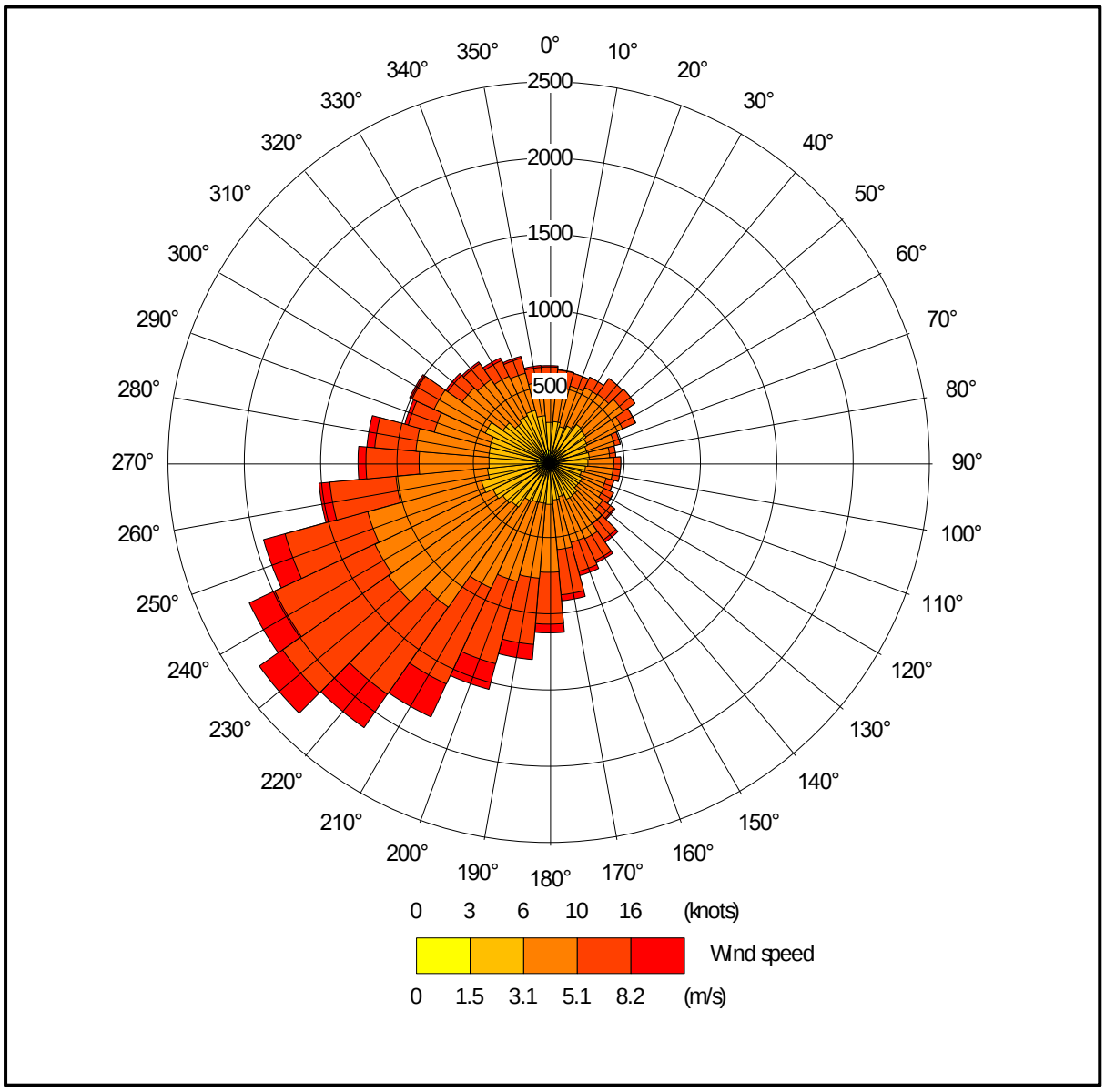


Figure 2b. The wind rose for the site of the proposed pig house NGR 529400, 257600, derived from FLOWSTAR output



4.2 Emission sources

Emissions from the chimneys of capped ridge/roof fans that are used to ventilate two of the existing pig houses houses are represented by three point sources per house within ADMS (FLAT_DECK a, b & c and FARROW a, b & c), some fugitive emissions are also likely from these houses and these emissions are assumed to be 25% of the total emissions and are represented by two volume sources within ADMS (FLAT_DECK and FARROW).

Emissions from the naturally ventilated houses at the existing piggery and emissions from the middens and slurry storage tank are represented by volume sources within ADMS (SERVICE, BREEDING, FINISHER, GROWERS, GROW_FIN, BOARS, FIN_GILTS, FARROW_B1, FARROW_B2, FINISHER_B3, MIDDENS and TANK).

Emissions from the soiled yards and the slurry lagoon at the existing piggery are represented by four area sources within ADMS (YARD1, YARD2, YARD3 and SLURRY).

Emissions from the chimneys of the uncapped high speed ridge/roof fans that would be used to ventilate the proposed pig houses are represented by three point sources per house within ADMS (DRY1, DRY2, DRY3, DRY4, FAR1, FAR2, FAR3, FAR4, SER1, SER2 and GRO a, b & c).

Details of the point, volume and area sources parameters are shown in Tables 2a, 2b and 2c. The positions of the sources may be seen in Figures 3a (Existing Piggery) and 3b (Proposed Piggery).

4.3 Modelled buildings

The structure of the pig houses (and other farm buildings) may affect the plumes from the point sources. Therefore, the buildings are modelled within ADMS. The positions of the modelled buildings may be seen in Figures 3a (Existing Piggery) and 3b (Proposed Piggery), where they marked by grey rectangles.

Table 2a. Point source parameters

Source ID (scenario)	Height (m)	Diameter (m)	Efflux velocity (m/s)	Emission temperature (˚C)	Emission rate per source (ou_E/s)
FLAT DECK a, b & c (Existing)	3,5	2.0	0.1	21.0	607.5
FARROW a, b & c (Existing)	3,5	2.0	0.1	21.0	220.0
DRY1 to DRY4 a, b & c (Proposed)	9.05	0.95	12.0	21.0	5,280.0
FAR1 to FAR4 a, b & c (Proposed)	8.88	0.95	12.0	21.0	953.3
SER1 and SER2 a, b & c (Proposed)	8.88	0.95	12.0	21.0	6,000.0
GRO a, b & c (Proposed)	8.35	0.95	12.0	21.0	10,469.7

Table 2b. Volume source parameters

Source ID	Length (m)	Width (m)	Depth (m)	Base Height (m)	Emission temperature (°C)	Emission rate (ou_E/s)
FLAT_DECK	7.01	18.59	3.0	0.0	Ambient	607.5
FARROW	4.42	18.90	3.0	0.0	Ambient	220.0
SERVICE	13.11	36.58	5.0	0.0	Ambient	4,400.0
BREEDING	12.95	42.98	5.0	0.0	Ambient	5,000.0
FINISHER	12.50	18.90	2.5	0.0	Ambient	8,599.5
GROWERS	7.62	37.19	3.0	0.0	Ambient	9,450.0
GROW_FIN	7.62	37.19	3.0	0.0	Ambient	23,490.0
BOARS	6.55	17.53	4.0	0.0	Ambient	500.0
FIN_GILTS	12.80	42.06	5.0	0.0	Ambient	15,400.0
MIDDENS	9.14	38.10	2.0	0.0	Ambient	871.0
TANK	18.00	18.00	2.0	5.0	Ambient	810.0
FARROW_B1	10.36	45.11	5.0	0.0	Ambient	550.0
FARROW_B2	10.36	7.62	5.0	0.0	Ambient	2,200.0
FINISHER_B3	6.10	17.68	5.0	0.0	Ambient	7,830.0

Table 2c. Area source parameters

Source ID	Area (m^2)	Base height (m)	Emission temperature (°C)	Emission rate (ou_E/s)
YARD1	404.0	0.0	Ambient	1,009.9
YARD2	305.2	0.0	Ambient	763.0
YARD3	515.2	0.0	Ambient	1,288.0
SLURRY	913.5	0.0	Ambient	2,283.7

Figure 3a. The positions of modelled sources and buildings – Existing Piggery

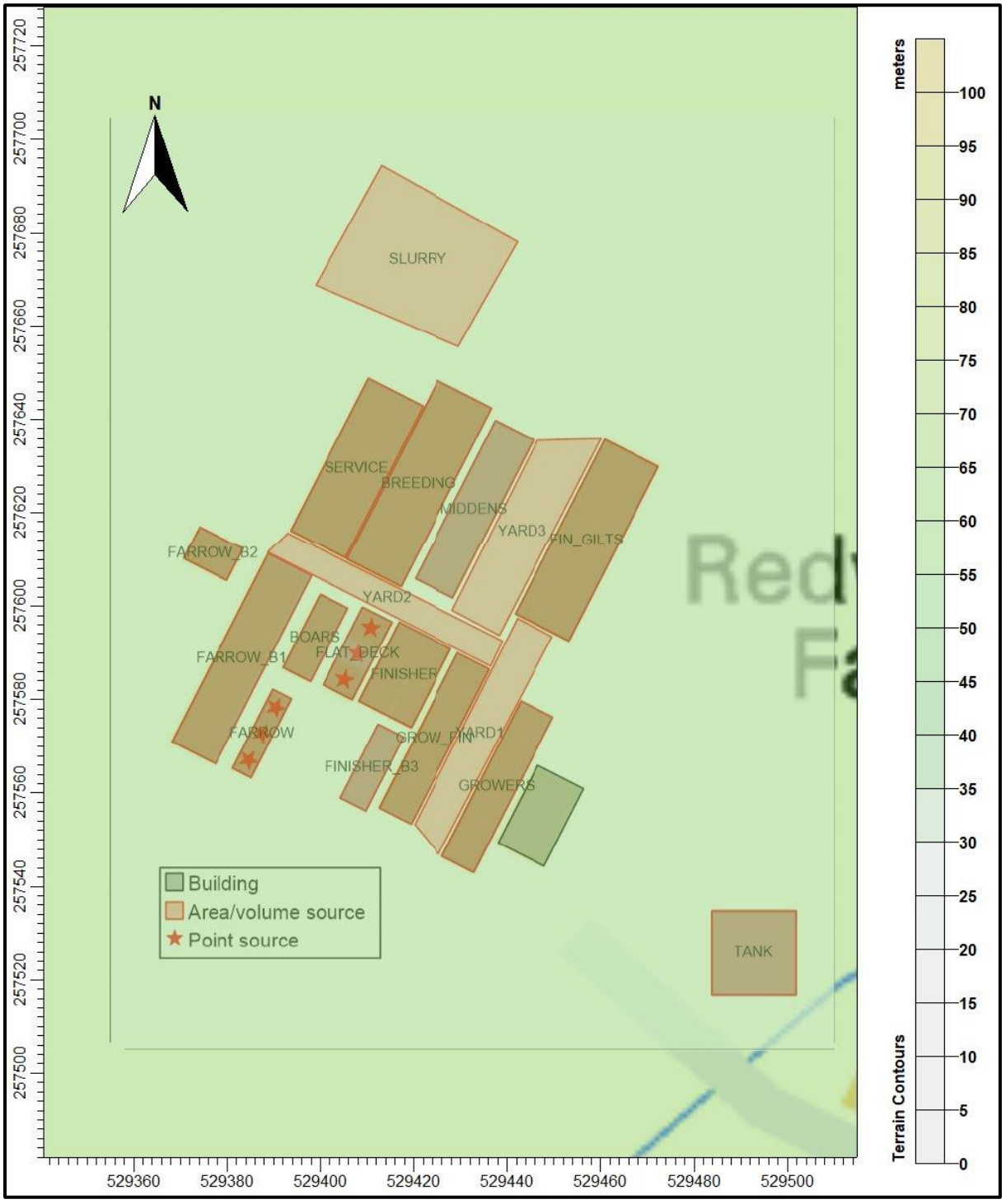


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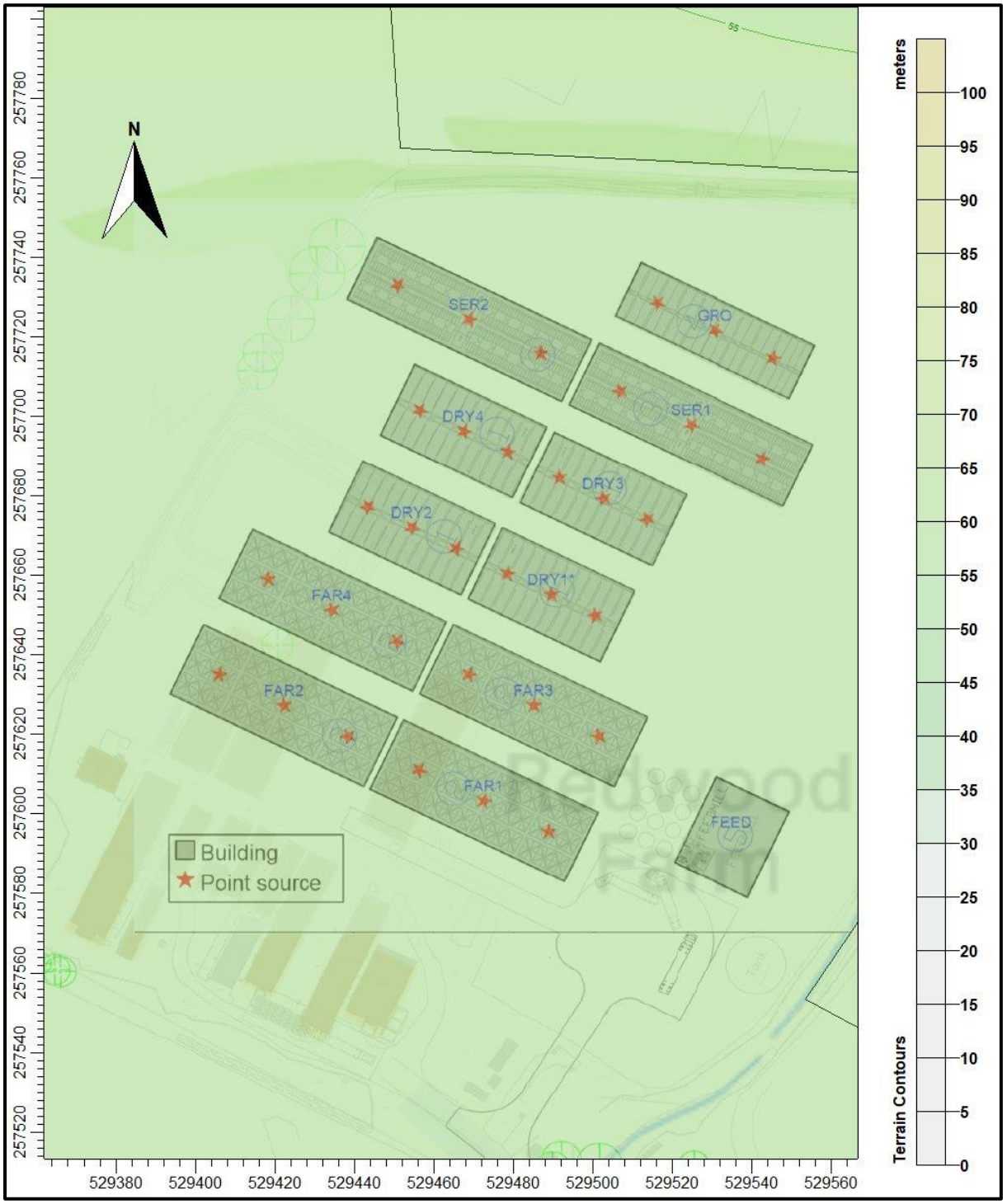
Figure 3b. The positions of modelled sources and buildings – Proposed Piggery



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4.4 Discrete receptors

Twenty discrete receptors have been defined at a selection of nearby residences and commercial premises. The receptors are defined at 1.5 m above ground level within ADMS and their positions may be seen in Figure 4, where they are marked by enumerated pink rectangles.

4.5 Nested Cartesian grid

To produce the contour plots presented in Section 5 of this report, a nested Cartesian grid has been defined within ADMS. The grid receptors are defined at 1.5 m above ground level within ADMS. The positions of the receptors may be seen in Figure 4, where they are marked by green crosses.

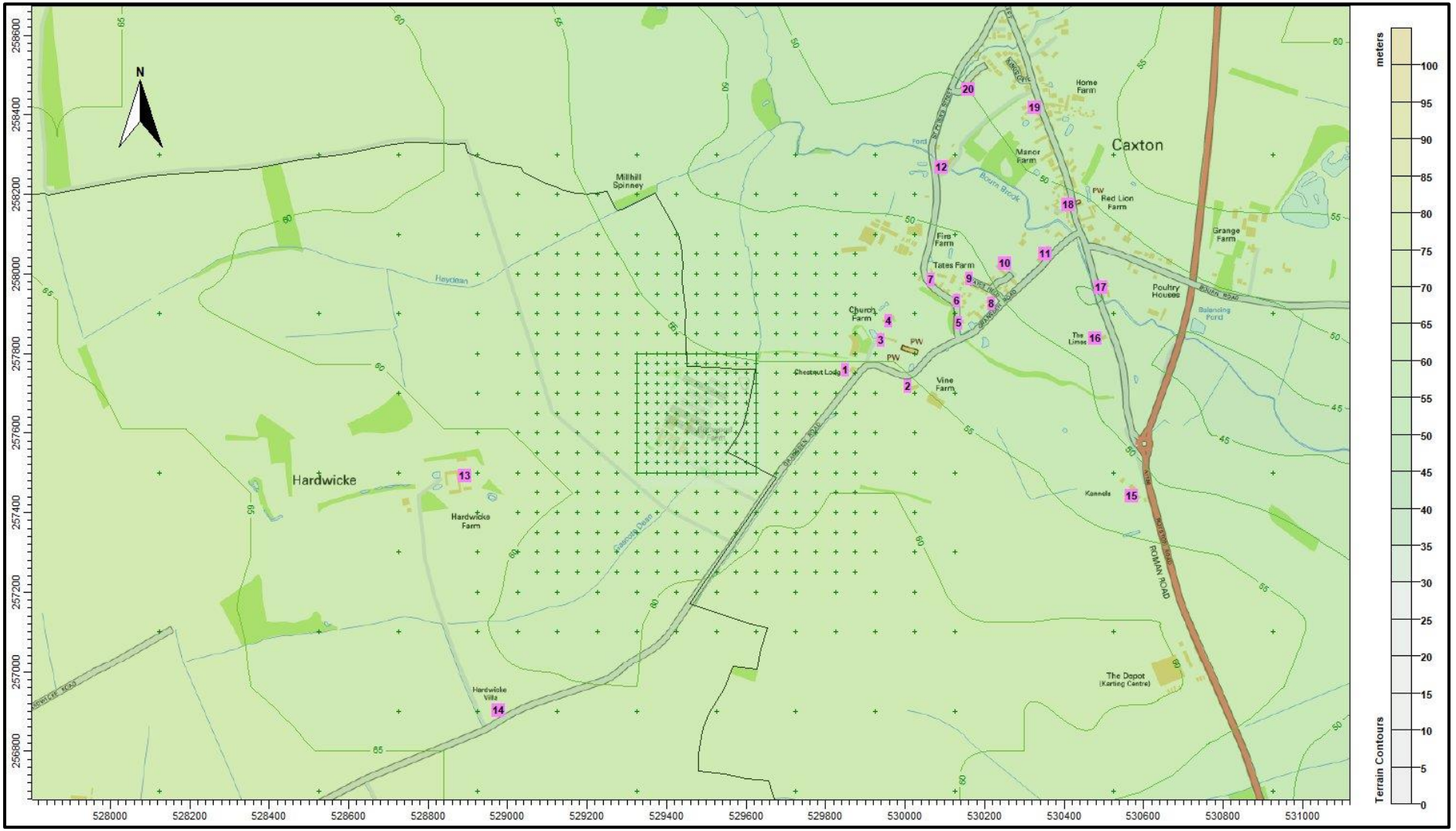
4.6 Terrain data

Terrain data has been considered in the modelling. The terrain data used is derived from the Ordnance Survey 50 m Digital Elevation Model (DEM). The 50 m DEM data has been resampled at 50 m for use within ADMS. The terrain domain is 6.4 km by 6.4 km and FLOWSTAR is run at a resolution of 64 x 64 points; therefore, the effective model resolution is 100 m.

4.7 Other model parameters

A fixed surface roughness length of 0.25 m has been applied over the entire modelling domain. As a precautionary measure, the GFS meteorological data is assumed to have a roughness length of 0.2 m. The effect of the difference in roughness length is precautionary as it increases the frequency of low wind speeds and the stability and therefore increases predicted ground level concentrations.

Figure 4. The discrete receptors and nested Cartesian grid receptors



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5. Details of the Model Runs and Results

For this study, ADMS was run with the terrain module of ADMS (FLOWSTAR) and with the calms module of ADMS.

ADMS was run eight times, once for each year of the four year meteorological record, for both the existing and proposed scenarios. Statistics for the annual 98th percentile hourly mean odour concentration at each receptor were compiled for each of the eight runs.

A summary of the results of these eight runs at the discrete receptors is provided in Table 3, where the maximum annual 98th percentile hourly mean odour concentration for both the existing and proposed scenarios is shown.

In Table 3, if there are any predicted odour exposures in excess of the Environment Agency's benchmark of 3.0 ou_E/m^3 as an annual 98th percentile hourly mean, then they are coloured blue; any predicted odour exposures in the range that UKWIR research suggests gives rise to a significant proportion of complaints, 5.0 ou_E/m^3 to 10.0 ou_E/m^3 as an annual 98th percentile hourly mean, are coloured orange and predicted exposures likely to cause annoyance and complaint are coloured red.

Contour plots of the predicted maximum annual 98th percentile hourly mean odour concentration are shown in Figures 5a (Existing Scenario) and 5b (Proposed Scenario).

Table 3. Predicted maximum annual 98th percentile hourly mean odour concentrations at the discrete receptors

Receptor number	X(m)	Y(m)	Name/Location	Maximum annual 98th percentile hourly mean odour concentration (ou_E/m^3)	
				Existing Scenario	Proposed Scenario
1	529850	257757	Chestnut Lodge	**6.27**	**4.23**
2	530008	257718	Vine Farm	**3.84**	**3.04**
3	529939	257834	Church Farm	**4.53**	**3.54**
4	529959	257880	Church Farm	**3.93**	**3.40**
5	530136	257875	St. Peters Street	2.91	2.59
6	530130	257932	St. Peters Street	2.85	2.60
7	530066	257984	St. Peters Street	2.90	2.71
8	530217	257926	Gransden Road	2.50	2.34
9	530161	257987	Tates Field	2.47	2.48
10	530252	258026	Tates Field	2.13	2.21
11	530352	258051	Gransden Road	1.81	1.91
12	530092	258268	St. Peters Street	1.77	1.70
13	528892	257491	Hardwicke Farm	**3.79**	1.97
14	528977	256903	Hardwicke Villa	2.04	1.38
15	530571	257441	Kennels, Roystion Road	1.29	1.30
16	530479	257837	The Limes	1.71	1.49
17	530493	257965	Caxton (south)	1.63	1.61
18	530411	258174	Caxtron (central)	1.42	1.55
19	530327	258418	Caxtron (central/north)	1.13	1.17
20	530158	258464	Caxton (north-west)	1.24	1.28

Figure 5a. Predicted maximum annual 98th percentile odour concentration – Existing Scenario

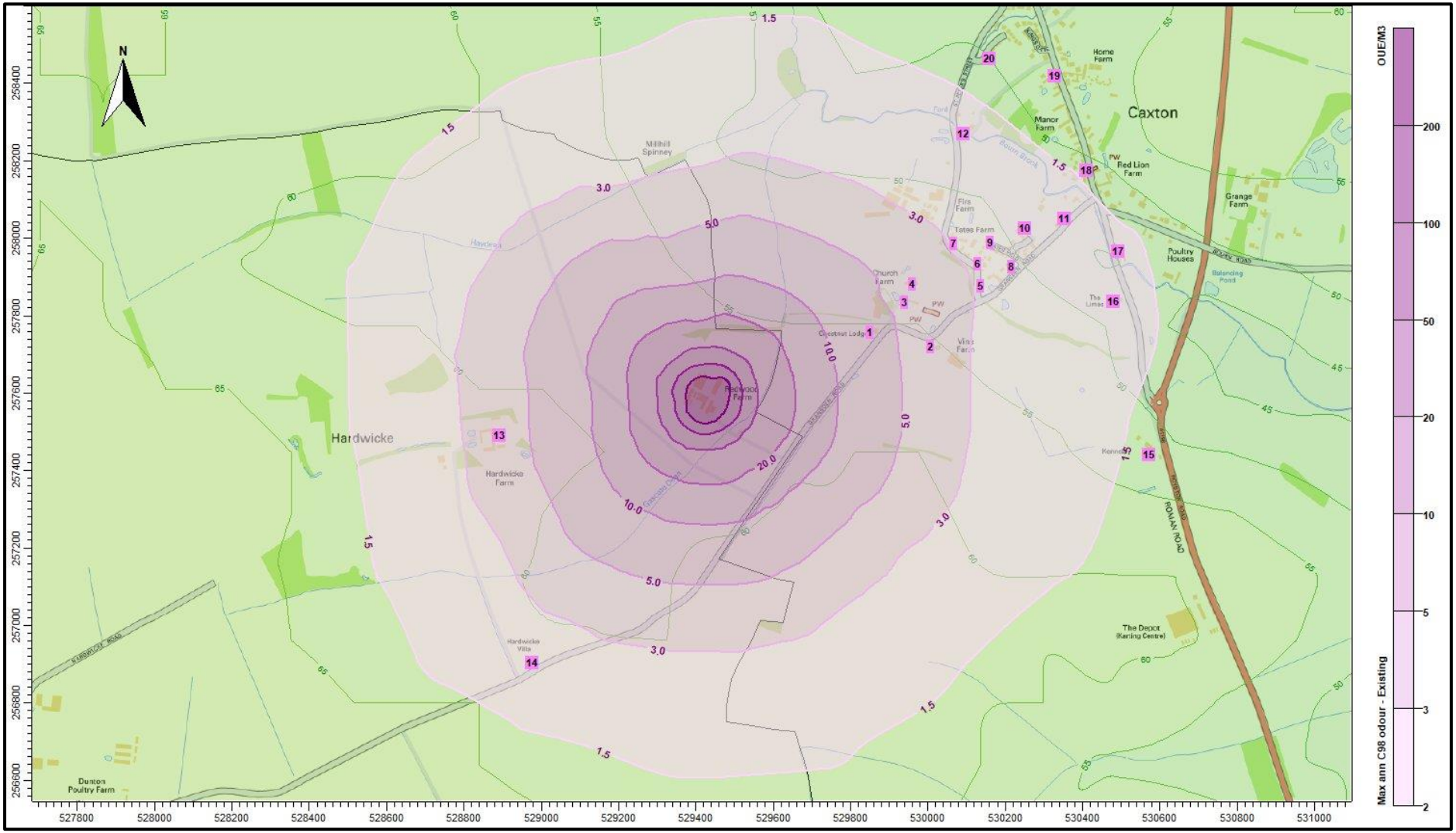

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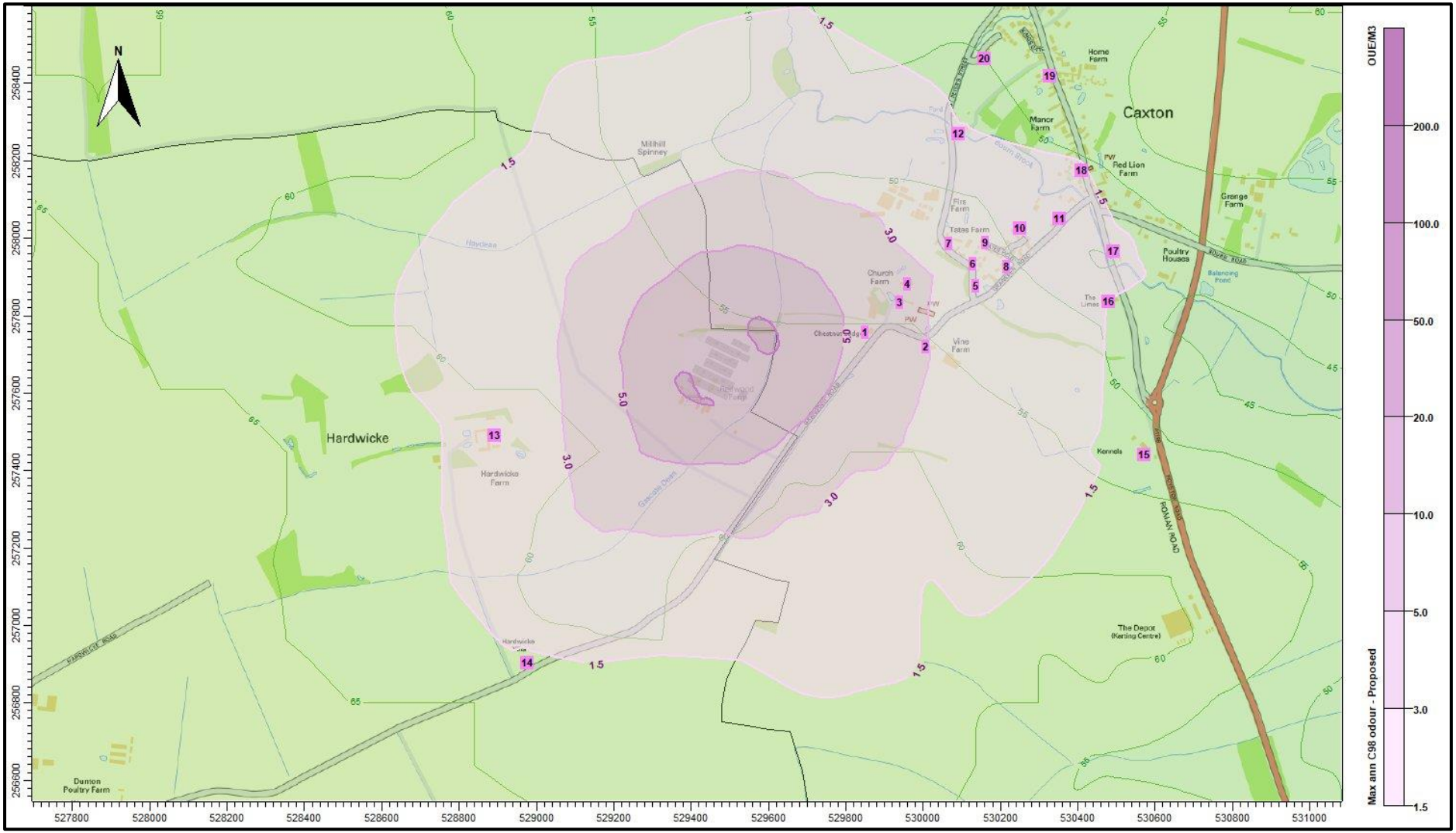
Figure 5b. Predicted maximum annual 98th percentile odour concentration – Proposed Scenario



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6. Summary and Conclusions

AS Modelling & Data Ltd. has been instructed by Martin Page of Brown & Co., on behalf of B&S Farming Ltd., to use computer modelling to assess the impact of odour emissions from the existing and proposed piggeries at Redwood Farm, Great Gransden, Sandy, Bedfordshire. CB23 3PL.

Odour emission rates from the existing and proposed piggeries have been assessed and quantified based upon emission rates obtained from available published research and measured emissions rates from the existing piggery. The odour emission rates so obtained have then been used as inputs to an atmospheric dispersion model which calculates odour exposure levels in the surrounding area.

Existing Piggery (baseline)

The modelling of odour emissions from the existing piggery predicts that odour exposure exceeds the chosen benchmark, an annual 98th percentile hourly mean odour concentration of 3.0 ou_E/m^3, at five nearby residences: Chestnut Lodge; Vine Farm; two residences at Church Farm and at Hardwicke Farm. At the closest residence, Chestnut Lodge, the predicted 98th percentile hourly mean odour concentration is also in the lower end of the range where UKWIR research suggest that complaints about odour become increasingly likely. At all other residential receptors considered, the predicted odour exposure level is below the chosen benchmark, an annual 98th percentile hourly mean odour concentration of 3.0 ou_E/m^3.

Proposed Piggery

The modelling of odour emissions from the proposed piggery predicts that odour exposure would continue to exceed the chosen benchmark, an annual 98th percentile hourly mean odour concentration of 3.0 ou_E/m^3, at four nearby residences: Chestnut Lodge; Vine Farm and two residences at Church Farm. However, the predicted exposure levels are lower than under the existing scenario and at Chestnut Lodge, the predicted 98th percentile hourly mean odour concentration is below the range where UKWIR research suggest that complaints about odour become increasingly likely. At all other residential receptors considered, the predicted odour exposure level is predicted to remain below the chosen benchmark, an annual 98th percentile hourly mean odour concentration of 3.0 ou_E/m^3 and in most cases is lower than under the existing scenario.

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APPENDIX 8.2
A REPORT ON THE MODELLING OF THE DISPERSION AND DEPOSITION OF AMMONIA FROM THE EXISTING AND PROPOSED PIGGERIES AT REDWOOD FARM, NEAR GREAT GRANSDEN IN BEDFORDSHIRE

A Report on the Modelling of the Dispersion and Deposition of Ammonia from the Existing and Proposed Piggeries at Redwood Farm, near Great Gransden in Bedfordshire

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1. Introduction

AS Modelling & Data Ltd. has been instructed by Martin Page of Brown & Co., on behalf of B&S Farming Ltd., to use computer modelling to assess the impact of ammonia emissions from the existing and proposed piggeries at Redwood Farm, Great Gransden, Sandy, Bedfordshire. CB23 3PL.

Ammonia emission rates from the existing and proposed piggeries have been assessed and quantified based upon figures obtained from the Inventory of Ammonia Emissions from UK Agriculture 2009 and 2012 and the Environment Agency's standard ammonia emission factors. The ammonia emission rates have then been used as inputs to an atmospheric dispersion and deposition model which calculates ammonia exposure levels and nitrogen and acid deposition rates in the surrounding area.

This report is arranged in the following manner:

- Section 2 provides relevant details of the farm and potentially sensitive receptors in the area.

- Section 3 provides some general information on ammonia; details of the method used to estimate ammonia emissions; relevant guidelines and legislation on exposure limits and where relevant, details of likely background levels of ammonia.

- Section 4 provides some information about ADMS, the dispersion model used for this study and details the modelling procedure.

- Section 5 contains the results of the modelling.

- Section 6 provides a discussion of the results and conclusions.

2. Background Details

Redwood Farm is in a rural area approximately 650 m to the south-west of the village of Caxton in Cambridgeshire (the farm itself is in Huntindonshire). The surrounding land is used largely for arable farming although there are some isolated wooded areas and meadows. The farm is at an elevation of around 57 m with the land falling gently towards the Bourn Brook to the north-east and rising gently towards higher ground to the south-west.

The existing farm comprises of a number of buildings of varying age and design which are used to accommodate approximately 2,600 pigs. The farm is primarily a breeding unit, producing high quality weaner pigs for transfer to other farm; however, a number of pigs are also reared for slaughter. The buildings are primarily naturally ventilated with solid floors and straw bedding; however, there are also some houses with partially slatted floors. Spent litter and manure from the solid floored houses is scraped into a manure storage area and slurries and dirty water are stored in a lagoon and a storage tank.

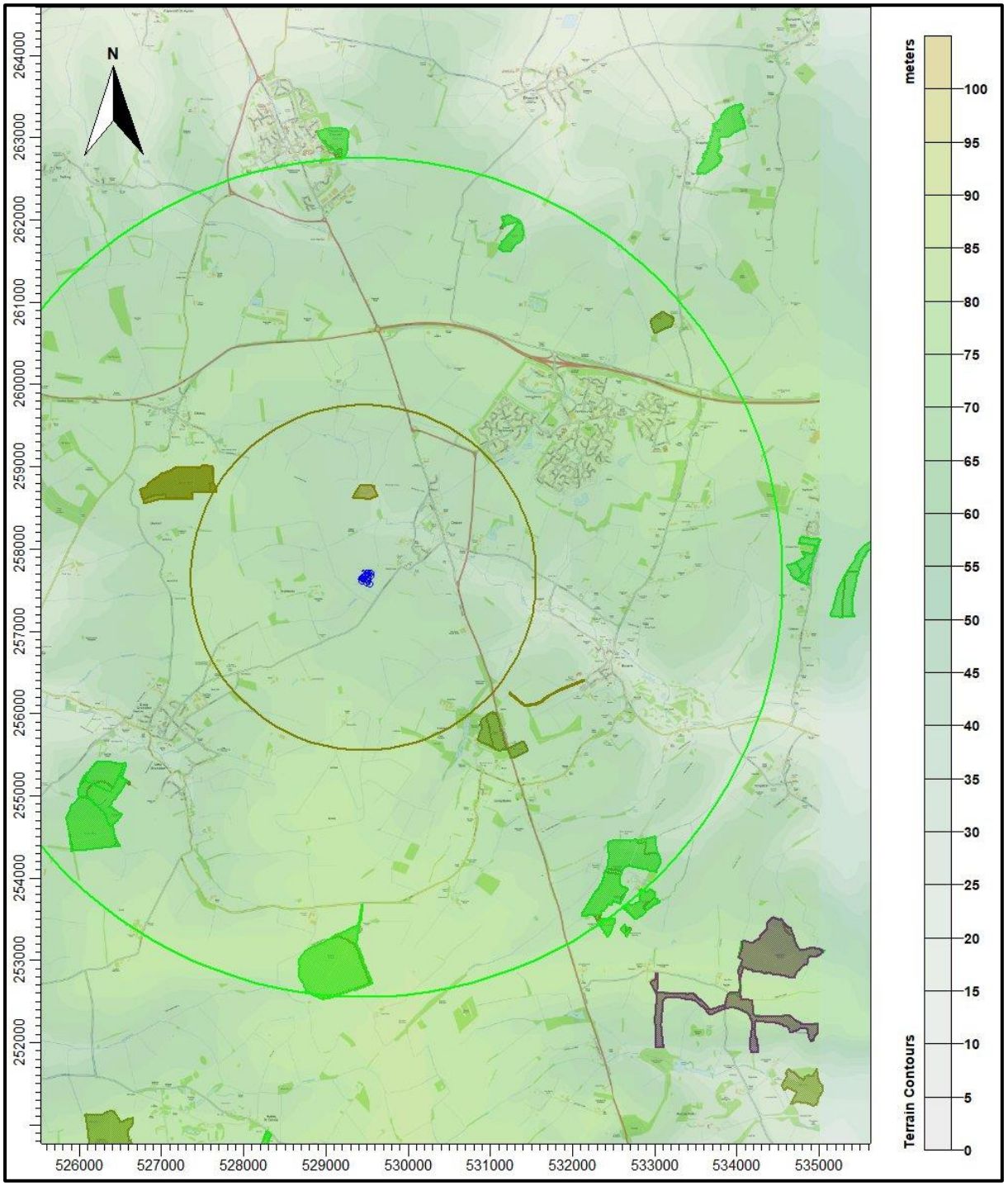
It is proposed that the existing pig housing be replaced by an entirely new piggery comprising eleven state-of-the-art pig houses. The new pig houses would be built on and to the north-east of the site of the existing houses. The new pig houses would house up to 2,998 pigs, 2,000 of which would be breeding sows, with the remainder being a few boar pigs and pigs being grown to replace the breeding sows; under the proposal, there would be no finisher pigs for slaughter at the farm. All the houses would have slatted flooring and slurry would be flushed and pumped into a sealed storage tank. The pig houses would be ventilated using uncapped high speed ridge/roof mounted fans each with a short chimney.

There are four areas designated as Local Wildlife Sites (LWSs) and/or Ancient Woodlands (AWs), within 2 km of the piggery at Redwood Farm. There are six areas designated as Sites of Special Scientific Interest (SSSIs) within 5 km of the farm and one Special Area of Conservation (SAC) within 10 km of the farm. Further details of the SSSIs and SAC are provided below:

- Waresly Wood SSSI – approximately 3.6 km to the south-west.
- Hayley Wood SSSI – approximately 3.8 km to the south.
- Kingston Wood & Outliers SSSI – approximately 4.2 km to the south-east.
- Elsworth Wood SSSI – approximately 4.2 km to the north-north-east.
- Papworth Wood SSSI – approximately 4.9 km to the north.
- Caldecot Meadows SSSI – approximately 5.0 km to the east.
- Eversden & Wimpole Woods SSSI/SAC – approximately 5.9 km to the south-east.

A map of the surrounding area showing the positions of the proposed pig houses, the LWSs/AWs, the SSSIs and the SAC is shown in Figure 1. In this figure, the LWSs/AWs are shaded in olive, the SSSIs are shaded in green, the SAC is shaded in purple and the positions of the proposed pig houses at Redwood Farm are outlined in blue.

Figure 1. The area surrounding Redwood Farm - concentric circles radii 5km (green) and 2 km (olive)



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3. Ammonia, Background Levels, Critical Levels & Loads & Emission Rates

3.1 Ammonia concentration and nitrogen and acid deposition

When assessing potential impact on ecological receptors, ammonia concentration is usually expressed in terms of micrograms of ammonia per metre cubed of air (µg-NH_3/m^3) as an annual mean. Ammonia in the air may exert direct effects on the vegetation, or indirectly affect the ecosystem through deposition which causes both hyper-eutrophication (excess nitrogen enrichment) and acidification of soils. Nitrogen deposition, specifically in this case the nitrogen load due to ammonia deposition/absorption, is usually expressed in kilograms of nitrogen per hectare per year (kg-N/ha/y). Acid deposition is expressed in terms of kilograms equivalent (of H^+ ions) per hectare per year (keq/ha/y).

3.2 Background ammonia levels and nitrogen and acid deposition

The background ammonia concentration (annual mean) in the area around Redwood Farm and the wildlife sites is 1.81 µg-NH_3/m^3. The background nitrogen deposition rate to woodland is 29.26 kg-N/ha/y and to short vegetation is 17.08 kg-N/ha/y. The background acid deposition rate to woodland is 1.96 keq/ha/y and to short vegetation is 1.17 keq/ha/y. The source of these background figures is the Air Pollution Information System (APIS, August 2018).

3.3 Critical Levels & Critical Loads

Critical Levels and Critical Loads are a benchmark for assessing the risk of air pollution impacts to ecosystems. It is important to distinguish between a Critical Level and a Critical Load. The Critical Level is the gaseous concentration of a pollutant in the air, whereas the Critical Load relates to the quantity of pollutant deposited from air to the ground.

Critical Levels are defined as: "concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge" (UNECE).

Critical Loads are defined as: "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (UNECE).

For ammonia concentration in air, the Critical Level for higher plants is 3.0 µg-NH_3/m^3 as an annual mean. For sites where there are sensitive lichens and bryophytes present, or lichens and bryophytes are an integral part of the ecosystem, the Critical Level is 1.0 µg-NH_3/m^3 as an annual mean.

Critical Loads for nutrient nitrogen are set under the Convention on Long-Range Transboundary Air Pollution. They are based on empirical evidence, mainly observations from experiments and gradient studies. Critical Loads are given as ranges (e.g. 10-20 kg-N/ha/y); these ranges reflect variation in ecosystem response across Europe.

The Critical Levels and Critical Loads at the wildlife sites assumed in this study are provided in Table 1. Where the Critical Level of 1.0 µg-NH_3/m^3 is assumed, it is usually unnecessary to consider the Critical Load as the Critical Level provides the stricter test. Normally, the Critical Load for nitrogen deposition provides a stricter test than the Critical Load for acid deposition.

Table 1. Critical Levels and Critical Loads at the wildlife sites

Site	Critical Level (µg-NH_3/m^3)	Critical Load Nitrogen Deposition (kg-N/ha/y)	Critical Load Acid Deposition (keq/ha/y)
AWs/LWSs	1.0 [1]	-	-
Caldecot Meadows SSSI	3.0 [2]	20.0 [3]	-
Other SSSIs & the SAC	3.0 [2]	15.0 [3]	-

1. Used as a precautionary figure where details of the site ecology are unavailable, or where sensitive lichens and bryophytes are present.
2. Based upon the citation for the site.
3. The lower bound of the range of Critical Loads obtained from APIS.

3.4 Guidance on the significance of ammonia emissions

The following are obtained from the Environment Agency's horizontal guidance, H1 Environmental Risks Assessment, H1 Annex B - Intensive Farming.

"An emission is insignificant where Process Contribution (PC) is <4% of Critical Levels for SACs, SPAs and Ramsars, <20% for SSSIs, and <50% for local and national nature reserves (LNRs & NNRs), ancient woodland and local wildlife sites." And "Where modelling predicts a process contribution >20% of the Critical Level/Load at a SAC, SPA or Ramsar, >50% at a SSSI or >100% at a NNR, LNR, ancient woodland or local wildlife site, your proposal may not be considered acceptable. In such cases, your assessment should include proposals to reduce ammonia emissions."

This document was withdrawn February 1st 2016 and replaced with a web-page titled "Intensive farming risk assessment for your environmental permit", which contains essentially the same criteria. It is assumed that the upper threshold and lower threshold on the web-page refers to the levels that were previously referred to as levels of insignificance and acceptability in Annex B– Intensive Farming.

Within the range between the lower and upper thresholds; 4% to 20% for SACs, SPAs and Ramsars; 20% to 50% for SSSIs and 100% to 100% for other non-statutory wildlife sites, whether or not the impact is deemed acceptable is at the discretion of the Environment Agency. In making their decision, the Environment Agency will consider whether other farming installations might act in combination with the farm and the sensitivities of the wildlife sites. N.B. In the case of LWSs and AWs, the Environment Agency do not usually consider other farms that may act in combination and therefore

a PC of up to 100% of Critical Level or Critical Load is usually deemed acceptable for permitting purposes and therefore the upper and lower thresholds are the same (100%).

3.5 Quantification of ammonia emissions

Ammonia emission rates from pig houses depend on many factors and are likely to be highly variable. However, the benchmarks for assessing impacts of ammonia and nitrogen deposition are framed in terms of an annual mean ammonia concentration and annual nitrogen deposition rates. To obtain relatively robust figures for these statistics, it is not necessary to model short term temporal variations and a steady continuous emission rate can be assumed. In fact, modelling short term temporal variations might introduce rather more uncertainty than modelling continuous emissions.

The Environment Agency provides an Intensive Farming Guidance note which lists standard ammonia emission factors for a variety of livestock, including for pigs. However, the Environment Agency Intensive Farming guidance note does not provide emission figures for the weight ranges of the grower/finisher pigs in the existing pig houses, nor for the gilt grow out pigs at the proposed piggery. It is understood that the Environment Agency's figures are based upon figures from the UK Ammonia Emissions Inventory (UKAEI) 2009; therefore, where necessary, AS Modelling and Data Ltd. has calculated emission factors specifically for the pigs that would be reared in the existing/proposed pig houses, using the figures from the UK Ammonia Emissions Inventory 2009/2012 and the same methodology as the Environment Agency. The emission factors for the proposed pig houses are based on standard pig growth curves, the weights of the pigs and an ammonia emission rate of 0.055883 g-NH_3/kg-live-weight/y for straw based systems and 0.063334 g-NH_3/kg-live-weight/y for slatted floor systems (multiplied by a factor of 0.5337 for part slatted floors, similarly to the emission factors in the Environment Agency guidance note).

Details of the pig numbers and types and emission factors used and calculated ammonia emission rates are provided in Tables 2a (Existing Piggery) and 2b (Proposed Piggery).

Table 2a. Details of pig numbers and ammonia emission rates - Existing Piggery

ADMS ID/Source	Housing type	Ventilation type	Pig type	Weights	Animal numbers	Baseline emission factor (kg-NH_3/animal-place/y)	Ammonia emission rate (g-NH_3/s)
FLAT_DECK	STRAW	Capped Fans/Natural	Weaners	7-20	400	0.754424	0.009563
FARROW	PSF	Capped Fans	Sows	200	16	4.57	0.002317
SERVICE	STRAW	Natural	Sows	200	80	4.57	0.011585
BREEDING	STRAW	Natural	Sows	200	80	4.57	0.011585
			Boars	300	6	10	0.001901
FINISHER	PSF	Natural	finishers	80-130	182	6.65	0.038352
GROWERS	STRAW	Natural	Growers	20-50	600	2.12	0.040307
GROW_FIN	STRAW	Natural	Growers/Finishers	35-110	720	4.14	0.094456
BOARS	STRAW	Natural	Boars	300	5	10	0.001584
FIN_GILTS	STRAW	Natural	Sows	300	100	4.57	0.014481
			Finishers	110	200	6.14	0.038913
FARROW_B1	STRAW	Natural	Sows	200	10	4.57	0.001448
FARROW_B2	STRAW	Natural	Sows	200	40	4.57	0.005793
FINISHER_B3	STRAW	Natural	Finishers	35-110	240	4.14	0.031485
ADMS ID/Source	Area (m^2)	Tonnes				Baseline emission factor (kg-NH_3/m^2 or t/y)	Ammonia emission rate (g-NH_3/s)
MIDDENS		200				1.49	0.009443
TANK	324					1.4	0.014374
YARD1	403.95					0.14	0.001792
YARD2	305.20					0.14	0.001354
YARD3	515.19					0.14	0.002286
SLURRY	913.49					1.4	0.040526

Table 2b. Details of pig numbers and ammonia emission rates - Proposed Piggery

ADMS ID	Housing type	Ventilation type	Pig type	Weights	Animal numbers	Baseline emission factor (kg-NH_3/animal-place/y)	Ammonia emission rate (g-NH3/s)
DRY1	PSF	Uncapped high speed	Dry Sows	200	288	2.41	0.021994
DRY2	PSF	Uncapped high speed	Dry Sows	200	288	2.41	0.021994
DRY3	PSF	Uncapped high speed	Dry Sows	200	288	2.41	0.021994
DRY4	PSF	Uncapped high speed	Dry Sows	200	288	2.41	0.021994
FAR1	PSF	Uncapped high speed	Farrowers	200	52	2.41	0.003971
FAR2	PSF	Uncapped high speed	Farrowers	200	52	2.41	0.003971
FAR3	PSF	Uncapped high speed	Farrowers	200	52	2.41	0.003971
FAR4	PSF	Uncapped high speed	Farrowers	200	52	2.41	0.003971
SER1	PSF	Uncapped high speed	Sows	200	320	2.41	0.024438
			Boars	300	4	10	0.001268
SER2	PSF	Uncapped high speed	Sows	200	320	2.41	0.024438
			Boars	300	4	10	0.001268
GRO	PSF	Uncapped high speed	Weaner	7-30	270	0.5092452	0.004357
			Grow out	30-150	720	3.04266	0.069420

4. The Atmospheric Dispersion Modelling System (ADMS) and Model Parameters

The Atmospheric Dispersion Modelling System (ADMS) ADMS 5 is a new generation Gaussian plume air dispersion model, which means that the atmospheric boundary layer properties are characterised by two parameters; the boundary layer depth, and the Monin-Obukhov length rather than in terms of the single parameter Pasquill-Gifford class.

Dispersion under convective meteorological conditions uses a skewed Gaussian concentration distribution (shown by validation studies to be a better representation than a symmetrical Gaussian expression).

ADMS has a number of model options including: dry and wet deposition; NO_x chemistry; impacts of hills, variable roughness, buildings and coastlines; puffs; fluctuations; odours; radioactivity decay (and γ-ray dose); condensed plume visibility; time varying sources and inclusion of background concentrations.

ADMS has an in-built meteorological pre-processor that allows flexible input of meteorological data both standard and more specialist. Hourly sequential and statistical data can be processed, and all input and output meteorological variables are written to a file after processing.

The user defines the pollutant, the averaging time (which may be an annual average or a shorter period), which percentiles and exceedance values to calculate, whether a rolling average is required or not and the output units. The output options are designed to be flexible to cater for the variety of air quality limits, which can vary from country to country, and are subject to revision.

4.1 Meteorological data

Computer modelling of dispersion requires hourly sequential meteorological data and to provide robust statistics the record should be of a suitable length; preferably four years or longer.

The meteorological data used in this study is obtained from assimilation and short term forecast fields of the Numerical Weather Prediction (NWP) system known as the Global Forecast System (GFS).

The GFS is a spectral model and data are archived at a horizontal resolution of 0.25 degrees, which is approximately 25 km over the UK (formerly 0.5 degrees, or approximately 50 km). In most cases, the GFS resolution adequately captures major topographical features and the broad-scale characteristics of the weather over the UK. Smaller scale topological features may be included in the dispersion modelling by using the flow field module of ADMS (FLOWSTAR). The use of NWP data has advantages over traditional meteorological records because:

- Calm periods in traditional records may be over represented, this is because the instrumentation used may not record wind speed below approximately 0.5 m/s and start up wind speeds may be greater than 1.0 m/s. In NWP data, the wind speed is continuous down to 0.0 m/s, allowing the calms module of ADMS to function correctly.

- Traditional records may include very local deviations from the broad-scale wind flow that would not necessarily be representative of the site being modelled; these deviations are difficult to identify and remove from a meteorological record. Conversely, local effects at the site being modelled are relatively easy to impose on the broad-scale flow and provided horizontal resolution is not too great, the meteorological records from NWP data may be expected to represent well the broad-scale flow.

- Information on the state of the atmosphere above ground level which would otherwise be estimated by the meteorological pre-processor may be included explicitly.

A wind rose showing the distribution of wind speeds and directions in the GFS derived data is shown in Figure 2a. Wind speeds are modified by the treatment of roughness lengths (see Section 4.7) and where terrain data is included in the modelling, wind speeds and directions will be modified. The terrain and roughness length modified wind rose for the site of the proposed pig houses is shown in Figure 2b. Note that elsewhere in the modelling domain, modified wind roses may differ more markedly and that the resolution of the wind field in terrain runs is approximately 240 m.

Figure 2a. The wind rose for the raw GFS derived data for 52.201N, 0.106 W, 2014 – 2017

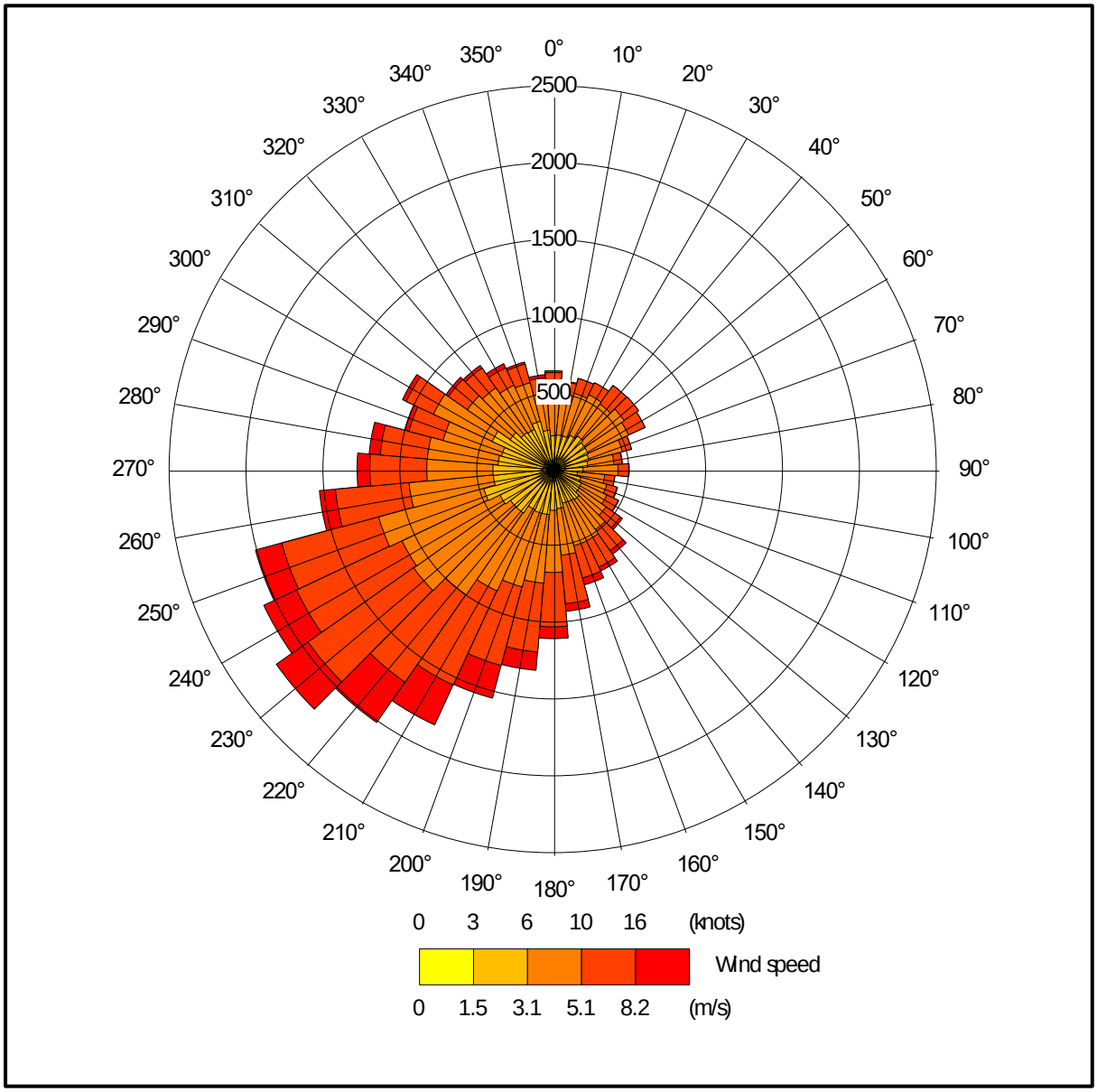
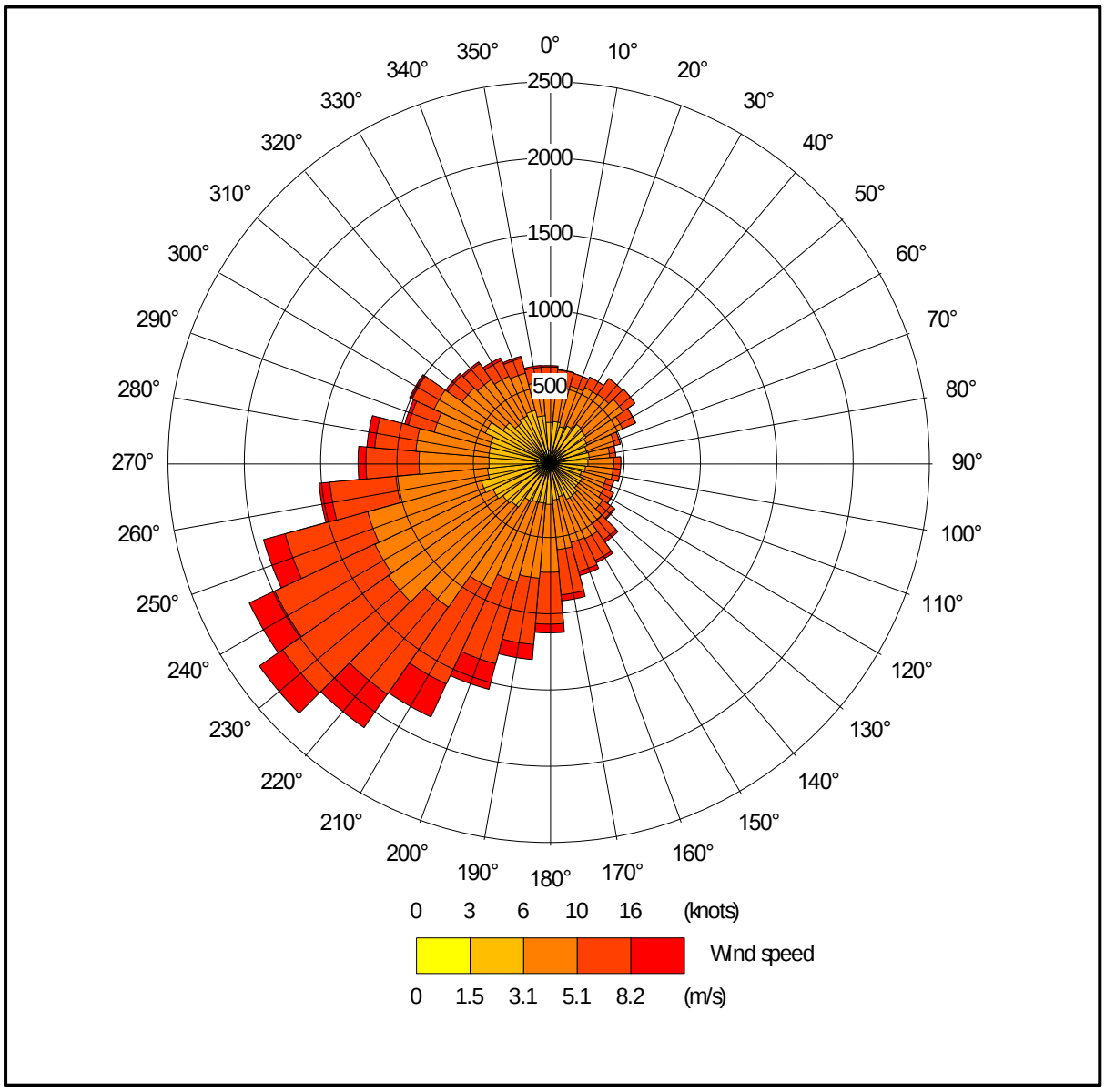


Figure 2b. The wind rose for the site of the proposed pig house NGR 529400, 257600, derived from FLOWSTAR output



4.2 Emission sources

Emissions from the chimneys of capped ridge/roof fans that are used to ventilate two of the existing pig houses house are represented by three point sources per house within ADMS (FLAT_DECK a, b & c and FARROW a, b & c), some fugitive emissions are also likely from these houses, these emissions are assumed to be 25% of the total emissions and are represented by two volume sources within ADMS (FLAT_DECK and FARROW).

Emissions from the naturally ventilated houses at the existing piggery and emissions from the middens and slurry storage tank are represented by volume sources within ADMS (SERVICE, BREEDING, FINISHER, GROWERS, GROW_FIN, BOARS, FIN_GILTS, FARROW_B1, FARROW_B2, FINISHER_B3, MIDDENS and TANK).

Emissions from the soiled yards and the slurry lagoon at the at the existing piggery are represented by four area sources within ADMS (YARD1, YARD2, YARD3 and SLURRY).

Emissions from the chimneys of the uncapped high speed ridge/roof fans that would be used to ventilate the proposed pig houses are represented by three point sources per house within ADMS (DRY1, DRY2, DRY3, DRY4, FAR1, FAR2, FAR3, FAR4, SER1, SER2 and GRO a, b & c).

Details of the point, volume and area sources parameters are shown in Tables 2a, 2b and 2c. The positions of the sources may be seen in Figures 3a (Existing Piggery) and 3b (Proposed Piggery).

4.3 Modelled buildings

The structure of the pig houses (and other farm buildings) may affect the plumes from the point sources. Therefore, the buildings are modelled within ADMS. The positions of the modelled buildings may be seen in Figures 3a (Existing Piggery) and 3b (Proposed Piggery), where they marked by grey rectangles.

Table 2a. Point source parameters

Source ID (scenario)	Height (m)	Diameter (m)	Efflux velocity (m/s)	Emission temperature (˚C)	Emission rate per source (g-NH_3/s)
FLAT DECK a, b & c (Existing)	3,5	2.0	0.1	21.0	0.002391
FARROW a, b & c (Existing)	3,5	2.0	0.1	21.0	0.000579
DRY1 to DRY4 a, b & c (Proposed)	9.05	0.95	12.0	21.0	0.007331
FAR1 to FAR4 a, b & c (Proposed)	8.88	0.95	12.0	21.0	0.001324
SER1 and SER2 a, b & c (Proposed)	8.88	0.95	12.0	21.0	0.008568
GRO a, b &c (Proposed)	8.35	0.95	12.0	21.0	0.024592

Table 2b. Volume source parameters

Source ID	Length (m)	Width (m)	Depth (m)	Base Height (m)	Emission temperature (°C)	Emission rate (g-NH_3/s)
FLAT_DECK	7.01	18.59	3.0	0.0	Ambient	0.002391
FARROW	4.42	18.90	3.0	0.0	Ambient	0.000579
SERVICE	13.11	36.58	5.0	0.0	Ambient	0.011585
BREEDING	12.95	42.98	5.0	0.0	Ambient	0.013486
FINISHER	12.50	18.90	2.5	0.0	Ambient	0.038352
GROWERS	7.62	37.19	3.0	0.0	Ambient	0.040307
GROW_FIN	7.62	37.19	3.0	0.0	Ambient	0.094456
BOARS	6.55	17.53	4.0	0.0	Ambient	0.001584
FIN_GILTS	12.80	42.06	5.0	0.0	Ambient	0.053394
MIDDENS	9.14	38.10	2.0	0.0	Ambient	0.009443
TANK	18.00	18.00	2.0	5.0	Ambient	0.014374
FARROW_B1	10.36	45.11	5.0	0.0	Ambient	0.001448
FARROW_B2	10.36	7.62	5.0	0.0	Ambient	0.005793
FINISHER_B3	6.10	17.68	5.0	0.0	Ambient	0.031485

Table 2c. Area source parameters

Source ID	Area (m^2)	Base height (m)	Emission temperature (°C)	Emission rate (g-NH_3/s)
YARD1	404.0	0.0	Ambient	0.001792
YARD2	305.2	0.0	Ambient	0.001354
YARD3	515.2	0.0	Ambient	0.002286
SLURRY	913.5	0.0	Ambient	0.040526

Figure 3a. The positions of modelled sources and buildings – Existing Piggery

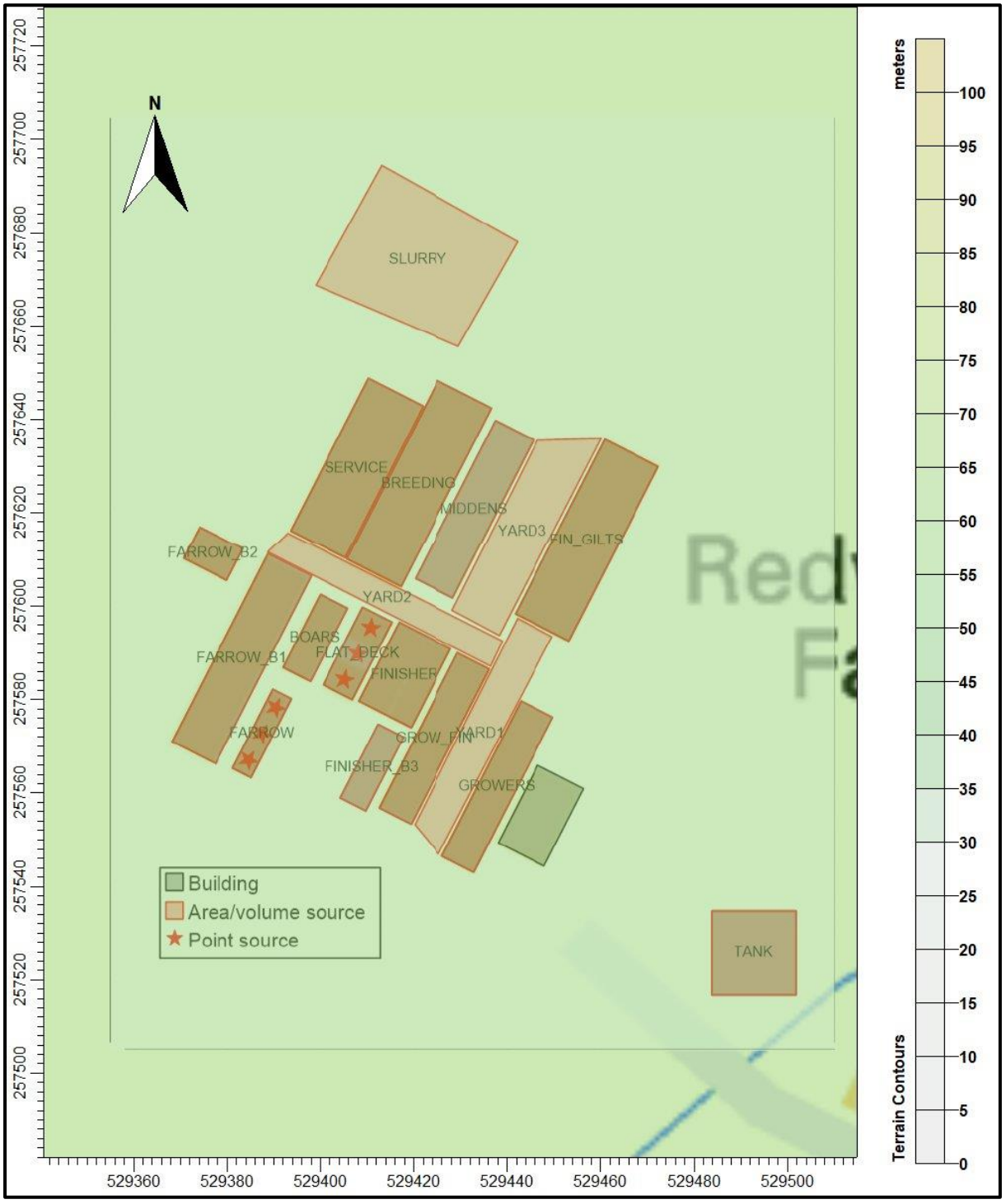


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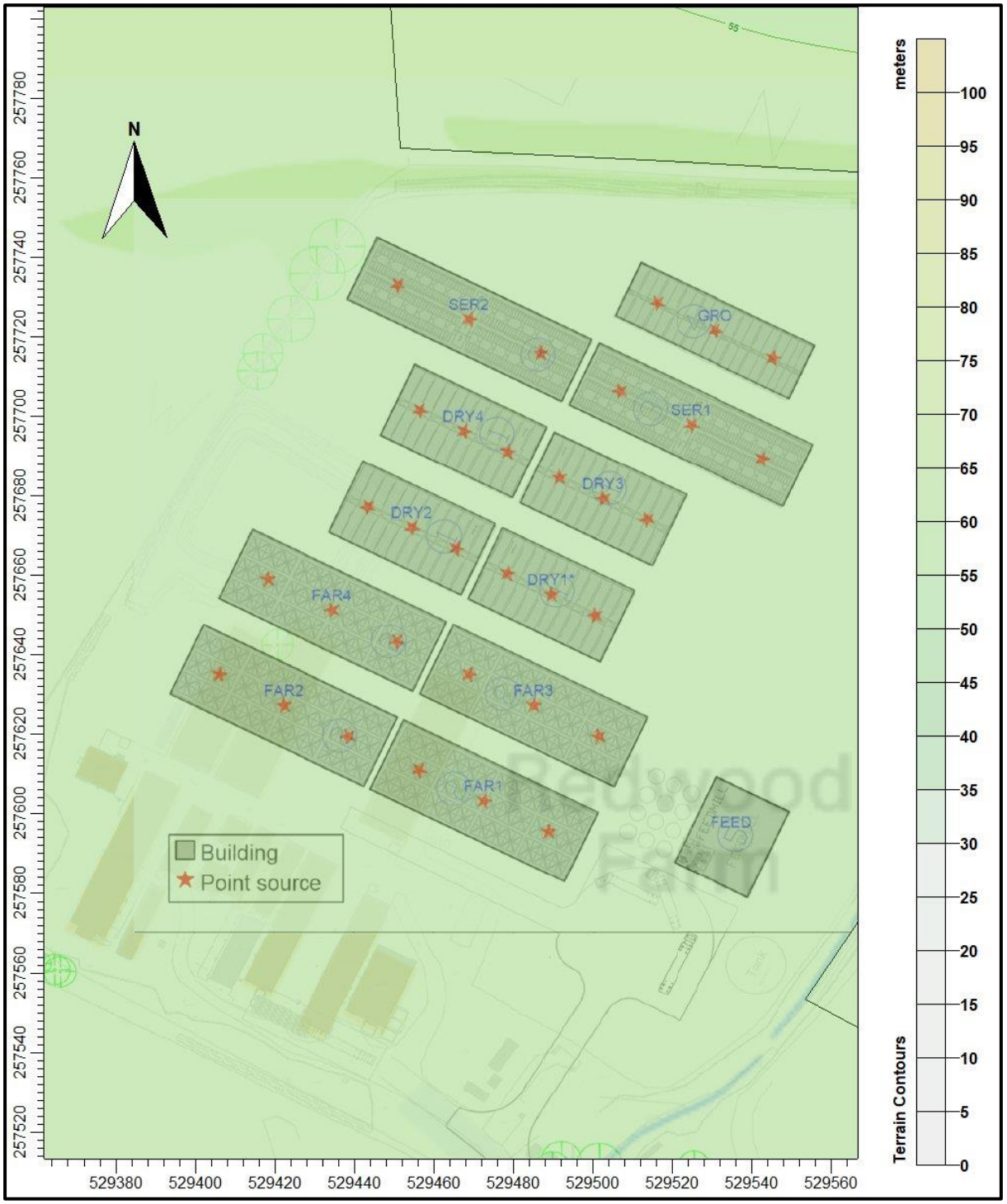
Figure 3b. The positions of modelled sources and buildings – Proposed Piggery



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4.4 Discrete receptors

Nineteen discrete receptors have been defined at nearby wildlife sites: six at the LWSs/AWs (1 to 6); ten at the SSSIs (7 to 16) and three at the SAC (17 to 19). These receptors are defined at ground level within ADMS. The positions of the discrete receptors may be seen in Figure 4, where they are marked by enumerated pink rectangles.

4.5 Cartesian grid

Not used.

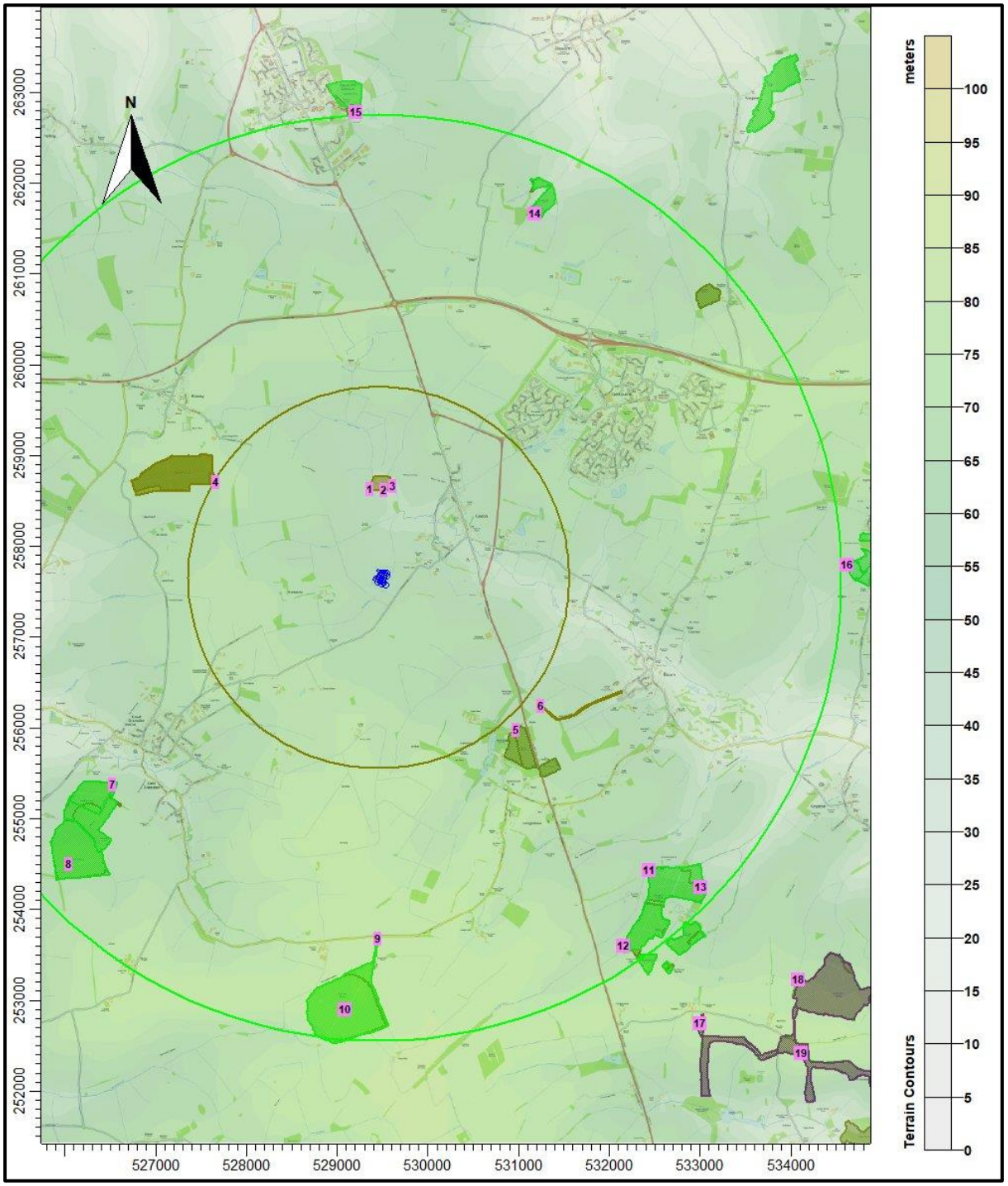
4.6 Terrain data

Terrain has been considered in the modelling. The terrain data are based upon the Ordnance Survey 50 m Digital Elevation Model. A 16 km x 16 km domain has been resampled at 100 m horizontal resolution for use within ADMS. N.B. The resolution of FLOWSTAR is 64 x 64 grid points; therefore, the effective resolution of the wind field for the terrain runs is approximately 240 m.

4.7 Roughness Length

A fixed surface roughness length of 0.25 m has been applied over the entire modelling domain. As a precautionary measure, the GFS meteorological data is assumed to have a roughness length of 0.2 m. The effect of the difference in roughness length is precautionary as it increases the frequency of low wind speeds and the stability and therefore increases predicted ground level concentrations.

Figure 4. The discrete receptors



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4.8 Deposition

The method used to model deposition of ammonia and consequent plume depletion is based on a document titled “Guidance on modelling the concentration and deposition of ammonia emitted from intensive farming” from the Environment Agency’s Air Quality Modelling and Assessment Unit, 22 November 2010. In this case, it proves unnecessary to model deposition of ammonia explicitly and where deposition figures are quoted, these are obtained by multiplying the predicted ammonia concentration by an appropriate deposition velocity and a factor of 259.7 to convert units. Please note that, because deposition of ammonia and the consequent plume depletion are not accounted for, this is a precautionary approach. Therefore, predicted ammonia concentrations (and nitrogen and acid deposition rates) are always higher than if deposition were modelled explicitly, particularly where there is some distance between the source and a receptor.

5. Details of the Model Runs and Results

5.1 Preliminary modelling and model sensitivity tests

ADMS was run a total of twenty-four times, once for each year in the meteorological record, for both the existing and proposed scenarios and in the following three modes:

- In basic mode without calms, or terrain – GFS data.
- With calms and without terrain – GFS data.
- Without calms and with terrain – GFS data.

For each mode, statistics for the maximum annual mean ammonia concentration at each receptor were compiled for the existing and proposed scenarios.

Details of the predicted annual mean ammonia concentrations at each receptor are provided in Table 5. Predicted ammonia concentrations that are in excess of the Environment Agency's upper threshold (20% for a SAC, 50% for a SSSI and 100% for a LWS) are coloured red. Predicted ammonia concentrations in excess of the Environment Agency's lower threshold (4% for a SAC, 20% for a SSSI and 100% for a LWS) are coloured blue.

Note that where a Critical Level of 3.0 μg-NH_3/m^3 is applicable, then, the Critical Load may provide the stricter test and the following conversions may be useful when reading Table 5:

- 20% of the Critical Load of 15.0 kg-N/ha/y is equivalent to an annual mean ammonia concentration of 0.3851 μg-NH_3/m^3 (assuming a deposition velocity of 0.03 m/s).
- 20% of the Critical Load of 20.0 kg-N/ha/y is equivalent to an annual mean ammonia concentration of 0.7701 μg-NH_3/m^3 (assuming a deposition velocity of 0.02 m/s).
- 4% of the Critical Load of 15.0 kg-N/ha/y is equivalent to an annual mean ammonia concentration of 0.0770 μg-NH_3/m^3 (assuming a deposition velocity of 0.03 m/s).

Table 5. Predicted maximum annual mean ammonia concentration at the discrete receptors

Receptor number	X(m)	Y(m)	Designation	Maximum annual mean ammonia concentration (µg/m³)					
				Existing			Existing		
				GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms Terrain	GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms Terrain
1	529356	258626	LWS	0.445	0.532	0.353	0.120	0.119	0.112
2	529512	258613	LWS	0.556	0.638	0.512	0.154	0.152	0.143
3	529617	258662	LWS	0.546	0.618	0.536	0.157	0.155	0.147
4	527657	258701	AW/LWS	0.141	0.170	0.161	0.026	0.026	0.028
5	530972	255978	AW/LWS	0.127	0.149	0.116	0.028	0.028	0.026
6	531241	256243	AW/LWS	0.132	0.153	0.116	0.031	0.031	0.028
7	526527	255373	Waresly Wood SSSI	0.063	0.073	0.068	0.018	0.018	0.018
8	526040	254496	Waresly Wood SSSI	0.048	0.055	0.050	0.015	0.015	0.016
9	529443	253674	Hayley Wood SSSI	0.046	0.057	0.032	0.011	0.011	0.012
10	529081	252898	Hayley Wood SSSI	0.034	0.042	0.020	0.009	0.009	0.010
11	532437	254435	Kingston Wood & Outliers SSSI	0.042	0.049	0.039	0.011	0.011	0.011
12	532152	253600	Kingston Wood & Outliers SSSI	0.037	0.043	0.033	0.010	0.010	0.010
13	533006	254242	Kingston Wood & Outliers SSSI	0.034	0.040	0.034	0.010	0.010	0.009
14	531175	261657	Elsworth Wood SSSI	0.054	0.061	0.041	0.018	0.018	0.017
15	529206	262780	Papworth Wood SSSI	0.029	0.035	0.025	0.011	0.011	0.010
16	534623	257790	Caldecot Meadows SSSI	0.040	0.046	0.052	0.016	0.015	0.017
17	533000	252743	Eversden & Wimpole Woods SSSI/SAC	0.026	0.030	0.021	0.007	0.008	0.007
18	534079	253221	Eversden & Wimpole Woods SSSI/SAC	0.022	0.027	0.020	0.007	0.007	0.006
19	534116	252410	Eversden & Wimpole Woods SSSI/SAC	0.020	0.023	0.015	0.006	0.006	0.006

6. Summary and Conclusions

AS Modelling & Data Ltd. has been instructed by Martin Page of Brown & Co., on behalf of B&S Farming Ltd., to use computer modelling to assess the impact of ammonia emissions from the existing and proposed piggeries at Redwood Farm, Great Gransden, Sandy, Bedfordshire. CB23 3PL.

Ammonia emission rates from the existing and proposed piggeries have been assessed and quantified based upon figures obtained from the Inventory of Ammonia Emissions from UK Agriculture 2009 and 2012 and the Environment Agency's standard ammonia emission factors. The ammonia emission rates have then been used as inputs to an atmospheric dispersion and deposition model which calculates ammonia exposure levels and nitrogen and acid deposition rates in the surrounding area.

- At all AWs/LWSs, the modelling predicts that the process contribution from the proposed piggery would be below the lower threshold percentage (100% for a non-statutory site) of the precautionary Critical Level of 1.0 µg-NH_3/m^3.

- At all SSSIs, the modelling predicts that the process contribution from the proposed piggery would be below the lower threshold percentage (20% for a SSSI) of the Critical Level of 3.0 µg-NH_3/m^3 and the Critical Load for the site (20 kg-N/ha/y for Caldecot Meadows SSSI and 15 kg-N/ha/y for other SSSIs).

- At the SAC, the modelling predicts that the process contribution from the proposed piggery would be below the lower threshold percentage (4% for a SAC) of the Critical Level of 3.0 µg-NH_3/m^3 and the Critical Load of 15 kg-N/ha/y.

- In all cases, the predicted process contribution from the proposed piggery is considerably lower than the predicted process contribution from the existing piggery.

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7. References

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