GEOSPHERE ENVIRONMENTAL

REPORT NUMBER:	3902,EC/GCN/P1/KL,RF/28-05-19/V1
SITE:	Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW
DATE:	28/05/2019

DOCUMENT CONTROL SHEET

Report Number:	3902,EC/GCN/P1/KL,RF/28-05-19/V1
Client:	M Scott Properties Ltd
Project Name:	Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW
Project Number:	3902,EC
Report Type:	Great Crested Newt and Amphibian Survey
Status:	Final
Date of Issue:	28/05/2019

Issued By:

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Time limit of reliance:

Please note that the reported surveys were conducted on the date(s) stated in the report and that it represents site conditions at the time of the visit. The findings and recommended mitigation are based upon these conditions. If site conditions change materially after the site survey, the original report cannot be relied upon and will need to be updated. Ecological reports can typically be relied on for 18 to 24 months from the date of survey.

Prepared By:	Reviewed By:	Authorised By:
Katie Linehan	James Booty	Tom Powling
Technical Director of Ecology	Senior Ecologist	Director

REVISION RECORD

Revision	Date	Revision Details	Prepared By:	Admin

EXECUTIVE SUMMARY

Report Description		Geosphere Environmental Limited was commissioned by M Scott Properties Ltd to undertake a Great Crested Newt (GCN) and Amphibian Survey on ponds located in proximity to Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW. Habitats onsite including hedgerows and semi-improved grassland were confirmed suitable for GCN within the Extended Phase 1 Habitat Survey dated December 2018 (ref.**R.1**). As such, a survey has been undertaken to establish whether GCN are present in ponds local to the site. The report relates to the proposed redevelopment of the site for residential use.
Summary of Main Findings		Three ponds (herein referred to as Ponds 1 to 3) were analysed for Great Crested Newt eDNA. Pond 2, returned a positive result, albeit, a single replicate of the 12 analyses undertaken. Ponds 1 and 3 returned negative results, despite Ponds 2 and 3, being connected via a drainage culvert (attenuation ponds). Further survey effort was undertaken comprising of traditional methods including bottle traps, night torching and egg searching. Four surveys were undertaken between 29 April and 23 May 2019. The following methodologies were used during each of the survey visits: Bottle traps, night torching, egg searching and netting. Results: • No GCN were recorded during the four survey events. • Smooth Newt were encountered in all ponds with a maximum count of 24 (Good Population) in Pond 3, on 13 May 2019. • A single Common Frog was noted in Pond 3 on 8 May 2019. Pond 2, appears to be used as an attenuation pond, used to collect surface water runoff from the development to the west and north, adjacent to the pond. There is potential that the GCN eDNA could have been transferred to the pond from elsewhere within the catchment.
Impact Assessment		Common Frog and Smooth Newt are widespread in mainland Britain and as such no specific local significance can be attached to the populations confirmed. As such the populations are deemed to be important on a site scale. Pond 1, is to be retained within the final development. Ponds 2 and 3,

		are located outside of the site boundary and will also be retained. As such, there will be no decrease in breeding habitat for these species.
Recommendations		Given the low positive result of GCN eDNA in Pond 2, and negative results within Ponds 1, 2 and 3, using traditional survey methods, it is unlikely GCN will be a material constraint to development. However, it would be prudent to undertake vegetation clearance and initial groundwork activities under a non-licensed method statement using risk avoidance measures such as; • Habitat manipulation and destructive hand searches of any habitats deemed suitable (semi-improved grassland/field margins); • Ecological Supervision when working within the semi-improved grassland onsite; • Should any additional drainage works be required on Ponds 2 and 3, works should be supervised and confined to the winter months to reduce impact; • If any GCN are encountered during unsupervised works, site activities should cease and a professional ecological consultant should be contacted for advice immediately.
Conclusions		No GCN were confirmed present within Ponds 1 to 3, during the survey. As such this species is not a material consideration for the scheme. Ponds 1 to 3, will be retained. As such, there will be no decrease in breeding habitat for Smooth Newt or Common Frog.

CONTENTS

TABLES

1. INTRODUCTION

1.1 General

Geosphere Environmental Limited was commissioned by M Scott Properties Ltd to undertake an amphibian survey of the site at Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW.

Any limitations and conditions pertaining to the report are stated within Appendix 1, with a full list of technical references provided within Appendix 2.

The proposed development boundary is shown on the Pond Locations and HSI Assessment plan, Drawing ref. 3902,EC/003/Rev 0 included within Appendix 3.

The report relates to the proposed development of the site, at present a finalised development plan is not available for the scheme however, the development is expected to fall within the survey area.

1.2. Background Information

The habitats onsite were confirmed suitable for GCN within the Geosphere Environmental Phase 1 Habitat Survey dated December 2018 (ref.**R.1**). Biological records from Norfolk Biodiversity Information Service (NBIS) and Suffolk Biodiversity Information Service (SBIS) show a single record of Great Crested Newt from 2006 located more that 500m west of the site. This record is ecologically separated from site by residential development and infrastructure.

As well as an HSI assessment, a full amphibian survey has been undertaken to establish whether Great Crested Newts are present onsite or within the wider area, in order to provide preliminary mitigation recommendations should they be confirmed.

1.3. Aims

The aims of the survey and report are to:

- Identify the presence/absence of Great Crested Newt (*Triturus cristatus*), and other species of amphibians on the site;
- Estimate a population size and species distribution during the aquatic phase;
- Evaluate the importance of habitat for Great Crested Newt and other amphibians onsite;
- Provide an assessment of the potential impacts, and advise the requirements for mitigating these impacts.

1.4. Current UK Legislation

Great Crested Newts are protected under Conservation of Habitats and Species Regulations 2017 Schedule 2, the Wildlife and Countryside Act 1981 (as amended) Schedule 5, and listed as a species of principal importance under Section 41, of the Natural Environment and Rural Communities (NERC) Act 2006.

The law applies to all life stages of the species and therefore includes both the terrestrial and aquatic components of the species' habitat.

It is an offence to:

- Kill, injure or capture any wild animal of European protected species;
- Disturb wild animals of any European protected species in such a way to be likely to significantly affect:
  - (i) The ability of any significant groups of animals of that species to survive, breed, rear or nurture their young; or
  - (ii) The local distribution of that species.
- Obstruct access to their place of rest;
- Damage or destroy breeding sites or resting places of such animals;
- Take or destroy the eggs of such an animal;
- Possess or transport any part of a European protected species, unless acquired legally;
- Sell, barter or exchange any part of a European protected species.

The more widespread native amphibians: Common Frog (*Rana temporaria*), Common Toad (*Bufo bufo*), Smooth Newt (*Lissotriton vulgaris*) and Palmate Newt (*Lissotriton helveticus*) do not receive protection from deliberate killing (subject to Animal Welfare Act 2006).

The reader is referred to the original legislation for definitive interpretation.

2. TECHNICAL APPROACH

2.1 Surveyors

All survey work was supervised by Katie Linehan (Technical Director, Natural England survey licence no. 2015-16411-CLS-CLS) with assistance from, Tom Cox (Assistant Ecologist), Louisa Theeman (Graduate Ecologist) in order to establish the status of Great Crested Newts to be affected by the proposed development at the site. The eDNA survey was undertaken by Richard Fenna (Ecologist, Survey Licence number: 2019-39150- CLS-CLS).

2.2 Habitat Suitability Index

A Habitat Suitability Index (HSI) was undertaken on ponds located on and around the site in order to assess the suitability of the ponds to be used by GCNs. This was undertaken on 16 October 2018.

The Habitat Suitability Index (HSI) can be used to assess the suitability of a pond for GCN, based upon a number of factors including the size, water quality, permanence, shading, presence of fish, the number of nearby ponds and macrophyte cover (ref.**R.2**). A score between 0 and 1 is given; where 0 represents poor suitability and 1 represents excellent suitability. Full details of the assessment can be found in Appendix 4.

2.3 eDNA Survey

The purpose of the survey is to take water samples from ponds to test for Environmental DNA (eDNA) which is a method for the determination of GCN presence or absence within a waterbody.

Samples were obtained on 15 April 2019. During the survey the weather was dry and sunny (cloud cover approximately 20%) with light air (Beaufort Scale 2) with a temperature of 15°C.

The Sampling method followed accepted Natural England approved guidelines: Technical Advice Note WC1067 "Analytical and methodological development for improved surveillance of the Great Crested Newt" (ref. **R.3**). Following the collection of the samples were stored in a cool, dark place for approximately 24 hours prior to being dispatched by next day delivery to Surescreen Scientifics Ltd for laboratory analysis. Surescreen Scientifics follow Technical Advice Note WC1067 and are listed as a quality provider of this service by Natural England.

2.4 Presence/Absence Survey

The Great Crested Newt presence/absence and population assessment survey was undertaken following the published English Nature's Great Crested Newt Mitigation Guidelines (ref.**R.4**) and Herpetofauna Workers' Manual (ref.**R.5**) for survey methodology and effort. The extent of the amphibian survey is relevant for the development, which surveyed all relevant ponds within the vicinity of the proposed development area.

The following methodologies were used during each of the survey visits: bottle traps, night torching, egg searching and netting.

The report of the survey and recommendations has been prepared to inform a planning application in accordance with the key principles of the Ministry of Housing, Communities and Local Government (MHCLG) (July 2018) National Planning Policy Framework (NPPF) (ref.**R.6**).

As well as the relevant legislation listed above, biodiversity action plans (BAP) referred to include the UK BAP (ref.**R.7**). Conservation status of species is as listed on the Conservation Designations for UK Taxa list published by the JNCC (ref.**R.8**). Conclusions and recommendations for further works are given to comply with current legislation and guidance.

2.5 Value of Habitats for Amphibians

The CIEEM guidance on Ecological Impact Assessment (ref.**R.9**) assesses the nature conservation value within a geographical context. To attain each level, the amphibian resource or one of the features (species population or assemblage of species) should meet the criteria set out in Table 1 below:

Table 1 – Assessment of Conservation Value of Amphibian Species

Geographical Frame of Reference	Brief Description
International	A species which is part of the cited interest of a SAC. A European protected species (e.g. GCN) which regularly occurs in internationally or nationally important numbers. A species present in internationally important numbers (>1% of international population).
National	A species which is part of the cited interest of a SSSI on site or with direct habitat connectivity with the site. A nationally important metapopulation of a European species (e.g. GCN) or UK BAP priority species (e.g. GCN, Common Toad).
Regional	Species listed as priority species in the UKBAP, which are not covered above, and which regularly occurs in regionally important numbers.
County	Species listed as priority species in the UKBAP, which regularly occurs in county important numbers. Species present in county important numbers in the survey area (>1% of county population). Sustainable populations of a species that is rare or scarce within a county.
District	Species present in numbers just under county importance in the survey area (<1% of county population). Sustainable populations of a species that is rare or scarce within the locality.
Local	Species regularly occurring in locally sustainable populations. Areas of habitat with medium or high populations of amphibians encountered within a site boundary.
Site	Low populations of common amphibians within a site boundary.

3. AMPHIBIAN SURVEY FINDINGS AND DISCUSSION

3.1 Habitat Suitability Index

A total of 14 ponds (numbered 1 to 14) were located within 500 metres of the site. A Habitat Suitability Index (HSI) was undertaken to assess their suitability to support Great Crested Newts. A score between 0 and 1 is given; where 0 represents poor suitability and 1 represents excellent suitability.

Pond P1, was shallow at the time of the survey and lacked macrophyte cover, it has connectivity to hedgerows, poor semi-improved grassland and Ponds P2, and P3. This pond has an HSI of 0.60 and is therefore considered to be of average suitability for breeding Great Crested Newts.

Ponds P2, and P3, are connected to the terrestrial habitats and Pond P1, on the development site. Both these ponds are considered to be of good suitability for breeding Great Crested Newts and are connected to each other via a culvert.

Ponds P4 to P8, are ecologically separated from the development site by a busy main road (A143) and Ponds P9 to P14, are either separated from site by sufficient barriers (busy road or residential development) or at a distance whereby any Great Crested Newts which may be using these ponds are unlikely to be found onsite. These ponds are not considered further within this report.

All water bodies with some degree of habitat connectivity (Ponds 1 to 3) are shown on the Pond Locations and HSI Assessment plan, Drawing ref. 3902,EC/003/Rev 0 in Appendix 3.

3.2 Presence / Absence Survey - eDNA

3.2.1 Survey Limitations – Risks of Field Based False Positives

During the survey approximately 90% of the waterbody perimeter could be accessed for water sampling without entering the water. According to current guidance (ref. **R.3**), ponds with between 80% and 90% of the perimeter sampled achieved a 99.3% detection rate.

Field based risks of false positives include cross contamination between sites (due to equipment and clothing etc.), however this is often mitigated against, inflows, bringing eDNA from sites with newts into unoccupied ponds and aquatic animals (e.g. herons, water voles) transferring newt DNA between sites (e.g. in faeces, in water trapped in fur).

3.2.2 eDNA Results

Following the HSI survey, all ponds within 250m that were considered suitable for Great Crested Newts and with habitat connectivity to the site were surveyed for eDNA (Ponds 1 to 3). The results of the eDNA are attached in Appendix 6.

Pond 2, returned a positive result, albeit, a single replicate of the 12 analyses undertaken. Ponds 1 and 3, returned a negative result, even though Ponds 2 and 3, are connected via a drainage culvert. Given the low positive result, traditional survey methods were undertaken also in case a false positive has been recorded.

3.3 Presence / Absence Survey – Traditional Survey

Traditional amphibian surveys were completed for 3 ponds: Pond numbers 1,2 and3, comprising of four evening and dawn surveys between 29 April and 23 May 2019 to determine GCN presence/ absence and to provide adequate information for an impact assessment.

Weather conditions during the survey are attached in Appendix 7. Full results of the surveys are attached as Appendix 8.

No GCN were recorded during the four survey events.

Pond 2, appears to be used as an attenuation pond, used to collect surface water runoff from the development to the west and north, adjacent to the pond. There is potential that the GCN eDNA could have been transferred to the pond from elsewhere within the catchment.

3.4 Other Amphibians Noted

Smooth Newt were encountered in all ponds with a maximum count of 24 (Good Population) in Pond 3, on the 13th May 2019.

A single Common Frog was noted in pond 3 on 8 May 2019.

3.5 Assessment of Ecological Value and Impact

Common Frog, and Smooth Newt are widespread in mainland Britain and as such no specific local significance can be attached to the populations confirmed. As such the populations are deemed to be important on a site to local scale.

Pond 1, is to be retained within the final development. Ponds 2 and 3, are located outside of the site boundary and will also be retained. As such, there will be no decrease in breeding habitat for these species.

4. CONCLUSIONS

Given the low positive result of GCN eDNA in Pond 2, and negative results within Ponds 1, 2 and 3, using traditional survey methods, it is unlikely GCN will be a material constraint to development. However, it would be prudent to undertake certain activities under a non-licensed method statement using risk avoidance measures such as:

- Habitat manipulation and destructive hand searches of any habitats deemed suitable such as hedgerows or semi-improved grassland;
- Ecological Supervision when working within the semi-improved grassland onsite;
- Should any additional drainage works be required on Ponds 2 and 3, works should be carried out under ecological supervision and limited to the winter months to reduce impact;
- If any GCN are encountered during unsupervised works, site activities should cease and a professional ecological consultant should be contacted for advice immediately.

Ponds 1 to 3, will be retained. As such, there will be no decrease in breeding habitat for Smooth Newt or Common Frog.

APPENDICES

Appendix 1 – Report Limitations and Conditions

General Limitations and Exceptions

This report was prepared solely for our Client for the stated purposes only and is not intended to be relied on by any other party or for any other use. No extended duty of care to any third party is implied or offered.

Geosphere Environmental Ltd does not purport to provide specialist legal advice.

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 upon current legislation in force at that time.

Ecology Limitations and Exceptions

Any limitations associated with the report will be stated. The consequences of any limitations, findings and/or recommendations in the report are made clear in line with CIEEM (2013) 'Guidelines for Preliminary Ecological Appraisal' (GPEA) and BSI (2013) BS 42020:2013 Biodiversity – 'Code of practice for planning and development'.

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.

The wildlife and habitats present on any site are subject to change over time. Surveys of this kind can have limited validity, with the possibility of behaviour patterns and territory boundaries varying over time due to the dynamics of adjacent populations.

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 12 months from the date of the report, the report should be referred to us for re-assessment and, if necessary, re-appraisal.

It should be noted that whilst every effort has been made to provide a comprehensive description of the site, no investigation can ensure the complete characterisation of the natural environment.

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

Appendix 2 – References

R.1. Preliminary Ecological Appraisal, Geosphere Environmental, 3495,EC,AR,DS/PEA/ZK,RF,KL/13-12-18/V2

R.2. Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000). Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus).

R.3. Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F 2014. Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA. Freshwater Habitats Trust, Oxford.

R.4. English Nature (2001) Great Crested Newt Mitigation Guidelines

R.5. Gent T., Gibson S. (2003) Herpetofauna Workers Manual. JNCC.

R.6. Ministry of Housing, Communities and Local Government (MHCLG) (July 2018) National Planning Policy Framework (NPPF).

R.7. JNCC (2012). The UK Biodiversity Action Plan (UK BAP). http://jncc.defra.gov.uk/default.aspx?page=5155.

R.8. JNCC (2014). Conservation Designations for UK Taxa. File name: Taxon_designations_20111020.zip; http://jncc.defra.gov.uk/page-3408.

R.9. CIEEM, (2016). Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland (Second edition dated January 2016).

Appendix 3 – Drawings

Pond Locations and HSI Assessment, Drawing ref. 3902,EC/003/Rev 0

GEOSPHERE ENVIRONMENTAL

LEGEND

- Deveolpment boundary
- Pond with Good HSI Score
- Pond with Average HSI Score

SOURCE

© OpenStreetMap contributors

PROJECT

Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW

TITLE

Pond Location & HSI Assessment Plan (P1)

DRAWING NUMBER

3902,EC/003/Rev0

SCALE	DATE
NTS	24/05/2019
DRAWN BY	**CHECKED BY**
KL	RF

N

Appendix 4 – HSI Scores

HSI SCORES

Project Number: 3902,EC

Project Name: Briar Farm: Land off Mendham Lane, Harleston, Norfolk **Date:** 28/05/2019

Pond Ref:	SI1	SI2	SI3	SI4	SI5	SI6	SI7	SI8	SI9	SI10	HSI	Suitability
	Location	Pond Area	Pond Drying	Water quality	Shade	Fowl	Fish	Ponds	Terr'l Habitat	Macrophytes		
1	1	0.9	0.5	0.33	1	0.67	1	0.65	0.33	0.3	0.60	Average
2	1	0.9	0.9	0.67	1	1	0.67	0.65	0.33	0.7	0.75	Good
3	1	0.98	0.9	0.67	1	1	0.67	0.65	0.33	0.8	0.76	Good
4	1	0.44	1	0.33	1	1	1	0.8	0.01	0.3	0.45	Poor
5	1	0.2	1	0.67	0.6	0.67	0.67	0.8	0.33	0.3	0.56	Below Average

HSI Score	Pond suitability
<0.5	Poor
0.5-0.59	Below average
0.6-0.69	Average
0.7-0.79	Good
>0.8	Excellent

Appendix 5 – Pond Descriptions

Pond 1

Pond 2

GEOSPHERE ENVIRONMENTAL

NOTE

Pond 1

This pond is located on site and although it was shallow at the time of the survey and lacked macrophyte cover, it has connectivity to hedgerows, poor semi-improved grassland and ponds P2, and P3. This pond has an HSI of 0.60 and is therefore considered to be of average suitability for breeding Great Crested Newts.

Pond 2

This pond has an HSI of 0.75 and is considered to be of good suitability for breeding Great Crested Newts. This is also directly connected to pond 3 via a drainage culvert.

PROJECT

Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW

PROJECT NUMBER

3902,EC

TITLE

Pond Photos

DATE

28/05/2019

Appendix 6 – eDNA Results

SureScreen Scientifics

Folio No: E4457
Report No: 1
Order No: 1521
Client: GEOSPHERE ENVIRONMENTAL
Contact: Richard Fenna
Contact Details: richard@geosphere-environmental.co.uk, richard@geosphere-environmental.co.uk
Date: 24/04/2019

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS

Date sample received at Laboratory: 17/04/2019
Date Reported: 24/04/2019
Matters Affecting Results: None

RESULTS

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
1342	Briar Farm Pond 3	TM 252 830	Pass	Pass	Pass	Negative	0
1344	Briar Farm Pond 2	TM 251 832	Pass	Pass	Pass	Positive	1
1343	Briar Farm Pond 1	TM 252 830	Pass	Pass	Pass	Negative	0

SUMMARY

When Great Crested Newts (GCN); Triturus cristatus inhabit a pond, they deposit traces of their DNA in the water as evidence of their presence. By sampling the water, we can analyse these small environmental DNA (eDNA) traces to confirm GCN habitation, or establish GCN absence.

The water samples detailed below were submitted for eDNA analysis to the protocol stated in DEFRA WC1067 (Latest Amendments). Details on the sample submission form were used as the unique sample identity.

RESULTS INTERPRETATION

Lab Sample No.- When a kit is made it is given a unique sample number. When the pond samples have been taken and the kit has been received back in to the laboratory, this sample number is tracked throughout the laboratory.

Site Name- Information on the pond.

O/S Reference – Location/co-ordinates of pond.

SIC- Sample Integrity Check. Refers to quality of packaging, absence of tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to results errors. Inspection upon receipt of sample at the laboratory. To check if the Sample is of adequate integrity when received. Pass or Fail.

DC- Degradation Check. Analysis of the spiked DNA marker to see if there has been degradation of the kit since made in the laboratory to sampling to analysis. Pass or Fail.

IC- Inhibition Check- PCR inhibitors can cause false results. Inhibitors are analysed to check the quality of the result. Every effort is made to clean the sample pre-analysis however some inhibitors cannot be extracted. An unacceptable inhibition check will cause an indeterminate sample and must be sampled again.

Result- NEGATIVE means that GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as no evidence of GCN presence. POSITIVE means that GCN eDNA was found at or above the threshold level and the presence of GCN at this location at the time of sampling or in the recent past is confirmed. Positive or Negative.

Positive Replicates- To generate the results all of the tubes from each pond are combined to produce one eDNA extract. Then twelve separate analyses are undertaken. If one or more of these analyses are positive the pond is declared positive for the presence of GCN. It may be assumed that small fractions of positive analyses suggest low level presence but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive.

METHODOLOGY

The laboratory testing adheres to strict guidelines laid down in WC1067 Analytical and Methodological Development for Improved Surveillance of The Great Crested Newt, Version 1.1

The analysis is conducted in two phases. The sample first goes through an extraction process where all six tubes are pooled together to acquire as much eDNA as possible. The pooled sample is then tested via real time PCR (also called q-PCR). This process amplifies select part of DNA allowing it to be detected and measured in ‘real time’ as the analytical process develops. qPCR combines PCR amplification and detection into a single step. This eliminates the need to detect products using gel electrophoresis. With qPCR, fluorescent dyes specific to the target sequence are used to label PCR products during thermal cycling. The accumulation of fluorescent signals during the exponential phase of the reaction is measured for fast and objective data analysis. The point at which amplification begins (the Ct value) is an indicator of the quality of the sample. True positive

controls, negatives and blanks as well as spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared so they act as additional quality control measures.

The primers used in this process are specific to a part of mitochondrial DNA only found in GCN ensuring no DNA from other species present in the water is amplified. The unique sequence appropriate for GCN analysis is quoted in DEFRA WC 1067 and means there should be no detection of closely related species. We have tested our system exhaustively to ensure this is the case in our laboratory. We can offer eDNA analysis for most other species including other newts.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. Kits are manufactured by SureScreen Scientifics to strict quality procedures in a separate building and with separate staff, adopting best practice from WC1067 and WC1067 Appendix 5. Kits contain a ‘spiked’ DNA marker used as a quality control tracer (SureScreen patent pending) to ensure any DNA contained in the sampled water has not deteriorated in transit. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd also participate in Natural England’s proficiency testing scheme and we also carry out inter-laboratory checks on accuracy of results as part of our quality procedures.

Reported by: Troy Whyte **Approved by:** Derry Hickman

End Of Report

Appendix 7 – Survey Weather Data

GREAT CRESTED NEWT SURVEY - WEATHER AND METHOD RECORDS

Project Number: 3902,EC **Date:** 28/05/2019

Project Name: Briar Farm, Land Off Mendham Lane, Harleston, Norfolk, IP20 9DW

Surveyor Names:	Louisa Theeman (LT), Tom Cox (TC)
Licenced Supervisor:	Katie Linehan (KL)
Site Location (Grid Ref.):	625260 282920

Date	Time		Ambient Temp (°C)		Pond Temperature (°C)			Turbidity (%)			Bottle Traps Placed/Taken In		
	Start	End	Start	End	Pond 1	Pond 2	Pond 3	Pond 1	Pond 2	Pond 3	Pond 1	Pond 2	Pond 3
Survey 1 - 29-04-19 - Evening Visit	20:00	21:30	13	12	10.5	1.8	10.6	40	80	85	0	30	15
Survey 1 - 30-04-19 - Morning Visit	08:30	10:30	6	9	9.0	9.5	7.0	35	85	85	0	30	15
Survey 2 - 08-05-19 - Evening Visit	20:30	22:00	8	7	8.7	7.0	8.0	35	85	80	0	28	14
Survey 2 - 09-05-19 - Morning Visit	08:25	09:45	10	12	11.8	10.6	10.3	30	85	85	0	28	14
Survey 3 - 13-05-19 - Evening Visit	21:00	21:30	8	7	11.3	11.7	11.5	30	70	80	0	30	15
Survey 3 - 14-05-19 - Morning Visit	08:30	10:00	11	13	11.2	11.1	10.1	35	70	85	0	30	15
Survey 4 - 22-05-19 - Evening Visit	20.00	21.00	16	14	11.9	11.8	11.5	20	68	70	0	30	13
Survey 4 - 23-05-19 - Morning Visit	8.15	9.30	13	15	12.0	12.1	11.7	30	70	70	0	30	13

***Beaufort Scale**

Beaufort Scale		Wind Speed (mph)	Beaufort Scale		Wind Speed (mph)
0	Calm	0 -1	**4**	Moderate breeze	13 - 17
1	Light air	1 - 3	**5**	Fresh breeze	18 - 24
2	Light breeze	4 - 7	**6**	Strong breeze	25 - 30
3	Gentle breeze	8 - 12	**7**	Near gale	31 - 38

Appendix 8 – Amphibian Survey Results

GREAT CRESTED NEWT SURVEY - SPECIES COUNT

Project Number: 3902,EC **Date:** 15/05/2019

Project Name: Briar Farm, Land Off Mendham Lane, Harleston, Norfolk, IP20 9DW

Location (Grid Reference)	**625260 282920**
Surveyors (Including Initials)	**Louisa Theeman (LT), Tom Cox (TC)**
Licenced Supervisor	**Katie Linehan (KL)**
Pond Number	**1**

Notes: M=Males. F=Female, UA=Unknown Adult, J=Juvenile

			Species										
Date	**Visit No.**	**Surveyors (Initials only)**	**Great Crested Newt**					**Smooth Newt**					**Other Species of Note**
			MA	**FA**	**UA**	**J**	**Total Adult**	**MA**	**FA**	**UA**	**J**	**Total Adult**	
Torching													
29/04/2019	1	LT, TC					0			3		3	
08/05/2019	2	LT, TC					0			1		1	
13/05/2019	3	LT, TC					0					0	
22/05/2019	4	LT, TC					0					0	
Trapping													
29/04/2019	1	LT, TC					0					0	
08/05/2019	2	LT, TC					0					0	
13/05/2019	3	LT, TC					0					0	
22/05/2019	4	LT, TC					0					0	
Egg Search and Netting													
29/04/2019	1	LT, TC	No eggs recorded					No eggs recorded					
08/05/2019	2	LT, TC	No eggs recorded					No eggs recorded					
13/05/2019	3	LT, TC	No eggs recorded					No eggs recorded					
22/05/2019	4	LT, TC	No eggs recorded					No eggs recorded					
Peak Count of Adults Observed in a Single Visit			**Great Crested Newt**				**0**	**Smooth Newt**				**3**	

GREAT CRESTED NEWT SURVEY - SPECIES COUNT

Project Number: 3902,EC **Date:** 15/05/2019

Project Name: Briar Farm, Land Off Mendham Lane, Harleston, Norfolk, IP20 9DW

Location (Grid Reference)	**625260 282920**
Surveyors (Including Initials)	**Louisa Theeman (LT), Tom Cox (TC)**
Licenced Supervisor	**Katie Linehan (KL)**
Pond Number	**2**

Notes: M=Males. F=Female, UA=Unknown Adult, J=Juvenile

			Species										
Date	**Visit No.**	**Surveyors (Initials only)**	**Great Crested Newt**					**Smooth Newt**					**Other Species of Note**
			MA	**FA**	**UA**	**J**	**Total Adult**	**MA**	**FA**	**UA**	**J**	**Total Adult**	
Torching													
29/04/2019	1	LT, TC					0					0	
08/05/2019	2	LT, TC					0					0	
13/05/2019	3	LT, TC					0		1			1	
22/05/2019	4	LT, TC					0					0	
Trapping													
29/04/2019	1	LT, TC					0		1			1	
08/05/2019	2	LT, TC					0	2				2	
13/05/2019	3	LT, TC					0	4				4	
22/05/2019	4	LT, TC					0					0	
Egg Search and Netting													
29/04/2019	1	LT, TC	No eggs recorded					No eggs recorded					
08/05/2019	2	LT, TC	No eggs recorded					No eggs recorded					
13/05/2019	3	LT, TC	No eggs recorded					No eggs recorded					
22/05/2019	4	LT, TC	No eggs recorded					No eggs recorded					
Peak Count of Adults Observed in a Single Visit			**Great Crested Newt**				**0**	**Smooth Newt**				**4**	

GREAT CRESTED NEWT SURVEY - SPECIES COUNT

Project Number: 3902,EC **Date:** 15/05/2019

Project Name: Briar Farm, Land Off Mendham Lane, Harleston, Norfolk, IP20 9DW

Location (Grid Reference)	**625260 282920**
Surveyors (Including Initials)	**Louisa Theeman (LT), Tom Cox (TC)**
Licenced Supervisor	**Katie Linehan (KL)**
Pond Number	**3**

Notes: M=Males. F=Female, UA=Unknown Adult, J=Juvenile

			Species										
Date	**Visit No.**	**Surveyors (Initials only)**	**Great Crested Newt**					**Smooth Newt**					**Other Species of Note**
			MA	**FA**	**UA**	**J**	**Total Adult**	**MA**	**FA**	**UA**	**J**	**Total Adult**	
Torching													
29/04/2019	1	LT, TC					0					0	
08/05/2019	2	LT, TC					0					0	
13/05/2019	3	LT, TC					0					0	
22/05/2019	4	LT, TC					0					0	
Trapping													
29/04/2019	1	LT, TC					0	4	3			7	
08/05/2019	2	LT, TC					0					0	1 Common Frog
13/05/2019	3	LT, TC					0	19	5			24	
22/05/2019	4	LT, TC					0	3	0			3	
Egg Search and Netting													
29/04/2019	1	LT, TC	No eggs recorded					No eggs recorded					
08/05/2019	2	LT, TC	No eggs recorded					No eggs recorded					
13/05/2019	3	LT, TC	No eggs recorded					No eggs recorded					
22/05/2019	4	LT, TC	No eggs recorded					No eggs recorded					
Peak Count of Adults Observed in a Single Visit			**Great Crested Newt**				**0**	**Smooth Newt**				**24**	

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GEOSPHERE ENVIRONMENTAL

REPORT NUMBER:	3902,EC/REPTILE/P1/KL,GG/02-08-19/V1
SITE:	Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW
DATE:	02 August 2019

DOCUMENT CONTROL SHEET

Report Number:	3902,EC/REPTILE/P1/KL,GG/02-08-19/V1
Client:	M Scott Properties Ltd
Project Name:	Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW
Project Number:	3902,EC
Report Type:	Reptile Survey
Status:	Final
Date of Issue:	02 August 2019

Issued By:

Geosphere Environmental Ltd, Brightwell Barns, Ipswich Road, Brightwell, Suffolk, IP10 0BJ.
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Prepared By:	Reviewed By:	Authorised By:
Katie Linehan	George Green	Tom Powling
Technical Director	Graduate Ecologist	Director

REVISION RECORD

Revision	Date	Revision Details	Prepared By:	Admin

EXECUTIVE SUMMARY

Report Description		Geosphere Environmental Limited was commissioned by M Scott Properties Ltd to undertake a Reptile Survey of the land at Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW. The report relates to the proposed redevelopment of the site for residential use. Habitats onsite including hedgerows and semi-improved grassland field margins were confirmed suitable for reptiles within the Extended Phase 1 Habitat Survey dated December 2018 (ref. Error! Reference source not found.).
Methodology		The reptile survey has been carried out by suitably trained and experienced ecologists in order to establish the status of reptiles in habitats to be affected by proposed development at the site. A total of 230 artificial cover objects (ACOs) were distributed throughout the 27 hectare survey area. The ACOs were checked on seven occasions between 16 May 2019 and 26 June 2019.
Summary of Main Findings		No reptiles were recorded during the survey.
Conclusions		Throughout the seven surveys undertaken onsite, no reptiles were recorded. As such it is unlikely that reptiles will be a material consideration to development. Biological enhancements could be implemented to increase suitability, with plantation of tussocky grass species and log piles incorporated into the design of the scheme.

CONTENTS

TABLES

1. INTRODUCTION

Geosphere Environmental Ltd was commissioned by M Scott Properties Ltd, to undertake a Reptile Survey of the site at Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW

Any limitations and conditions pertaining to the report are stated within Appendix 1, with a full list of technical references provided within Appendix 2.

The report relates to the proposed development of the site, at present a finalised development plan is not available for the scheme however, the development is expected to fall within the survey area as shown in figure 1 below:

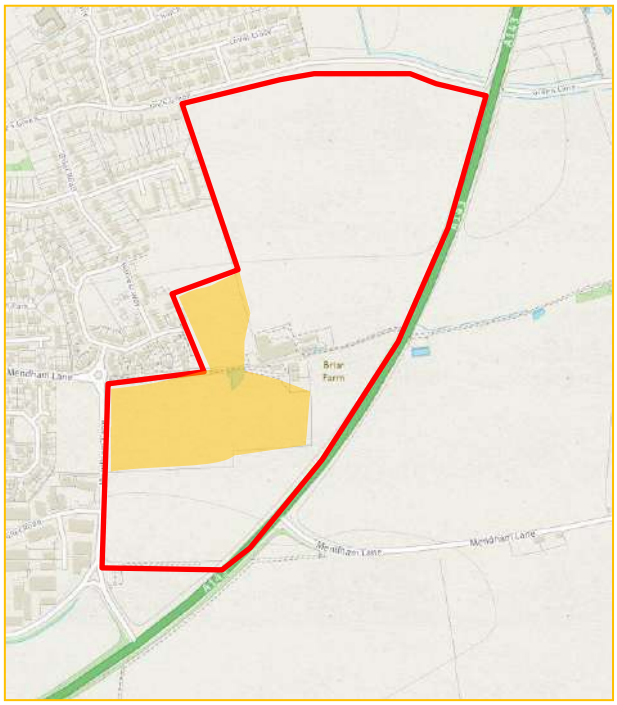


Figure 1 –The 27 ha Survey Area is outlined in red with the likely development zone highlighted orange

1.1 Aims

The aims of the survey were to:

- Identify the presence/absence of reptiles on the site;
- If present, to estimate a population size and species distribution;
- Evaluate the importance of habitats for reptiles onsite.

1.2 Background information

The habitats onsite were confirmed suitable for reptiles within the Geosphere Environmental Phase 1 Habitat Survey dated December 2018 (ref. Error! Reference source not found.). Biological records from Norfolk Biodiversity Information Service (NBIS) and Suffolk Biodiversity Information Service (SBIS) show Grass Snake and Slow-worm have been identified locally.

Areas of suitable habitat identified with the report includes hedgerows and field margins could provide habitat for reptiles. There is some connectivity to grazing fields to the north and as such there is potential for reptiles to be present onsite. As such a reptile survey has been undertaken to establish whether any reptiles are present onsite and inform any mitigation that would be necessary were reptiles confirmed.

1.3 Current UK Legislation

The four common British reptiles, Common Lizard (*Zootoca vivipara*), Slow-worm (*Anguis fragilis*), Grass Snake (*Natrix natrix*), and Adder (*Vipera berus*) are protected under the Wildlife and Countryside Act (WCA) 1981 (part of Section 9(1) and all of Section 9(5) apply). Meaning they are protected against intentionally killing and injuring (but not 'taking'), and against sale. They are also listed on the Biodiversity Action Plan Priority List.

Sand Lizard (*Lacerta agilis*) and Smooth Snake (*Coronella austriaca*) are fully protected under Section 9 of the WCA and are classified as European protected species under the Conservation of Habitats and Species Regulations 2010 under schedule 2 Annex IV. The protection afforded is given in Regulations 40 and 43.

2. TECHNICAL APPROACH

2.1 Reptile Survey

The reptile survey was undertaken by Geosphere Environmental in areas of potentially suitable reptile habitat in accordance with guidance published by JNCC (ref. **R.1**) and Froglife (ref. **R.3**) for survey methodology and effort.

The survey was undertaken by Tom Cox (Ecologist), Louisa Theeman (Graduate Ecologist), George Green (Graduate Ecologist) and George Hood (Assistant Ecologist) who are suitably qualified ecologists in order to establish the status of reptiles to be affected by the proposed development at the site.

The report of the survey and recommendations has been prepared to inform a planning application in accordance with the key principles of the Ministry of Housing, Communities and Local Government (MHCLG) (July 2018) National Planning Policy Framework (NPPF) (ref. **R.4**). Conclusions and recommendations for further works are given to comply with current legislation and guidance.

2.2 Methodology

Froglife's method for assessing reptile population sizes is based upon the peak number of adult reptiles seen using artificial cover objects (ACOs) on a site (ref. **R.3**). This methodology combined with a visual search of existing natural refuge was adopted during the survey.

The survey area covers a total area of approximately 27 hectares (ha). The majority of this habitat is arable land, considered unsuitable for reptiles and as such the field margins and hedgerow boundaries were targeted. A total of 230 ACOs (0.5m^2 roofing felt mats) were placed in suitable habitat and in positions that would receive sunlight during the course of the day. The locations are shown on the Reptile Survey: ACO Locations plan, Drawing ref. 3902,EC/001/Rev 0, shows the positions of ACOs placed and is attached in Appendix 3.

Visual transect and refuge searches were undertaken on seven visits between 16 May 2019 and 27 June 2019, choosing optimal weather in which reptiles would be active or using the ACOs.

The reptile population size has been estimated based upon the peak number of adult reptiles observed during surveys as detailed by Froglife, (ref **R.3**). This methodology is based upon an average ACO placement of 5 to 10 per hectare (ha) and provides a rough estimate only, as it is difficult to get a more accurate idea of population size on a site. without long term study and analysis.

2.3 Ecological Impact Assessment for Reptiles

The CIEEM guidance on Ecological Impact Assessment (ref. **R.5**) assesses the nature conservation value within a geographical context. To attain each level, the reptile resource or one of the features, (species population or assemblage of species), should meet the criteria set out in Table 1 below:

Table 1 – Assessment of Conservation Value of Reptile Species

Geographical Frame of Reference	Brief Description
International, National and Regional	Widespread reptiles in Britain do not meet international or national criteria for conservation, as they are common in Europe and although declining nationally, there is not a marked national decline in species or distribution across the UK. The four widespread reptiles in Britain are common across England so populations encountered do not meet criteria for regional importance.
County	Species listed as priority species in the UKBAP, which regularly occurs in county important numbers. Species present in county important numbers (>1% of county population). Sustainable populations of a species that is rare or scarce within a county. A site designated for its county important assemblage of reptiles.
District	Species present in numbers just under county importance (<1% of county population). Sustainable populations of a species that is rare or scarce within the locality.
Local	Species regularly occurring in locally sustainable populations. Areas of habitat with good or high populations of reptiles encountered within a site boundary.
Site	Low populations of common reptiles within a site boundary.

3. REPTILE SURVEY

3.1 Results

A total of seven surveys were undertaken within the site and the weather conditions documented for each survey is detailed in Table 2 below:

Table 2 – Weather Conditions During Survey

Date	Time		Ambient Temp (°C)		Wind Speed* (Beaufort)	Cloud Cover (%)	General Weather Observation
	Start	End	Start	End			
16/05/2019	18.30	19.30	14	13	3	50	dry
22/05/2019	19.00	20.00	18	17	0	10	dry
30/05/2019	10.20	11.50	17	18	4	80	dry
05/06/2019	10.50	11.40	17	17	2	40	dry
20/06/2019	19.20	20.20	16	16	1	25	dry
24/06/2019	20.10	20.30	19	19	1	20	dry
27/06/2019	19.55	20.40	16	14	2	15	dry

*Beaufort Scale

Beaufort Scale		Wind Speed (mph)	Beaufort Scale		Wind Speed (mph)
0	Calm	0 -1	**4**	Moderate breeze	13 - 17
1	Light air	1 - 3	**5**	Fresh breeze	18 - 24
2	Light breeze	4 - 7	**6**	Strong breeze	25 - 30
3	Gentle breeze	8 - 12	**7**	Near gale	31 - 38

Throughout the seven visits conducted, no reptiles were encountered within the site boundary.

3.2 Enhancement Opportunities

Although reptiles have not been confirmed, the site still has potential for the proposed development to enhance the existing quality of the habitat. The construction of log piles within the development would allow for refuge and hibernation. A guide to the creation of appropriate log piles is included in Appendix 4.

Open space could be enhanced with a tussocky grass seed mix to provide additional terrestrial habitat to allow for reptiles in the wider area to move onto the site post development. Specifically, field margins should be enhanced through widening and seeding with a tussock grassland mix to provide additional habitat and maintain a connective corridor around the site. An example grass seed mixture is attached as Appendix 5.

These enhancements would improve the habitat for reptiles, and other species such as invertebrates, which are a common prey species for reptiles.

4. CONCLUSIONS

Throughout the seven surveys undertaken onsite, no reptiles were recorded. As such it is unlikely that reptiles will be a material consideration to development.

The enhancements suggested within this report, including the incorporation of log piles and inclusion of wider field margins seeded with a tussock grass mix would likely result in a positive impact on reptiles in the local area and should be incorporated in the design of the scheme.

APPENDICES

APPENDIX 1 – REPORT LIMITATIONS AND CONDITIONS

General Limitations and Exceptions

This report was prepared solely for our Client for the stated purposes only and is not intended to be relied on by any other party or for any other use. No extended duty of care to any third party is implied or offered.

Geosphere Environmental Ltd does not purport to provide specialist legal advice.

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 upon current legislation in force at that time.

Ecology Limitations and Exceptions

Any limitations associated with the report will be stated. The consequences of any limitations, findings and/or recommendations in the report are made clear in line with CIEEM (2013) 'Guidelines for Preliminary Ecological Appraisal' (GPEA) and BSI (2013) BS 42020:2013 Biodiversity – 'Code of practice for planning and development'.

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.

The wildlife and habitats present on any site are subject to change over time. Surveys of this kind can have limited validity, with the possibility of behaviour patterns and territory boundaries varying over time, due to the dynamics of adjacent populations.

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, re-appraisal.

It should be noted that whilst every effort has been made to provide a comprehensive description of the site, no investigation can ensure the complete characterisation of the natural environment.

The scoping survey does not assess the presence or absence of a species, but is used to assess the potential for habitat to support them. Additional surveys may be recommended if, on the basis of the preliminary assessment or during subsequent surveys, it is considered reasonably likely that protected species may be present.

This survey does not constitute an invasive species survey and should not be treated as such.

Owing to seasonal variances and prevailing weather, conditions may sometimes be sub-optimal for surveying and this may delay or disrupt planned survey programmes. If applicable, full details are given in the report.

Geosphere Environmental Ltd may not be aware of information that could be held by other organisations or individuals, and it is always possible for features of nature conservation interest to be unrecorded during surveys.

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

APPENDIX 2 – REFERENCES

R.1. Preliminary Ecological Appraisal, Geosphere Environmental, 3495,EC,AR,DS/PEA/ZK,RF,KL/13-12-18/V2

R.2. Gent T., Gibson S. (2003) Herpetofauna Workers Manual. JNCC.

R.3. Froglife (1999). Froglife Advice Sheet 10: Reptile Survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife, Halesworth.

R.4. Ministry of Housing, Communities and Local Government (MHCLG) (July 2018) National Planning Policy Framework (NPPF).

R.5. CIEEM, (2016). Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland (Second edition dated January 2016).

APPENDIX 3 – DRAWINGS

Reptile Survey: ACO Location Plan – Drawing ref. 3902,EC/001/Rev 0

GEOSPHERE ENVIRONMENTAL

LEGEND

Survey Area

ACO Locations

SOURCE

© OpenStreetMap contributors

PROJECT

Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW

TITLE

Reptile Survey: ACO Location

DRAWING NUMBER

3902,EC/001/Rev0

SCALE

As marked

DATE

23/04/2019

DRAWN BY

GG

CHECKED BY

KL

N

APPENDIX 4 – LOG PILE AND LOG PYRAMID EXAMPLE

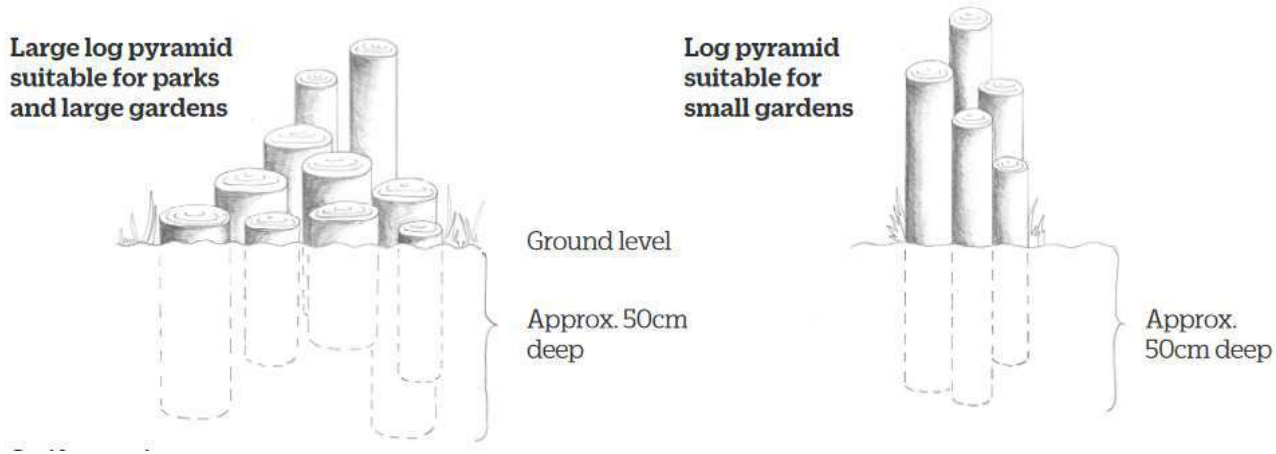
LOG PYRAMID AND LOG PILE GUIDANCE

1. LOG PYRAMID

Establishing the Log Pyramid

Where space is limited and log piles are deemed unsuitable, log pyramids can be created as shown below.

- Drill holes into some of the logs. Drill holes to various depths.
- Dig holes onto the ground ranging from 48cm deep to 60cm deep to give the pyramid shape. The final construction should be as shown below:



2. STUMPERY

Taken and adapted from Buglife (https://www.buglife.org.uk/activities-for-you/wildlife-gardening/create-your-own-dead-wood-habitats)

Stumpery creation involves replicating a forest floor using a mix of different sized wood stumps, logs and even driftwood. They are similar to a rockery, but made with parts of dead trees such as stumps and logs.

Dig a hole in the ground. 'Plant' your logs in it, orientated vertically, so that half the log is in the hole. Pack soil in the gaps of the hole to bury the bases of the logs. This will support species like Stag beetle that like damp submerged dead wood. Interplant with ferns and other shade loving plants and bulbs. Stumperies are strongly recommended if you live in Stag beetle hotspots such as the New Forest, Home Counties and East Suffolk

GEOSPHERE ENVIRONMENTAL

REFERENCE
Log pyramid drawing copyright of https://ptes.org/wp-content/uploads/2016/11/Build-a-log-pile-for-stag-beetles.pdf

TITLE
Log Pyramid and Log Pile Guidance

DATE
02/08/2019

3. LOG PILES

Resourcing Logs

Try to avoid taking logs from woods and hedges as you will be removing the resource from its natural environment, along with any associated flora or fauna. A local tree surgeon may be able to supply you with some logs. Alternatively sourcing logs from friends or neighbour who have had recent tree work is a viable way of sourcing the raw materials required.

Which Wood to Use

Logs at least 100mm thick (4 ins) with the bark still attached provide the best wood. Hard wood trees such as ash, oak and beech are particularly good. Birch logs can look particularly attractive.

Be careful of freshly cut willow and poplar logs, as these can easily re-sprout if left lying on the ground.

Establishing the Log Pile

Leaving woody cuttings from trees, shrubs and herbaceous plants in piles within a shrub bed is an ideal way of attracting invertebrate to site. The damp conditions behind peeling bark are very inviting for woodlice, spiders and beetles, while butterflies and ladybirds take up residence in the drier parts over winter.

It is best to not cut the wood into small pieces. Leave it in direct contact with the ground, in compact piles to maintain humidity. Larger diameter pieces are of most value, but even small twigs and branches should not be discounted.

Bury the lower logs into the soil a few centimetres. This keeps them damp and the resident creatures happy.

GEOSPHERE ENVIRONMENTAL

REFERENCE
Log pyramid drawing copyright of https://ptes.org/wp-content/uploads/2016/11/Build-a-log-pile-for-stag-beetles.pdf

TITLE
Log Pyramid and Log Pile Guidance

DATE
02/08/2019

APPENDIX 5 – EXAMPLE GRASS SEED MIX

EM10 – TUSSOCK MIXTURE

The lists of plants below are taken from Emorsgate Seeds (ref.**1**), a company dedicated to the promotion of using wild plant seeds. These plants are grown on their sites and the seeds collected, which shows they are from a reputable source, rather than illegally taken from the wild.

EM10 – Tussock Mixture has been devised to create areas of tussocky grassland that, once established, require little or no maintenance. This grassland type can form a good habitat for insects, small mammals, birds, amphibians and reptiles, providing nesting sites during spring, food during summer and autumn, and shelter during winter.

NATIVE WILDFLOWERS

Common Name	Latin Name	Percentage
Yarrow	*Achillea millefolium*	0.5
Agrimony	*Agrimonia eupatoria*	1.5
Lesser Burdock	*Arctium minus*	1
Common Knapweed	*Centaurea nigra*	2.5
Greater Knapweed	*Centaurea scabiosa*	2
Wild Carrot	*Daucus carota*	2
Wild Teasel	*Dipsacus fullonum*	1
Hedge Bedstraw	*Galium album - (Galium mollugo)*	1
Meadow Cranesbill	*Geranium pratense*	0.2
Oxeye Daisy	*Leucanthemum vulgare*	0.5
Wild Parsnip	*Pastinaca sativa*	1
Ribwort Plantain	*Plantago lanceolata*	0.7
Common Fleabane	*Pulicaria dysenterica*	0.1
Red Campion	*Silene dioica*	2
Upright Hedge-parsley	*Torilis japonica*	2
Common Vetch	*Vicia sativa ssp. segetalis*	2

20% representative mix

NATIVE GRASSES

Common Name	Latin Name	Percentage
Meadow Foxtail (w)	*Alopecurus pratensis*	2
Crested Dogstail	*Cynosurus cristatus*	20
Cocksfoot (w)	*Dactylis glomerata*	16
Tufted Hair-grass (w)	*Deschampsia cespitosa*	2
Strong-creeping Red-fescue	*Festuca rubra*	20
Yorkshire Fog	*Holcus lanatus*	2
Tall Fescue (w)	*Schedonorus arundinaceus - (Festuca arundinacea)*	10
Meadow Fescue (w)	*Schedonorus pratensis - (Festuca pratensis)*	8

80% representative mix

GEOSPHERE ENVIRONMENTAL

REFERENCES

1. https://wildseed.co.uk/mixtures/view/10

TITLE
EM10 – Tussock Mixture

DATE
02/08/2019

EM10 – TUSSOCK MIXTURE

GEOSPHERE ENVIRONMENTAL

GROUND PREPARATION

To prepare a seed bed first remove weeds using repeated cultivation or a herbicide. Then plough or dig to bury the surface vegetation, harrow or rake to produce a medium tilth, and roll, or tread, to produce a firm surface.

SOWING

Seed is best sown in the autumn or spring but can be sown at other times of the year if there is sufficient warmth and moisture. The seed must be surface sown and can be applied by machine or broadcast by hand. To get an even distribution and avoid running out divide the seed into two or more parts and sow in overlapping sections. Do not incorporate or cover the seed but firm in with a roll, or by treading, to give good soil/seed contact.

AFTERCARE

First Year

Most sown meadow wild flower and grass species are perennial; they will be slow to germinate and grow and will not usually flower in their first growing season. There will often be a flush of annual weeds from the soil in the first growing season which may grow up and obscure the meadow seedlings beneath. This annual weed growth is easily controlled by topping or mowing.

Mow newly sown meadows regularly throughout the first year of establishment to a height of 40-60mm, removing cuttings if dense. This will control annual weeds and help maintain balance between faster growing grasses and slower developing wild flowers.

Avoid cutting in the spring and early summer if the mixture has been sown with a nurse cover of cornfield annuals, or is autumn sown and contains Yellow Rattle. These sown annuals should be allowed to flower, then in mid-summer cut back and the cut vegetation removed. It is important to cut back cornfield annuals before they die back, set seed or collapse: this cut will reveal the developing meadow mixture and give it the space it needs to develop.

Carefully dig out or spot treat any residual perennial weeds such as docks.

Following Years

Once established tussocky grassland requires minimal maintenance.

Unwanted perennial weeds (docks, thistles) may need control by occasional spot treatment with a herbicide. To control scrub and bramble development, tussocky areas may need cutting every 2-3 years between October and February. For wildlife this cutting is best done on a rotational basis so that no more than half the area is cut in any one year leaving part as an undisturbed refuge.

TITLE
EM10 – Tussock Mixture

DATE
02/08/2019

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Ec Ecology.

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Kw Knotweed.

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GEOSPHERE ENVIRONMENTAL

REPORT NUMBER:	3902,EC/ARB/TC,RF,KL/28-06-19/V1
SITE:	Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW
DATE:	28/06/2019

DOCUMENT CONTROL SHEET

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Project Name:	Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW
Project Number:	3902,EC
Report Type:	Arboricultural Survey
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REVISION RECORD

Revision	Date	Revision Details	Prepared By:	Admin

Executive Summary

Report Description		Geosphere Environmental Limited was commissioned by M Scott Properties Ltd to undertake an Arboricultural Survey of the land at Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW. The site is located at National Grid Reference TM 25260 82920. The report relates to the proposed redevelopment of the site for residential use. A Sketch Masterplan has been provided as drawing ref. 7055/SK02A and is included within Appendix 6. The site covers an area of approximately 27.13 hectares (ha). This and the immediate surrounding area were surveyed.
Summary of Main Findings		The Tree Constraints Plan Drawing ref. 3902,EC/007/Rev 0 in Appendix 6, shows the locations of all the trees surveyed with the canopy and root protection area plotted on the plan. A total of fifty-two trees and nineteen groups of trees were surveyed. Thirteen trees and one group of trees were classed as category A trees. Five trees and five groups of trees were classified as category B trees. Thirty-four trees and thirteen groups of trees were classified as category C trees. No trees or groups of trees were categorised as category U trees. The BGS digital mapping indicated that the site comprised of a bedrock layer of Norwich Crag Formation – Sand, with a recorded superficial layer of Lowestoft Formation – Diamicton. These soils, potentially contain cohesive materials which could indicate a risk of shrink/ swell that should be considered during foundation design. An enquiry was made with South Norfolk Council on 19 June 2019 requesting information about Tree Preservation Orders and Conservation Areas. South Norfolk Council replied on 19 June 2019 and confirmed that there are no Tree Preservation Orders onsite and the site is not located within a Conservation Area.
Preliminary Implications Assessment		The category A trees should be retained as part of any new development on the site. These trees are predominantly located around the site margins or offsite so this should be possible for them to remain in place, however, the root protection areas extend some distance into the site, and tree protection measures will be required to ensure the trees are not damaged during the demolition/construction process.

		The Category B trees, should also be retained where possible. The root protection areas of these trees will have to be considered when designing the proposed development to avoid impacting as many trees as possible. Some of the Category C trees will need to be removed to facilitate development. If possible, these trees could be retained as part of the proposed residential gardens or open spaces. T38, T42, T43, T45, T46, T48, T51, T52 and G16, are Category A trees which are not in the boundary of the site, according to the current proposal these trees are to be retained, however they are situated in close proximity to roads, therefore tree protection measures may be required to ensure these trees are not damaged.

CONTENTS

APPENDICES

1. INTRODUCTION

1.1 General

Geosphere Environmental Limited was commissioned by M Scott Properties Ltd to undertake an Arboricultural Survey of the land at Briar Farm, Land off Mendham Lane, Harleston, Norfolk, IP20 9DW. The site covers an approximate area of 27 hectares (ha) and is located at National Grid reference (NGR) 625260 282920.

The site boundary is shown on Figure 1 below:

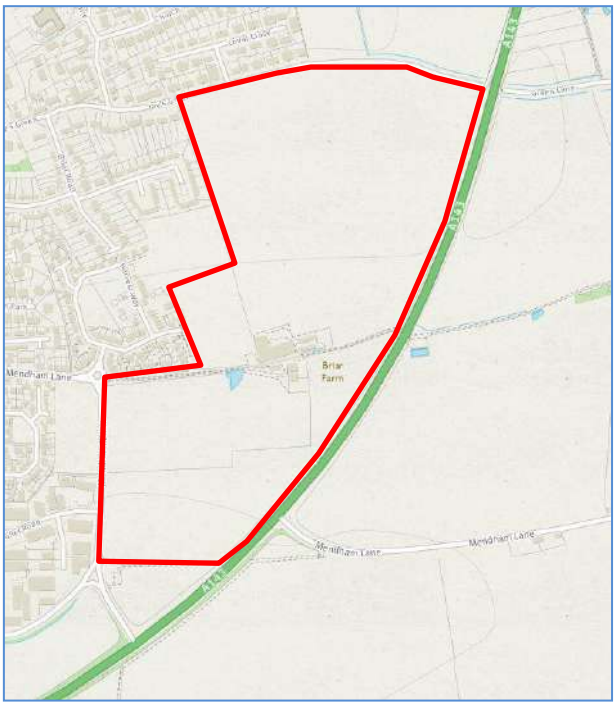


Figure 1 –The site boundary is outlined in red.

1.2 Aims

This report has been prepared to support a planning application and provides baseline data for an arboricultural assessment of the site and identifies the tree constraints and root protection areas of trees on or near the site which may be affected by future development.

2. TECHNICAL APPROACH

2.1 Arboricultural Survey

The arboricultural survey has been undertaken in general accordance with BS 5837:2012 (ref. **R.1**). The recommendations for tree remediation works are in accordance with current legislation and guidance, including BS 3998: 2010, 'Tree work – Recommendations' (ref. **R.2**).

The data collected during this survey is based entirely upon arboricultural grounds and reflects the condition of the trees on the day the survey was undertaken. The locations of the trees were detailed on a topographical survey provided by the client. All locations of trees are assumed to be correct. Any trees not noted on the topographical plan have been added where appropriate during the tree survey.

Scientific names and common names of plant species identified are as they appear in Stace (ref. **R.3**). For species not listed in Stace, scientific and common and names were taken from Johnson and More (ref. **R.4**).

2.2 Soil Assessment

A desk-based assessment of the soil was undertaken to determine potential for volume changing soils onsite, using BGS mapping (ref. **R.5**).

2.3 Site Specific Limitations

Trees were surveyed without undertaking vegetation clearance.

Some trees were covered with ivy or located within dense hedgerows which limited the visibility of the stem size and structure. This may have increased the margin of error when recording measurements and assessing the quality of the trees. In cases where the trees were obscured or inaccessible, the parameters which could not be accurately measured were estimated as per BS 5837: 2012 (ref. **R.1**).

3. TREE SURVEY

The survey was undertaken by an experienced surveyor from Geosphere Environmental Ltd on 5 June 2019 to record data relevant to the assessment of the trees on and adjacent to the site.

3.1 Site Description

The site comprises of three large arable fields with a thick intact hedgerow separating the site from the A143 to the east. There is also a band of trees along the north and north east boundaries. The two fields to the south are separated by hedgerows with trees and another tree belt exists to the south of the site.

To the north and west of the site is residential development, to the south are allotments beyond which is arable farmland and to the east is the A143 road, followed by arable farmland.

3.2 Tree Survey Results

The results of the tree survey are shown within the Tree Survey Schedule in Appendix 3. A full description of the surveyed parameters is included in the Survey Schedule Descriptions in Appendix 4. A key to the scientific names used is attached within Appendix 5. The results are summarised below:

- A total of fifty-two trees and nineteen groups of trees were surveyed;
- Thirteen trees and one group of trees were classed as Category A trees. This is the highest classification available under BS 5837:2012. These trees are of high quality and confer particular visual importance on the landscape. These trees are likely to be required to be protected during the development;
- Five trees and five groups of trees were classified as Category B trees. These trees are of moderate quality and confer considerable importance on the landscape. These trees should be retained where possible during development;
- Thirty-four trees and thirteen groups of trees were classified as Category C trees. These trees are of low quality and confer lower levels of benefits to the landscape. The local authority may find it acceptable to remove these trees during development;
- No trees were categorised as Category U trees. These trees are of poor condition and are unlikely to provide significant value to the landscape for more than ten years.

3.3 Tree Constraints Plan

A Tree Constraints Plan Drawing referenced 3902,EC/007/Rev 0 has been prepared for the site and is attached within Appendix 6.

The Tree Constraints Plan describes the constraints that the trees may place on the development. The tree canopy and root protection area have been calculated using the stem diameter as per BS 5837:2012 (ref. **R.1**).

3.4 Soil Assessment

The BGS digital mapping (ref. **R.5**) indicated that the site comprised of a bedrock layer of Norwich Crag Formation – Sand, with a recorded superficial layer of Lowestoft Formation - Diamicton. These soils potentially contain cohesive materials and therefore there is a risk of shrink swell soil present onsite. A further site investigation should be undertaken to confirm the findings of the BGS digital maps.

The combination of shrinkable soils and trees, hedgerows or shrubs represents a hazard to structures that requires special consideration. Trees and hedgerows can take moisture out of the ground. In cohesive soils this can cause volume change resulting in ground movement and damage to building foundations.

In order to minimise the risk, foundations should be designed in accordance to NHBC Standards Chapter 4.2 Building near Trees, (ref. **R.6**).

3.5 Permissions and Council Restrictions

An enquiry was made with South Norfolk Council on 19 June 2019 requesting information about Tree Preservation Orders and Conservation Areas. South Norfolk Council replied on 19 June 2019 and confirmed that there are no Tree Preservation Orders onsite and the site is not located within a Conservation Area.

It is advisable to contact the local authority regarding Tree Preservation Orders and Conservation Areas before any tree works are carried out, as new Tree Preservation Orders can be made subsequent to the issuing of this report.

4. PRELIMINARY ARBORICULTURAL IMPLICATIONS ASSESSMENT

4.1 Proposed Development

A proposed Sketch Masterplan Drawing ref. 7055/SK02A has been supplied by the client and is included within Appendix 6. The proposed development comprises of residential housing with associated roads and access with a large open space to the east. There is potential for planting within the development scheme.

4.2 Priorities for Retention

The category A trees should be retained as part of any new development on the site. The trees located around the site margins could remain in place, however, the root protection areas extend some distance into the site, and tree protection measures will be required to ensure the trees are not damaged during the demolition/construction process.

T38, T42, T43, T45, T46, T48, T51, T52 and G16, are Category A trees which are not in the boundary of the site, these trees are to be retained within the current proposal, however they are situated in close proximity to roads, therefore tree protection measures may be required to ensure these trees are not damaged.

The Category B trees, should also be retained where possible. The root protection areas of these trees will have to be considered when designing the proposed development to avoid impacting as many trees as possible.

Some of the Category C trees, will need to be removed to facilitate development. If possible, these trees could be retained as part of the proposed residential gardens or open spaces.

4.3 Tree Management

Standard avoidance measures reduce the impact of development on trees as required by BS 5837:2012, (ref. **R.1**), is simplified as follows for any development type:

- A Consultant Project Arboriculturalist should be appointed to oversee the arboricultural aspects of the development project;
- The Root Protection Areas and above ground structures for retained trees must be protected during construction work with barriers as prescribed by BS 5837:2012, (ref.**R.1**). The locations of barriers should be determined once a finalised development plan has been produced;
- Once the protection areas have been finalised and the protection barriers have been erected, then these areas are to be considered construction exclusion zones. Any work within these zones will need prior agreement with the Consultant Project Arboriculturalist;
- Changes to the shape of the canopy of retained trees must be agreed with the Consultant Project Arboriculturalist before any works are undertaken, however all construction within the canopy extent

of a tree is best avoided to avoid potential damage to future buildings and to avoid recurring pruning regimes;

- Tree planting should form part of the soft landscaping onsite to offset any trees which are removed during the development process. An appropriate after care scheme should be implemented to ensure the newly planted trees reach maturity.

4.3.1 Tree Pruning

The site contains a number of trees in various stages of maturity, containing deadwood and fungal infections, usual for trees of their age. Any hazards should be removed prior to commencement of construction.

The canopies of the trees are likely to require pruning to accommodate new construction. Once the layout of the development area has been finalised, a tree management plan should be completed advising on remedial action required for health and safety and facilitation pruning for construction needs.

All tree work is to be carried out in general accordance with BS 3998:2010 Tree Work – Recommendations (ref. **R.2**) by a professional and specialist arboricultural contractor, who carries the appropriate experience and insurance cover.

4.3.2 Tree Planting

The Sketch Masterplan in Appendix 6, shows that there is opportunity for new tree planting within the proposed scheme. Trees should be replanted on at least a 1:1 ratio for those removed.

5. RECOMMENDATIONS

The Tree Constraints Plan Drawing ref. 3902,EC/007/Rev 0 in Appendix 6, should be consulted to ensure that the constraints posed by the trees are taken into account when designing the proposed development. For example, retained trees could be incorporated within the proposed residential gardens or within proposed public open space.

Further arboricultural planning is required once the development plans have been finalised. The formal planning process with regards to trees will require the following additional information:

- A Tree Retention Plan should be designated once the layout of the development area has been finalised and a final proposed development plan is available. This will show the locations of trees which will remain throughout the development works, and the trees which will be removed prior to the commencement of development;
- A Tree Protection Plan should be designed based upon the Tree Retention Plan. This will include finalised locations of protective barriers, construction exclusion zones and any other protection measures that trees will require prior to commencement of construction;
- An Arboricultural Impact Assessment, Arboricultural Method Statement, and Tree Management Plan should be supplied with the Tree Protection Plan. A Consultant Project Arboriculturalist should be appointed by the developer, to ensure all the arboricultural aspects of the redevelopment project are taken into account, from the planning stage onwards.

APPENDICES

Appendix 1 – Report Limitations and Conditions

General Limitations and Exceptions

This report was prepared solely for our Client for the stated purposes only and is not intended to be relied on by any other party or for any other use. No extended duty of care to any third party is implied or offered.

Geosphere Environmental Ltd does not purport to provide specialist legal advice.

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 upon current legislation in force at that time.

Arboricultural Limitations and Exceptions

This report is prepared and written in the context 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, re-appraisal.

The trees were not climbed but surveyed from ground level. The survey recorded any defects which were observed, but a full tree health and safety inspection for the site is beyond the scope of this survey.

Any physical changes that happen to the site after the tree survey was undertaken have the potential to invalidate or change the findings of this report. Therefore, the consultant shall not be responsible for any event that may happen after the survey was undertaken due to factors that were not apparent at the time.

Any hazards that were visible on the day of the survey have been noted in the tree management recommendations section of the Tree Survey Schedule. However, this report should not be considered a substitute for a tree risk assessment or management plan, which would be required to minimise the risk and liability associated with the trees found onsite.

Appendix 2 – References

R.1. BSI (2012). BS 5837:2012 Trees in relation to design, demolition and constructions- Recommendations.

R.2. BSI (2010). BS 3998:2010 Trees work- Recommendations.

R.3. Stace, C. A. (2010). New Flora of the British Isles (third edition), Cambridge University Press.

R.4. Johnson and More (2006). Tree Guide, Harper Collins Publishers Ltd.

R.5. British Geological Survey (accessed 19 June 2019) Geology of Britain Viewer website: http://mapapps.bgs.ac.uk/geologyofbritain/home.html.

R.6. National House-Building Council, Standards, Chapter 4.2, 2003 'Building Near Trees'.

R.7. BSI (2014). BS 8545:2014 Trees: from nursery to independence in the landscape – Recommendations.

Appendix 3 – Tree Survey Schedule

TREE SURVEY SCHEDULE

Project Number: 3902,EC

Project Name: Briar Farm, Land Off Mendham Lane, Harleston, Norfolk, IP20 **Date:** 28/06/2019

1	2	3	4	5	6				7	8	9	10	11	12	13	14	15	16
Tree No.	Species	Height (m)	Stem Diamenter (mm)	No. of Stems	Branch Spread (m)				First Branch Height (m)	Canopy Height (m)	Life Stage	Physiological Conditions	Stuctural Conditions	Remaining Contribution (years)	Category Grading	RPA (m2)	RPA Radius (m)	Tree Work Recommendations / Comments
					N	E	S	W										
# denotes estimated values due to lack of access																		
T1	Pedunculate Oak	9	270	1	2.5	2.5	2.5	2.5	2	2.5	SM	G	G	20+	C	33.0	3.2	
T2	Pedunculate Oak #	14	700	1	4	4	4	4	2.5	6	EM	G	G	40+	B	221.7	8.4	
T3	Horse Chestnut #	3	150	1	1.5	1.5	1.5	1.5	0.5	2	Y	G	G	20+	C	10.2	1.8	
T4	Sycamore #	3	150	1	1.5	1.5	1.5	1.5	0.5	2	Y	G	G	20+	C	10.2	1.8	
T5	Pedunculate Oak #	20	1000	1	7	7	7	7	6	8	M	G	G	40+	A	452.4	12.0	
T6	Horse Chestnut #	4	150	1	2	2	2	2	1	2	Y	G	G	20+	C	10.2	1.8	
T7	Horse Chestnut #	4	150	1	2	2	2	2	1	2	Y	G	G	20+	C	10.2	1.8	
T8	Pedunculate Oak #	4	150	1	2	2	2	2	1	2	Y	G	G	20+	C	10.2	1.8	
T9	Pedunculate Oak #	16	800	1	5	5	5	5	4	14	M	G	G	40+	A	289.5	9.6	
T10	Ash #	10	250	1	2	2	2	2	2	4	SM	G	G	20+	C	28.3	3.0	
T11	White Poplar #	8	250	1	2	2	2	2	2	2	SM	G	G	20+	C	28.3	3.0	
T12	Sycamore #	10	250	1	2.5	2.5	2.5	2.5	2	4	SM	G	G	20+	C	28.3	3.0	
T13	Pedunculate Oak #	16	850	1	6	6	6	6	6	8	M	G	G	20+	A	326.9	10.2	
T14	Pedunculate Oak	12	860	1	5	5	5	5	5	5	M	G	G	40+	A	334.6	10.3	
T15	Pedunculate Oak	11	860	1	5.5	5.5	5.5	5.5	5	5	M	G	G	40+	A	334.6	10.3	
T16	Pedunculate Oak	6	260	1	2	2	2	2	2	2	SM	G	G	20+	C	30.6	3.1	

TREE SURVEY SCHEDULE

Project Number: 3902,EC

Project Name: Briar Farm, Land Off Mendham Lane, Harleston, Norfolk, IP20 **Date:** 28/06/2019

1	2	3	4	5	6				7	8	9	10	11	12	13	14	15	16
Tree No.	Species	Height (m)	Stem Diamenter (mm)	No. of Stems	Branch Spread (m)				First Branch Height (m)	Canopy Height (m)	Life Stage	Physiological Conditions	Stuctural Conditions	Remaining Contribution (years)	Category Grading	RPA (m2)	RPA Radius (m)	Tree Work Recommendations / Comments
					N	E	S	W										
# denotes estimated values due to lack of access																		
T17	Horse Chestnut	3	110	1	1.5	1.5	1.5	1.5	1	1	SM	G	G	20+	C	5.5	1.3	
T18	Silver Birch	8	290	1	1.5	1.5	1.5	1.5	1	1	SM	G	G	20+	C	38.0	3.5	
T19	Sweetchestnut	4	100	1	1.5	1.5	1.5	1.5	0.5	2	SM	G	G	20+	C	4.5	1.2	
T20	Pedunculate Oak	6	90	1	2	2	2	2	0.5	0.5	SM	G	G	20+	C	3.7	1.1	
T21	Sweetchestnut	8	290	1	2.5	2.5	2.5	2.5	1	1	SM	G	G	20+	C	38.0	3.5	
T22	Aspen	10	410	1	3	3	3	3	1	1	SM	G	G	20+	C	76.0	4.9	
T23	Walnut	10	380	1	3	3	3	3	1	1	SM	G	G	20+	C	65.3	4.6	
T24	Walnut	10	350	1	3	3	3	3	1	1	SM	G	G	20+	C	55.4	4.2	
T25	Silver Birch	12	300	1	2	2	2	2	1	1	SM	G	G	20+	C	40.7	3.6	
T26	Ash	12	350	1	2.5	2.5	2.5	2.5	2	2	SM	G	G	20+	C	55.4	4.2	
T27	Ash #	16	350	2	4	4	4	4	5	6	SM	G	G	20+	C	55.4	4.2	
T28	Pedunculate Oak	10	300	1	3	3	3	3	3	3	SM	G	G	20+	C	40.7	3.6	
T29	Ash	10	310	1	3	3	3	3	6	6	SM	G	G	20+	C	43.5	3.7	
T30	Hawthorn	6	410.12	2	1.5	1.5	1.5	1.5	3	3	SM	G	G	20+	C	76.1	4.9	
T31	Ash #	14	700	1	6	6	6	6	2	5	M	G	G	40+	B	221.7	8.4	
T32	Maple	10	450	1	3	3	3	3	4	4	SM	G	G	20+	C	91.6	5.4	

TREE SURVEY SCHEDULE

Project Number: 3902,EC

Project Name: Briar Farm, Land Off Mendham Lane, Harleston, Norfolk, IP20 **Date:** 28/06/2019

1	2	3	4	5	6				7	8	9	10	11	12	13	14	15	16
Tree No.	Species	Height (m)	Stem Diamenter (mm)	No. of Stems	Branch Spread (m)				First Branch Height (m)	Canopy Height (m)	Life Stage	Physiological Conditions	Stuctural Conditions	Remaining Contribution (years)	Category Grading	RPA (m2)	RPA Radius (m)	Tree Work Recommendations / Comments
					N	E	S	W										
# denotes estimated values due to lack of access																		
T33	Ash	12	510	1	3	3	3	3	6	8	SM	G	G	20+	C	117.7	6.1	
T34	Sorbus sp #	8	350	1	2.5	2.5	2.5	2.5	6	6	SM	G	G	20+	C	55.4	4.2	
T35	Pedunculate Oak #	14	750	1	5	5	5	5	8	8	EM	G	G	20+	C	254.5	9.0	
T36	Hawthorn #	10	150	1	2	2	2	2	0	0	SM	G	G	20+	C	10.2	1.8	
T37	Ash #	14	500	1	4	4	4	4	6	6	SM	G	G	20+	C	113.1	6.0	
T38	Pedunculate Oak #	14	1000	1	6	6	6	6	2	10	M	G	G	40+	A	452.4	12.0	
T39	Ash #	14	500	1	4.5	4.5	4.5	4.5	6	7	SM	G	G	20+	B	113.1	6.0	

Appendix 4 – Survey Schedule Descriptions

TREE SURVEY SCHEDULE DESCRIPTIONS

GEOSPHERE ENVIRONMENTAL

Tree Survey Schedule Description		
Column Number	**Heading**	**Description**
1	Tree No.	Sequential reference number (as recorded on the tree constraints plan)
2	Species	Species listed by common name
3	Height (m)	Total height of the tree
4	Stem Diameter (mm)	Stem diameter measured at 1.5 m above ground level in accordance to BS 5837:2012
5	No of stems	Total number of stems of a tree
6	Branch spread (m)	Branch spread, taken at the four cardinal points, to derive an accurate representation of the crown (plotted on the tree constraints plan)
7	First branch hgt (m)	Existing height above ground level of first branch measured at the union with the stem
8	Canopy hgt (m)	Existing height of the average clearance of the canopy above ground level
9	Life stage	The age of the tree determined by life stage category: Y- young, SM- semi-mature, EM- early mature, M- mature, OM- over mature, V- veteran
10	Physiological condition	The physiological condition of a tree based on a tree health assessment: G- good, F- fair, P- poor, D- dead
11	Structural condition	The structural condition of a tree based on structural integrity and signs of structural defects which may cause failure: G- good, F- fair, P- poor, D- dead
12	Remaining contribution (yrs)	Estimated remaining contribution in years that the trees will have on the landscape in their current context. A tree will not necessarily remain safe for the entirety of the remaining years. The remaining contribution has been categorised as follows: <10, 10+, 20+ and 40+
13	Category grading	The trees have been graded as per BS 5837: 2012 recommendations. The grading is formed by a letter and a number. The letter denotes the quality grading of the tree, the number represents one of three sub categories. Sub categories 1, 2 and 3 reflect arboricultural, landscape and cultural qualities respectively. The primary letter grading is as follows: U- Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years A- Trees of high quality with an estimated remaining life expectancy of at least 40 years B- Trees of moderate quality with an estimated remaining life expectancy of at least 20 years C- Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm
14	RPA (m^2)	The root protection area calculated following BS 5837: 2012
15	RPA radius (m)	The root protection area radius calculated following BS 5837: 2012
16	Tree work recommendations/ comments	Work which is recommended for a tree to improve its longevity and safety in its present context. The recommendations are recorded primarily to assist with the categorisation of the trees. Please see Section 6, Tree Management for further limitations.

TITLE
Tree Survey Schedule Descriptions

DATE
28/06/2019

Appendix 5 – Key to Scientific Names

SCIENTIFIC NAMES KEY

Common Name	Scientific Name
Fir sp.	*Abies sp.*
Field Maple	*Acer campestre*
Sycamore	*Acer pseudoplatanus*
Maple	*Acer sp.*
Horse Chestnut	*Aesculus hippocastanum*
Silver Birch	*Betula pendula*
Sweet Chestnut	*Castanea sativa*
Hazel	*Corylus avellana*
Hawthorn	*Crataegus monogyna*
Ash	*Fraxinus excelsior*
Holly	*Ilex aquifolium*
Walnut	*Juglans regia*
Garden Privet	*Ligustrum ovalifolium*
White Poplar	*Populus alba*
Aspen	*Populus tremula*
Blackthorn	*Prunus spinosa*
Pedunculate Oak	*Quercus robur*
Dog Rose	*Rosa canina*
Whitebeam	*Sorbus sp.*
Leyland Cypress	*x Cupressocyparis leylandii*

GEOSPHERE ENVIRONMENTAL

REFERENCE

Common and scientific names based on Stace (2010) New flora of the British Isles (3rd Edition), Cambridge University Press. For species not present in Stace, scientific and common and names were taken from Johnson and More (2006). Tree Guide, Harper Collins Publishers Ltd.

TITLE

Scientific Names Key

DATE

28/06/2019

Appendix 6 – Drawings

Tree Constraints Plan – Drawing Ref. 3902,EC/007/Rev 0

Sketch Masterplan – Drawing Ref. 7055/SK01

REV	DATE	DESCRIPTION

LEGEND

Category U

Category A
Trees of high quality

Category B
Trees of moderate quality

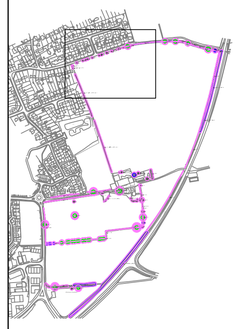
Category C
Trees of low quality

RPA using formula in accordance with BS5837:2012

# denotes estimated values due to lack of access

Trees categorised in accordance with BS5837:2012 "Trees in relation to design, demolition and construction ï Recommendations"

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



LOCATIONS ARE APPROXIMATE.

PROJECT

Briar Farm, Land Off Mendham Kane, Harleston, Norfolk, IP20 9DW

TITLE

Tree Constraints Plan

DRAWING NUMBER

3902,EC/007-1/Rev0

CLIENT

M Scott Properties Ltd

SCALE 1:400 @ A1 DATE 17/06/19

GEOSPHERE ENVIRONMENTAL

T15 Pedunculate Oak
hgt: 11.0

G4 Maple, Privet
hgt: 1.5.0

G3 Field Maple, Hawthorn, Privet, Ash, Rose
hgt: 2.0

T16 Pedunculate Oak
hgt: 6.0

T17 Horse Chestnut
hgt: 3.0

T18 Silver Birch
hgt: 8.0

T19 Sweet Chestnut
hgt: 4.0

T20 Pedunculate Oak
hgt: 6.0

T21 Sweet Chestnut
hgt: 8.0

T22 Aspen
hgt: 10.0

T23 Walnut
hgt: 10.0

T24 Walnut
hgt: 10.0

T25 Silver Birch
hgt: 12.0

G5 Walnut
hgt: 8.0

T26 Ash
hgt: 12.0

T27 Ash#
hgt: 16.0

T28 Pedunculate Oak
hgt: 10.0

G6 Field Maple, Hawthorn, Introduced Shrub#
hgt: 2.5.0

G7 Introduced Shrub, Holly, Hawthorn, Blackthorn, Rose#
hgt: 3.0

LOVAT CLOSE

JAY'S GREEN

ARTIN ROAD

ESS

21 31 34 12 2 77 69 61 11 11 59 49 46 23

DRAIN

GREEN LANE

T14 Pedunculate Oak
hgt: 12.0

G3 Field Maple, Hawthorn, Privet, Ash, Rose#
hgt: 2.0

T13 Pedunculate Oak#
hgt: 16.0

T12 Sycamore#
hgt: 10.0

T11 White Poplar#
hgt: 8.0

T10 Ash#
hgt: 10.0

T9 Pedunculate Oak#
hgt: 16.0

T8 Pedunculate Oak#
hgt: 4.0

T7 Horse Chestnut#
hgt: 4.0

T6 Horse Chestnut#
hgt: 4.0

T5 Pedunculate Oak#
hgt: 20.0

T4 Sycamore#
hgt: 3.0

T3 Horse Chestnut#
hgt: 3.0

T2 Pedunculate Oak#
hgt: 14.0

T1 Pedunculate Oak
hgt: 9.0

G1 Hawthorn hedge#
hgt: 1.5.0

G2 Oak, Maple, Ash, Hawthorn, Silver Birch#
hgt: 12.0

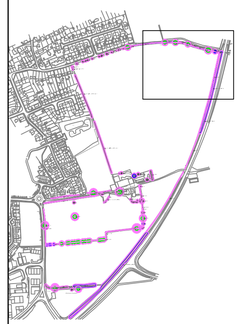
REV	DATE	DESCRIPTION

LEGEND

- Category U
- Category A
  Trees of high quality
- Category B
  Trees of moderate quality
- Category C
  Trees of low quality
- RPA using formula in
  accordance with BS5837:2012

# denotes estimated values
due to lack of access

Trees categorised in accordance with BS5837:2012 "Trees in relation to design, demolition and construction ï Recommendations"



LOCATIONS ARE APPROXIMATE.

PROJECT

Briar Farm, Land Off Mendham Kane, Harleston, Norfolk, IP20 9DW

TITLE

Tree Constraints Plan

DRAWING NUMBER

3902,EC/007-2/Rev0

CLIENT

M Scott Properties Ltd

SCALE 1:400 @ A1 DATE 17/06/19

GEOSPHERE ENVIRONMENTAL

N ROAD

22

33

30

Pond

Pond

Pond

G7 Introduced Shrub, Holly, Hawthorn, Blackthorn, Rose#
hgt: 3.0

HER WAY

9

2

1

REV	DATE	DESCRIPTION

LEGEND

Category U

Category A
Trees of high quality

Category B
Trees of moderate quality

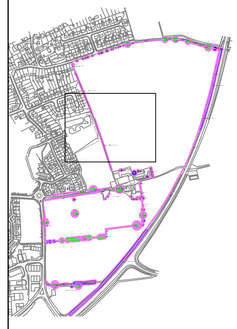
Category C
Trees of low quality

RPA using formula in accordance with BS5837:2012

# denotes estimated values due to lack of access

Trees categorised in accordance with BS5837:2012 "Trees in relation to design, demolition and construction ï Recommendations"

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



LOCATIONS ARE APPROXIMATE.

PROJECT

Briar Farm, Land Off Mendham Kane, Harleston, Norfolk, IP20 9DW

TITLE

Tree Constraints Plan

DRAWING NUMBER

3902,EC/007-3/Rev0

CLIENT

M Scott Properties Ltd

SCALE 1:400 @ A1 DATE 17/06/19

GEOSPHERE ENVIRONMENTAL

G2 Oak, Maple, Ash, Hawthorn, Silver Birch#
hgt: 12.0

G1 Hawthorn hedge#
hgt: 1.5.0

REV	DATE	DESCRIPTION

LEGEND

Category U

Category A
Trees of high quality

Category B
Trees of moderate quality

Category C
Trees of low quality

RPA using formula in
accordance with BS5837:2012

# denotes estimated values
due to lack of access

Trees categorised in accordance with BS5837:2012 "Trees in relation to design, demolition and construction ï Recommendations"

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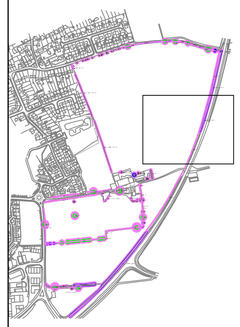

LOCATIONS ARE APPROXIMATE.

PROJECT

Briar Farm, Land Off Mendham Kane, Harleston, Norfolk, IP20 9DW

TITLE

Tree Constraints Plan

DRAWING NUMBER

3902,EC/007-4/Rev0

CLIENT

M Scott Properties Ltd

SCALE 1:400 @ A1 DATE 17/06/19

GEO
GEOSPHERE ENVIRONMENTAL