

**Flood Risk and Drainage
Site Appraisal**
January 2020

The logo for EAS, consisting of a dark blue square with the letters 'EAS' in white, sans-serif font.

Grange Farm

**Huntingdon Road, Girton
Cambridgeshire**

Chivers Farms Ltd.

Document History

JOB NUMBER: 2604/2020
DOCUMENT REF: Flood Risk and Drainage Site Appraisal
REVISIONS: A - Draft

| Revision | Comments | By | Checked | Authorised | Date |
|----------|--------------|----|---------|------------|------------|
| A | Client Draft | ML | SA | SA | 03/02/2020 |
| B | | | | | |
| C | | | | | |
| D | | | | | |
| E | | | | | |
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1 Introduction

- 1.1 EAS has been commissioned by Chivers Farms Limited to prepare a Site Appraisal for land at Grange Farm, Huntingdon Road, Girton, Cambridgeshire. This document has been prepared to inform site representations to the Greater Cambridge Local Plan Regulation 18 Issues and Options consultation.
- 1.2 The contents of this report form a preliminary assessment of the site in terms of flood risk and drainage.
- 1.3 The site is located to the east of the M11 and A14 and to the west of Girton. The site is surrounded by arable and agricultural land.
- 1.4 The 6.276ha site is currently a mixture of agriculture, farm buildings and telecommunication cast with redundant buildings on site which were previously used for grading, packing and and storage for agricultural produce. A location plan is contained within Appendix A. For the purposes of this report it is proposed that 65% of the site is developed for commercial use.
- 1.5 The site falls mostly within Flood Zone 1 of the Environment Agency (EA) Flood Zone maps. However, there is an area adjacent to the Beck Brook which is within Flood Zone 2 and 3. It is also shown to be predominantly at very low risk of surface water flooding with some small isolated areas at risk of surface water flooding and areas adjacent to the brook similar to the fluvial Flood Zones. This document will review the above risks further and provide advice to support the site representation and future masterplanning of the site.
- 1.6 This report is based on EA Flood Maps, South Cambs Strategic Flood Risk Assessment (SFRA), Cambridgeshire County Council Surface Water Management Plan (SWMP), BGS geological information and Anglian Water sewer records.
- 1.7 The report is set out as follows:
 - Section 2 – sets out the relevant flood risk and drainage policy background.
 - Section 3 – reviews and discusses the flood risk to the development and the future development drainage.
 - Section 4 – provides a brief review of surface water drainage requirements
 - Section 5 – provides a brief review of foul drainage solutions.
 - Section 6 – summarises the findings of the report.

2 Policy Background

Introduction

- 2.1 This section sets out the current local policy and examines the local strategic documents for flood risk and drainage matters.

Adopted South Cambridgeshire Local Plan (2018)

Policy CC/9: Managing Flood Risk

- 2.2 The policy states that:

1. "In order to minimise flood risk, development will only be permitted where:
 - a. The sequential test and exception tests established by the National Planning Policy Framework demonstrate the development is acceptable (where required).
 - b. Floor levels are 300mm above the 1 in 100 year flood level plus an allowance for climate change where appropriate and practicable also 300mm above adjacent highway levels.
 - c. Suitable flood protection/mitigation measures are incorporated as appropriate to the level and nature of flood risk, which can be satisfactorily implemented to ensure safe occupation, access and egress. Management and maintenance plans will be required, including arrangements for adoption by any public authority of statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime;
 - d. There would be no increase to flood risk elsewhere, and opportunities to reduce flood risk elsewhere have been explored and taken (where appropriate), including limiting discharge of surface water (post development volume and peak rate) to natural greenfield rates or low, and
 - e. The destination of the discharge obeys the following priority order:
 - I. Firstly, to the ground via infiltration;
 - II. Then, to a water body;
 - III. Then, to a surface water sewer
 - IV. Discharge to a foul water or combined sewer is unacceptable.
2. Site specific Flood Risk Assessments (FRAs) appropriate to the scale and nature of the development and the risks involved, and which takes account of future climate change, will be required for the following:
 - f. Development proposals over 1ha in size;
 - g. Any other development proposals in flood zones 2 and 3;
 - h. Any other development proposals in flood zone 1 where evidence, in particular the Strategic Flood Risk Assessment or Surface Water Management Plans, indicates there

are records of historic flooding or other sources of flooding, and/or a need for more detailed analysis.

3. FRAs will need to meet national standards and local guidance (including recommendations of the South Cambridgeshire and Cambridge City Strategic Flood Risk Assessment (2010) and the Phase 1 and 2 Water Cycle Strategy or successor documents)."

Policy CC/8: Sustainable Drainage Systems

2.3 The policy is as follows:

"Development proposals must incorporate appropriate sustainable surface water drainage systems (SuDS) appropriate to the nature of the site. Development proposals will be required to demonstrate that:

- a. Surface water drainage schemes comply with the Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems and the Cambridgeshire Flood and Water Supplementary Planning Document or successor documents;
- b. Opportunities have been taken to integrate sustainable drainage with the development, create amenity, enhance biodiversity, and contribute to a network of green (and blue) open space;
- c. Surface water is managed close to its source and on the surface where it practicable to do so;
- d. Maximum use has been made of low land take drainage measures, such as rain water recycling, green roofs, permeable surfaces and water butts;
- e. Appropriate pollution control measures have been incorporated, including multiple component treatment trains; and
- f. Arrangements have been established for the whole life management and maintenance of surface water drainage systems."

Policy CC/7: Water Quality

2.4 The policy states:

1. "In order to protect and enhance water quality, all development proposals must demonstrate that:
 - a. There are adequate water supply sewerage and land drainage systems (including water sources, water and waste water infrastructure) to serve the whole development, or an agreement with the relevant service provide to ensure the provision of the necessary infrastructure prior to the occupation of the development. Where development is being phased, each phase must demonstrate sufficient water supply and waste water conveyance, treatment and discharge capacity;
 - b. The quality of ground, surface or water bodies will not be harmed and opportunities have been explored and taken for improvements to water quality, including renaturalisation of river morphology, and ecology;

- c. Appropriate consideration is given to sources of pollution, and appropriate Sustainable Drainage Systems (SuDS) measures incorporated to protect water quality from polluted surface water runoff.
2. Foul drainage to a public sewer should be provided wherever possible, but where it is demonstrated that it is not feasible, alternative facilities must not pose unacceptable risk to water quality or quantity.”

South Cambridgeshire and Cambridge City Level 1 Strategic Flood Risk Assessment (SFRA) September 2010

- 2.5 The SFRA objectives are to:
 - Assess the risks from all forms of flooding affecting the SCDS and CCC area;
 - Provide a reference and policy document to inform the preparation of future LDF documents;
 - Ensure that SCDC and CCC meet their obligations under the current PPS25 and Local Development Framework Policy guidelines and standards;
 - Inform the Sustainability Appraisal so that flood risk is taken into account when considering options and in the preparation of land use policies;
 - Provide a sufficient level of detail to allow SCDC and CCC to undertake the Sequential Test;
 - Advise and inform private and commercial developers of their obligations under PPS25 in relation to sustainable development and flood risk.
- 2.6 Appendix C2 and C2.1 illustrate that there is low potential for infiltration at this site.
- 2.7 Appendix C3 confirms that the site is not within a Source Protection Zone.
- 2.8 Appendix D1.1 shows that the site is at risk of fluvial flooding adjacent to the Beck Brook but not within the majority of the site.
- 2.9 Tables 4a and 4b from the SFRA contain historic flood records from sources including rivers, highway drainage and sewers and there are no records of historic flooding within the site.
- 2.10 In summary no additional evidence is presented within the SFRA which indicates that the development site is at a risk of flooding from any source other than the areas identified within the EA flood mapping.

Cambridgeshire County Council Surface Water Management Plan (SWMP) August 2011 and County Wide Update (2014)

- 2.11 The SWMP was originally published in 2011 and was updated in 2014.
- 2.12 The objectives of the SWMP are to:
 - Engage with partners and stakeholders

- Map historical flood incident data
- Map surface water influenced flooding locations
- Identify areas at risk of surface water flooding referred to as “wetspots”
- Identify measures, assess options and confirm preferred options to mitigate against surface water flooding in the prioritised “wetspots”
- Make recommendations for next steps

2.13 The update was to ensure that flooding incidents between 2011 and 2014 were taken in to consideration due to instances of surface water flooding across the County.

3. Flood Risk Assessment

- 3.1 A copy of the Environment Agency's current Flood Map included in Appendix B shows the development site to be located mostly within Flood Zone 1 and it has been confirmed to EAS that all built development will remain outside of the Flood Zones 2 and 3 therefore the site is deemed to be at a low risk of fluvial flooding.
- 3.2 The NPPF requires that for a development site located within Flood Zone 1 which is larger than one hectare, an FRA must accompany the planning application which demonstrates that the proposals would not be exposed to an unsatisfactory level of flood risk, and would not result in an increase in the existing level of flood risk to the surrounding area.
- 3.3 In addition to the requirements of the NPPF and as a result of changes to the roles of Lead Flood Authorities, from 15 April 2015 all major applications (over 10 dwellings) submitted to the Lead Local Flood Authority (LLFA) which for this site is Cambridgeshire County Council and must include a 'Surface Water Drainage Strategy' which will set out the appropriateness of SuDS to manage surface water run-off, including the provision of the maintenance for the lifetime of the development which they serve. Major applications which do not meet this requirement will not be made valid.
- 3.4 The site is not within an area managed by an Internal Drainage Board (IDB).

Local Policy

- 3.5 From a review of the South Cambridgeshire and Cambridge City Council SFRA undertaken in Section 2 of this report, there were no additional sources of flooding other than identified within the EA Flood Map which would impact on the development site nor historic flooding incidents associated with the site.

Sources of Flooding

- 3.6 **Fluvial Watercourses:** A copy of the Environment Agency's Flood Map for the area is included in Appendix B. The mapping shows that the site is located predominantly within Flood Zone 1 with areas of Flood Zone 2 and 3 surrounding the Beck Brook. However, all built development will remain in Flood Zone 1 and therefore the site is considered to be at low risk of fluvial flooding; less than a 0.1% annual probability of flooding from fluvial sources.
- 3.7 **Groundwater:** The site has a bedrock of Gault formation (mudstone) and no recorded superficial deposits. The area is shown to have unproductive groundwater vulnerability in DEFRA's Magic Map.
- 3.8 Appendix C2 and C2.1 of the SFRA show that there is low potential for infiltration whilst appendix B3 confirms that there are no recorded incidents of groundwater flooding at this location. The Flood Incidents Register contained within the 2015 Cambridgeshire County Council Surface Water Management Plan also shows include any records of groundwater flooding. The register held no records of groundwater flooding at this location.
- 3.9 BGS borehole data shows a large number of records within close proximity to the site. Many of the records are shallow in depth (less than 10m) with no water encountered during the testing. There are three deeper (10-30m) boreholes one within the site and two in close

proximity, ground water was only encountered in one at 12.1m below ground level. As such, the risk of groundwater flooding at the site is considered to be low.

- 3.10 **Sewer Flooding:** Anglian Water sewer records show that they have no assets within the site or in the immediate surrounding area. As there are no sewers in the vicinity, the risk of sewer flooding is considered low.
- 3.11 **Surface Water/Overland Flow:** The EA surface water flood map shows the majority of the site to be at very low risk of flooding from surface water. The mapping also shows that there are some isolated areas of low risk (0.1-1% annual probability and low depth flood extents across the site with some medium risk (1-3.33% annual probability) with low depth alongside the Beck Brook As development will be kept out of Flood Zones 2 and 3 this will also ensure that development remains outside the area of surface water flooding adjacent to the brook. It is recommended that a topographic survey is carried out on site to determine the site levels however, the small areas of low risk and low depth surface water flood risk are unlikely to represent any causes for concern and could be mitigated against as part of any development proposal.
- 3.12 It is important that an effective surface water drainage system is included in the proposed development to ensure surface water runoff does not pose a significant flood risk to the development or to adjacent land and properties. This has been discussed further in the next section.
- 3.13 **Artificial Sources:** The EA flood map shows that there is no risk of flooding from reservoirs.

4 Surface Water Drainage

- 4.1 The NPPF states within Flood Zone 1, “developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques (SuDS)”.
- 4.2 SuDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood risk, these features can improve water quality and provide biodiversity and amenity benefits.
- 4.3 The SuDS management train incorporates a hierarchy of techniques and considers all three SUDS criteria of flood reduction, pollution reduction, and landscape and wildlife benefit. In decreasing order of preference, the preferred means of disposal of surface water runoff is:
- Discharge to ground.
 - Discharge to a surface water body.
 - Discharge to a surface water sewer.
 - Discharge to a combined sewer.
- 4.4 The philosophy of SUDS is to replicate as closely as possible the natural drainage from a site pre-development and to treat runoff to remove pollutants, resulting in a reduced impact on the receiving watercourses. The benefits of this approach are as follows:
- Reducing runoff rates, thus reducing the flood risk downstream.
 - Reducing pollutant concentrations, thus protecting the quality of the receiving water body.
 - Groundwater recharge.
 - Contributing to the enhanced amenity and aesthetic value of development areas.
 - Providing habitats for wildlife in developed areas, and opportunity for biodiversity enhancement.

Site-Specific SuDS

- 4.5 The site geology is a bedrock Gault Mudstone formation with no recorded superficial deposits (taken from BGS geology mapping) and therefore an attenuation strategy is recommended which restricts runoff before discharging to the adjacent brook should be utilised as the preferred surface water drainage solution.
- 4.6 The site falls predominantly from east to west towards the Beck Brook. The Beck Brook is a main river and therefore any works to or within 8 metres of the Brook will require a permit from the Environment Agency.
- 4.7 Previous experience working with Cambridgeshire County Council (CCC) has identified the requirement for source control measures to be included across the site. The use of permeable paving, bioretention areas, green roofs and rainwater harvesting are all

considered to be source control measures and therefore at least one would need to be included in any drainage strategy to satisfy CCC when submitting a planning application.

- 4.8 An assessment of the volume of storage has been based on the 1 in 1 year greenfield runoff rate for the site assuming a connection to a watercourse.
- 4.9 To understand the scale of attenuation volume that might be required at the site, Micro Drainage was used to estimate greenfield runoff rates based on an impermeable site area of 4.08 hectares. The estimated runoff rates are:

$$Q_{BAR} = 3.3 \text{ l/s/ha (13.5 l/s)}$$

$$Q_{1 \text{ year}} = 2.9 \text{ l/s/ha (11.8 l/s)}$$

$$Q_{30 \text{ year}} = 8.0 \text{ l/s/ha (32.6 l/s)}$$

$$Q_{100 \text{ year}} = 11.8 \text{ l/s/ha (48.1 l/s)}$$

- 4.10 The MicroDrainage output is included in Appendix D.
- 4.11 A MicroDrainage Quick Storage Estimate was carried out to determine the likely storage volume required for a 1 in 100 year (+40% climate change) restricted to the 1 in 1 year greenfield runoff rate. It was assumed that 65% of the site was impermeable (roofs and hardstandings) for the purposes of this storage estimate, i.e. an impermeable area of 4.08 hectares. This results in a required attenuation volume of 3531m³. The Quick Storage Estimate parameters and results are included in Appendix E.

5 Foul Water Drainage Assessment

- 5.1 Anglian Water records show that there is a rising main which runs adjacent to the site within High Street. Anglian Water records show a connection to the rising main north of Middle Farm, it is assumed that foul water from the buildings within the red line boundary all discharge at this location.
- 5.2 It has been confirmed by Chivers Farms Ltd that the site is currently served by a sewage treatment plant (STP).
- 5.3 Given the distance to the closest sewer it is appropriate to utilise a STP for the proposed redevelopment of the site for commercial use.
- 5.4 It is likely that the STP will need to be upgraded to ensure that the system has sufficient capacity and meets the requirements of the Environment Agency, Local Planning Authority and Building Regulations.
- 5.5 An Environmental Permit from the Environment Agency will be required where the General Binding Rules cannot be met.

6 Summary and Conclusions

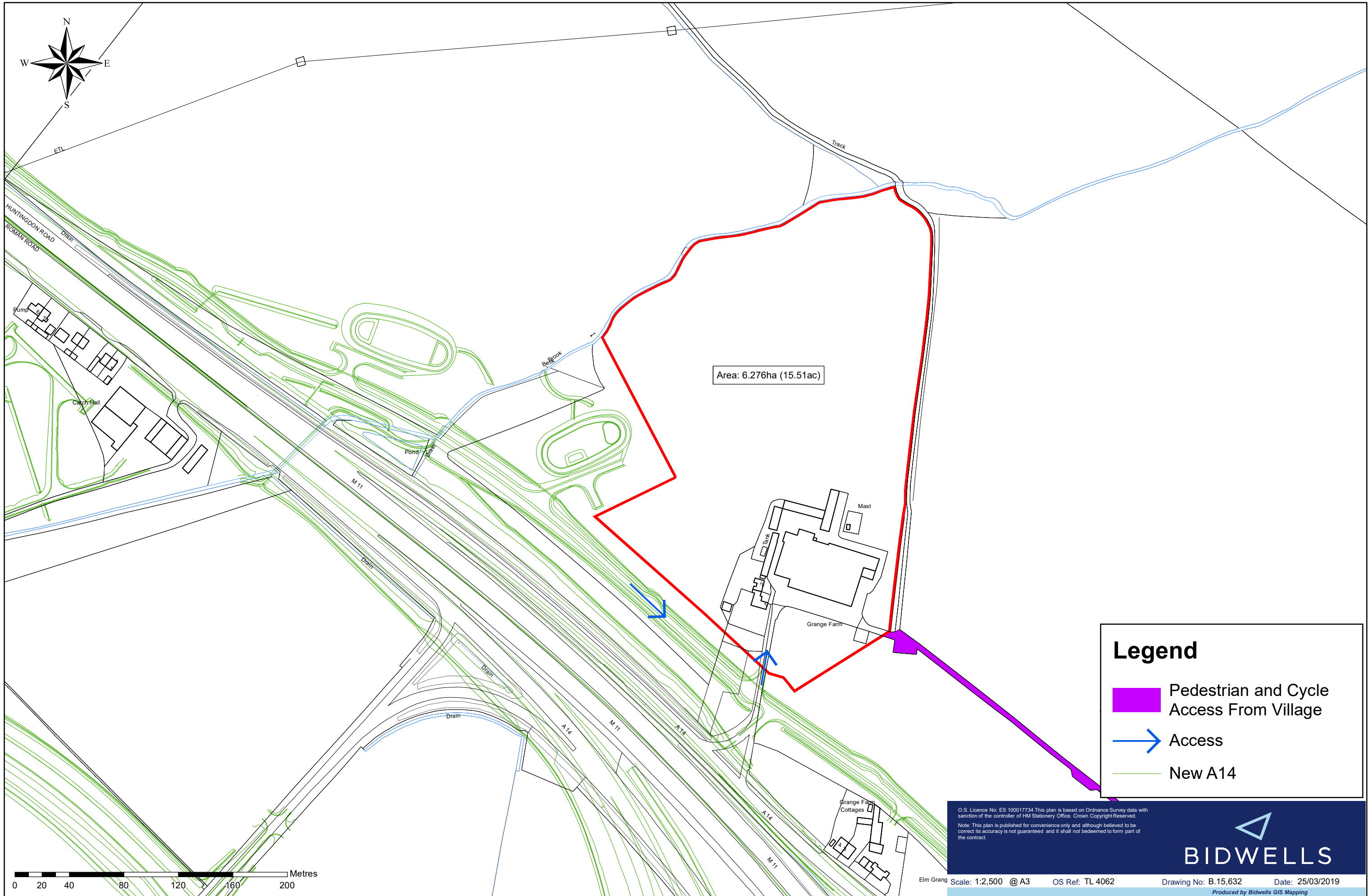
- 6.1 This report has dealt with a proposed redevelopment of the site for commercial use which would cover approximately 65% of the site.
- 6.2 The site falls mostly within Flood Zone 1 of the Environment Agency (EA) Flood Zone maps. However, there is an area adjacent to the Beck Brook which is within Flood Zone 2 and 3. It is also shown to be predominantly at very low risk of surface water flooding with some small isolated areas at risk of surface water flooding and areas adjacent to the brook similar to the fluvial Flood Zones. This document will review the above risks further and provide advice to support the site representation and future masterplanning of the site.
- 6.3 The surface water drainage will be restricted to the 1 in 1 year greenfield runoff rate and discharged to the Beck Brook.
- 6.4 The following recommendations are made as a result of this assessment in order to demonstrate the feasibility of the proposals at a planning application stage:
- A) All sources of flooding have been considered by means of a desktop assessment and no significant risks have been identified to the area (other than that shown within the EA flood mapping).
 - B) The mudstone geology is unlikely to be suitable for infiltration drainage therefore an attenuation strategy is recommended.
 - C) The drainage strategy will be restricted to the 1 in 1 year greenfield runoff rate and storage will be provided for all events up to and including the 1 in 100 year + 40% climate change event with at least one source control feature included within the design.
 - D) The Anglian Water records show that there are no sewers within close proximity to the site. The existing site is currently served by a sewage treatment plant and it is recommended that non-mains drainage is the most viable solution for this site.
 - E) It is likely that the existing sewage treatment plant will need to be upgraded as part of any future development.
- 6.5 In conclusion, provided that all built development remains within Flood Zone 1 and outside of the areas at risk of surface water flooding adjacent to the Beck Brook, the overall risk of flooding to the site is low with practical and sustainable solutions for both foul and surface water drainage.

Appendices




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Appendix: A - Location Plan

Grange Farm, Huntingdon Road



Legend

-  Pedestrian and Cycle Access From Village
-  Access
-  New A14

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BIDWELLS

Appendix: B – EA Flood Map for Planning

Flood map for planning

Your reference

Grange Farm

Location (easting/northing)

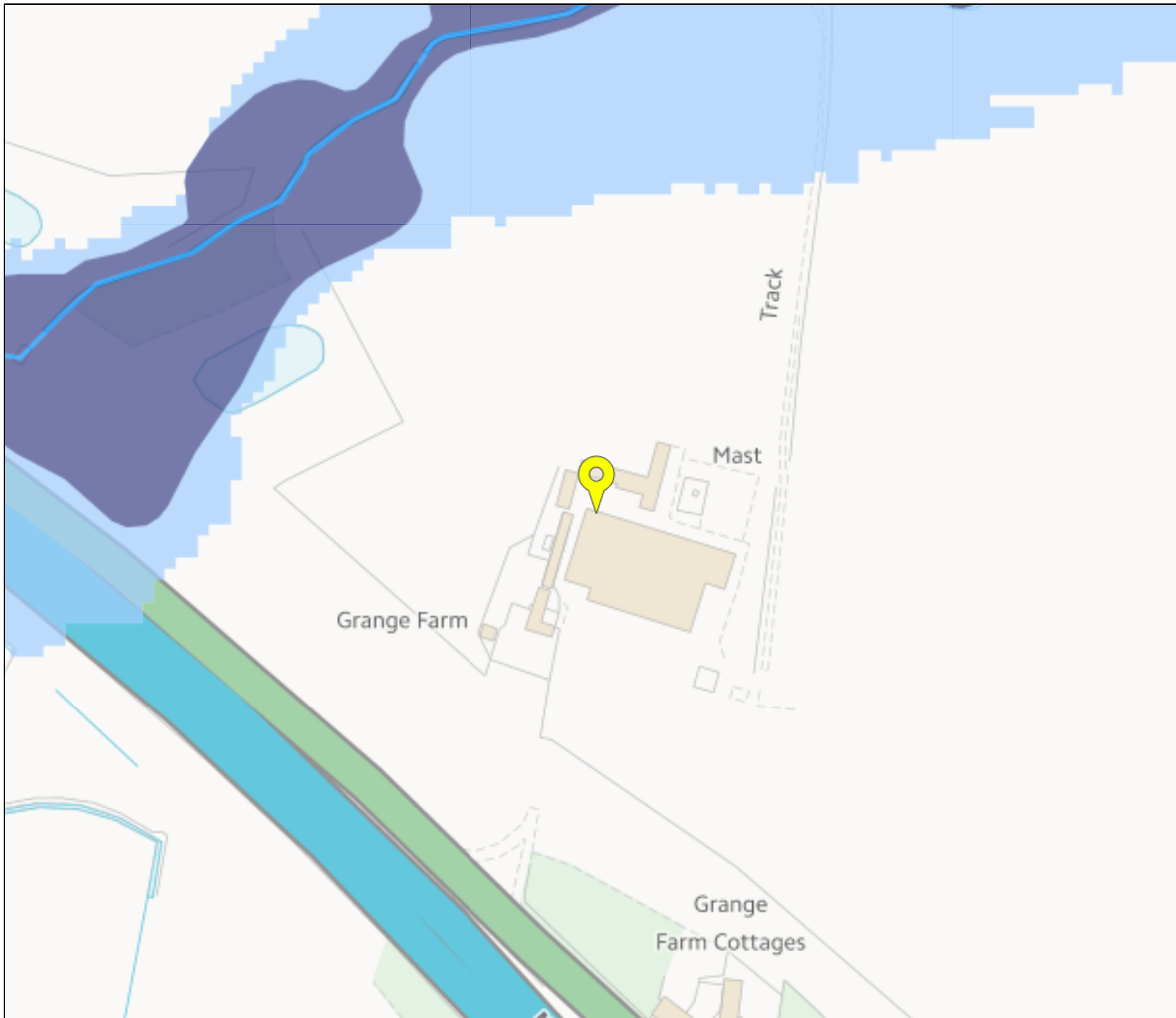
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



Scale

1:2500

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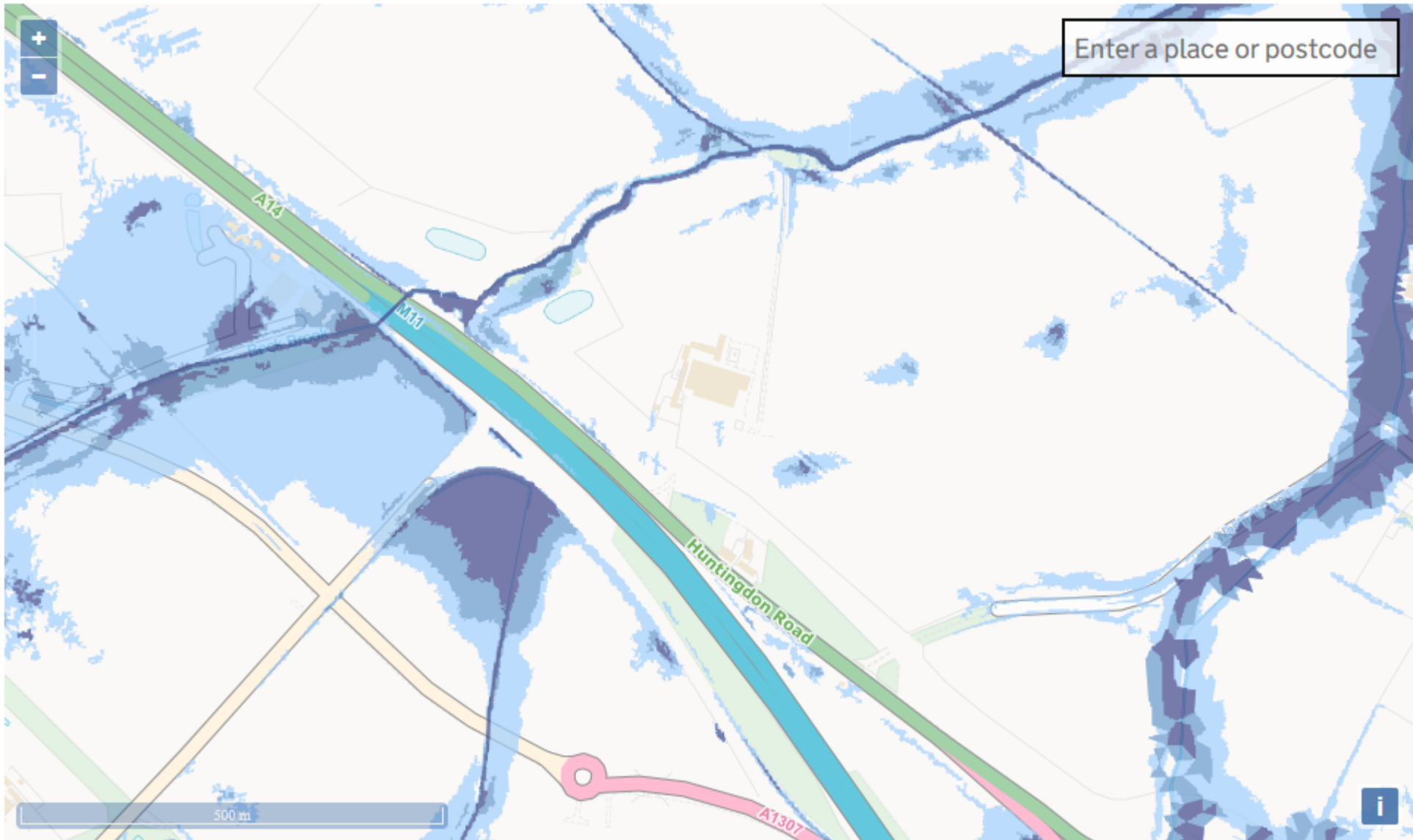
31 Jan 2020 12:26



-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area



Appendix: C – EA Surface Water Flood Map



Source: Long Term Flood Risk Map (<https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>)

Appendix: D – Greenfield Runoff Rates



Date 31/01/2020 16:00
File

Designed by Maz
Checked by

Micro Drainage

Source Control 2013.1.1

ICP SUDS Mean Annual Flood

Input

| | | | |
|-----------------------|-------|---------------|----------|
| Return Period (years) | 100 | Soil | 0.400 |
| Area (ha) | 1.000 | Urban | 0.000 |
| SAAR (mm) | 550 | Region Number | Region 5 |

Results 1/s

QBAR Rural 2.6
QBAR Urban 2.6

Q100 years 9.1

Q1 year 2.2
Q30 years 6.2
Q100 years 9.1

Appendix: E – MicroDrainage Quick Storage Estimate

Storage requirements for the 1 in 100yr + 40% climate change event

The screenshot shows the 'Quick Storage Estimate' dialog box with the 'Variables' tab selected. The left sidebar contains buttons for 'Variables', 'Results', 'Design', 'Overview 2D', 'Overview 3D', and 'Vt'. The main area contains the following settings:

| | | |
|----------------------------|-----------------------------------|---------|
| FSR Rainfall | Cv (Summer) | 0.750 |
| Return Period (years): 100 | Cv (Winter) | 0.840 |
| Region: England and Wales | Impemeable Area (ha) | 4.080 |
| M5-60 (mm): 20.000 | Maximum Allowable Discharge (l/s) | 11.8 |
| Ratio R: 0.450 | Infiltration Coefficient (m/hr) | 0.00000 |
| | Safety Factor | 2.0 |
| | Climate Change (%) | 40 |

Buttons at the bottom: Analyse, OK, Cancel, Help.

Footer: Enter Maximum Allowable Discharge between 0.0 and 999999.0

The screenshot shows the 'Quick Storage Estimate' dialog box with the 'Results' tab selected. The left sidebar contains buttons for 'Variables', 'Results', 'Design', 'Overview 2D', 'Overview 3D', and 'Vt'. The main area displays the following results:

Global Variables require approximate storage of between 2752 m³ and 3531 m³.

These values are estimates only and should not be used for design purposes.

Buttons at the bottom: Analyse, OK, Cancel, Help.

Footer: Enter Maximum Allowable Discharge between 0.0 and 999999.0

Appendix: F – Anglian Water Sewer Records



(c) Crown copyright and database rights 2020 Ordnance Survey 100022432 Date: 30/01/20 Scale: 1:1250 Map Centre: 541245,262117 Data updated: 02/12/19 Our Ref: 366024 - 1 Wastewater Plan A1

This plan is provided by Anglian Water pursuant to its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2020 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

| | | | |
|-----------------------|--|----------|--|
| Foul Sewer | | Outfall* | |
| Surface Sewer | | | |
| Combined Sewer | | Inlet* | |
| Final Effluent | | | |
| Rising Main* | | Manhole* | |
| Private Sewer* | | | |
| Decommissioned Sewer* | | | |

| | | | |
|--|--------------------------------|--|-------------|
| | Sewage Treatment Works | | Grange Farm |
| | Public Pumping Station | | |
| | Decommissioned Pumping Station | | |

*Colour denotes effluent type



