Flood Risk and Drainage
Site Appraisal
February 2020

EAS

# Land to the west of Papworth (Site A)

## Papworth Everard, Cambridgeshire

Varrier-Jones Foundation

# Document History

**JOB NUMBER:** 2582/2020
**DOCUMENT REF:** Flood Risk and Drainage Site Appraisal
**REVISIONS:** B - Final

| Revision | Comments | By | Checked | Authorised | Date |
|---|---|---|---|---|---|
| A | Client Draft | ML | SA | SA | 03/02/2020 |
| B | Final | ML | SA | SA | 14/02/2020 |
| C | | | | | |
| D | | | | | |
| E | | | | | |
| | | | | | |

EAS

# Contents

# 1 Introduction

1.1 EAS has been commissioned by the Varrier-Jones Foundation to prepare a Site Appraisal for land to the east of Stirling Way, Papworth Everard, 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 west of the Papworth and is bordered by the A1198 on the west and residential properties to the east.

1.4 The 40ha site (Site A) is currently greenfield, a location plan is contained within Appendix A. For the purposes of this report it is proposed that the site will comprise of a residential development of between 301-452 dwellings.

1.5 The site falls mostly within Flood Zone 1 of the Environment Agency (EA) Flood Zone maps. However, there is a narrow buffer of Flood Zone 2 and 3 along the brook which bisects the southern part of the site then runs along the eastern boundary up to the north of the site. It is also shown to be predominantly at very low risk of surface water flooding with a similar flood extent for surface water flooding as there is fluvial flooding. 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 proivision 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 not at risk of fluvial flooding.

2.9 Tables 4a and 4b from the SFRA contain historic flood records from sources including rivers, highway drainage and sewers. There are no reported incidents of flooding within the site or on Stirling Way, the only recorded incident in Papworth Everard was blocked highway drains in Ermine Street which did not cause flooding.

2.10 In summary no evidence is presented within the SFRA which indicates that the development site is at a risk of flooding from any source.

**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 mosty within in Flood Zone 1, and therefore 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 or within Flood Zone 2 or 3, 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 sources of flooding identified 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 majority of the site is located within Flood Zone 1, however the watercourse that runs through the south of the site then flows north along the eastern boundary has a small buffer of Flood Zone 2 and 3 either side of the brook itself. It is recommended that all built development remains outside of any land within Flood Zone 2 and 3.

3.7 Alternatively, an allowance for climate change can be applied to the Flood Zone 3 extent to the site to determine the future impacts of climate change on the brook as part of a detailed FRA and analysed against a topographical survey of the site.

3.8 The climate change allowances applied to the brook flood levels are 35% for the Higher Central allowance and 65% for the Upper End in the Anglian region.

**3.9** In the absence of the climate change impact analysis, it is recommended that as part of the initial master-planning that all built development remains outside of Flood Zone 2. This area can be utilised for landscaping and/or public open space but should remain free from all built development.

3.10 It is also recommended that a buffer zone of at least 8 metres is provided between the brook and any built development to provide a biodiversity and habitat corridor and allow sufficient space for maintaining the brook.

3.11 Therefore, the risk of fluvial flooding is considered to be low.

3.12 **Groundwater:** The site has a bedrock geology of Oxford Clay formation (mudstone) and no superficial deposits. The area is shown to have low and unproductive groundwater vulnerability in DEFRA's Magic Map.

3.13 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.

3.14 BGS borehole data shows a significant number of records along the route of the A1198 however these boreholes are all confidential. Further investigation will be required to determine if groundwater is an issue on site however, given the desktop study and lack of recorded incidents within Papworth itself, it is unlikely that groundwater flooding is likely to be at risk on site.

3.15 **Sewer Flooding:** Anglian Water sewer records show that a foul sewer runs along the eastern boundary of the site flowing north. The records also show a 375mm surface water sewer which runs adjacent to the foul sewer. Table 4b of the SFRA does not indicate any sewer flooding incidents close to the site. The sewer records can be seen in **Appendix D.** As there are no recorded incidents of flooding on the site or within close proximity, sewer flooding is not considered to be a significant flood risk to the development site.

3.16 **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 shows that similarly to the fluvial flood risk extent, the surface water flood risk extent is mainly contained in close proximity to the watercourse which runs within the site. There are also a number of some small overland flow paths.

3.17 As with the fluvial flood extent, it is also strongly recommended that no built development is located within areas at risk of surface water flooding as the mapping shows that depths can exceed 900mm in places along the watercourse.

3.18 If built development is proposed within the surface water flood extents, it should be limited to areas with flood depths below 300mm for the low (0.1-1% annual probability), medium (1-3.3% annual probability) and high (greater than 3.3% annual probability) flood risk events.

3.19 There are a number of reported highway flooding incidents within the SWMP for Papworth Everard however, there are no reported incidents within the site or within close proximity to the site and therefore the risk of surfacing water flooding is considered to be low.

3.20 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.

3.21 **Artificial Sources:** The EA flood map shows that there is no risk of flooding from reservoirs.

3.22 **Summary:** Other than the areas surrounding the brook, the rest of the site is at low risk of flooding.

# 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 Oxford Clay formation (mudstone) and no recorded superficial deposits (taken from BGS geology mapping) and therefore infiltration drainage is unlikely to be suitable as emphasised within Appendix C2 and C2.1 of the SFRA.

4.6 The site forms a valley, with land to the west falling east towards the watercourse and land to the east falling west towards the watercourse. Therefore it is likely that all drainage will discharge in to the watercourse at the 1 in 1 year greenfield runoff rate with storage provided on site for all events up to and including the 1 in 100 year + 40% climate change allowance.

4.7 The sustainable drainage system (SuDS) should be integrated within the site layout and priority must be given to features that provide multiple benefits such as multi-functional spaces, biodiversity, amenity, water quality and reducing water consumption.

4.8 Features such as detention basins can provide areas that are dry for most of the year and can be used for recreational activities.

4.9 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 would need to be included in any drainage strategy to satisfy CCC when submitting a planning application.

## 5 Foul Water Drainage Assessment

5.1 There is a 225mm foul sewer which runs along the eastern boundary of the site adjacent to the existing residential areas. The sewer originates in St Peter's lane to the south east of the site and runs along the eastern boundary to the northern tip where it runs adjacent to the A1198.

5.2 The site topography means that a pumped foul drainage solution is likely to be required to connect to the existing foul drainage system.

5.3 Due to the proposed number of units within the site, it would not be suitable to connect to non-mains drainage given the proximity of the public foul sewer. However, given the size of the proposed development it is likely that upgrades to the sewer would be required.

5.4 It is recommended that consultation with Anglian Water is carried out to determine if it is feasible to connect to the sewer and the level of upgrades required.

5.5 However, the presence of Anglian Water foul water infrastructure in close proximity to the site demonstrates that a foul water solution is available.

# 6 Summary and Conclusions

6.1 This report has dealt with a proposed development which will comprise of a residential development for 301-452 dwellings.

6.2 The site falls mostly within Flood Zone 1 of the Environment Agency (EA) Flood Zone maps. It is also shown to be predominantly at very low risk of surface water flooding with the watercourse and a small area on either side of the watercourse at high risk of surface water flooding and within Flood Zones 2 and 3.

6.3 No built development should be included within areas at risk of surface water flooding or within Flood Zones 2 and 3. An 8 metre buffer should also be maintained from the watercourse to provide a biodiversity and habitat corridor.

6.4 The surface water drainage will discharge to the watercourse with a restricted discharge to the 1 in 1 year greenfield runoff rate with storage provided for all events up to and including the 1 in 100 year + 40% climate change.

6.5 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 as built development will remain outside the areas at risk of flooding.

B) The clay geology is unlikely to be suitable for infiltration drainage and therefore an attenuation strategy would be required.

C) Sustainable drainage systems (SuDS) should be integrated in to the development with features that have multiple benefits and create multi-functional spaces.

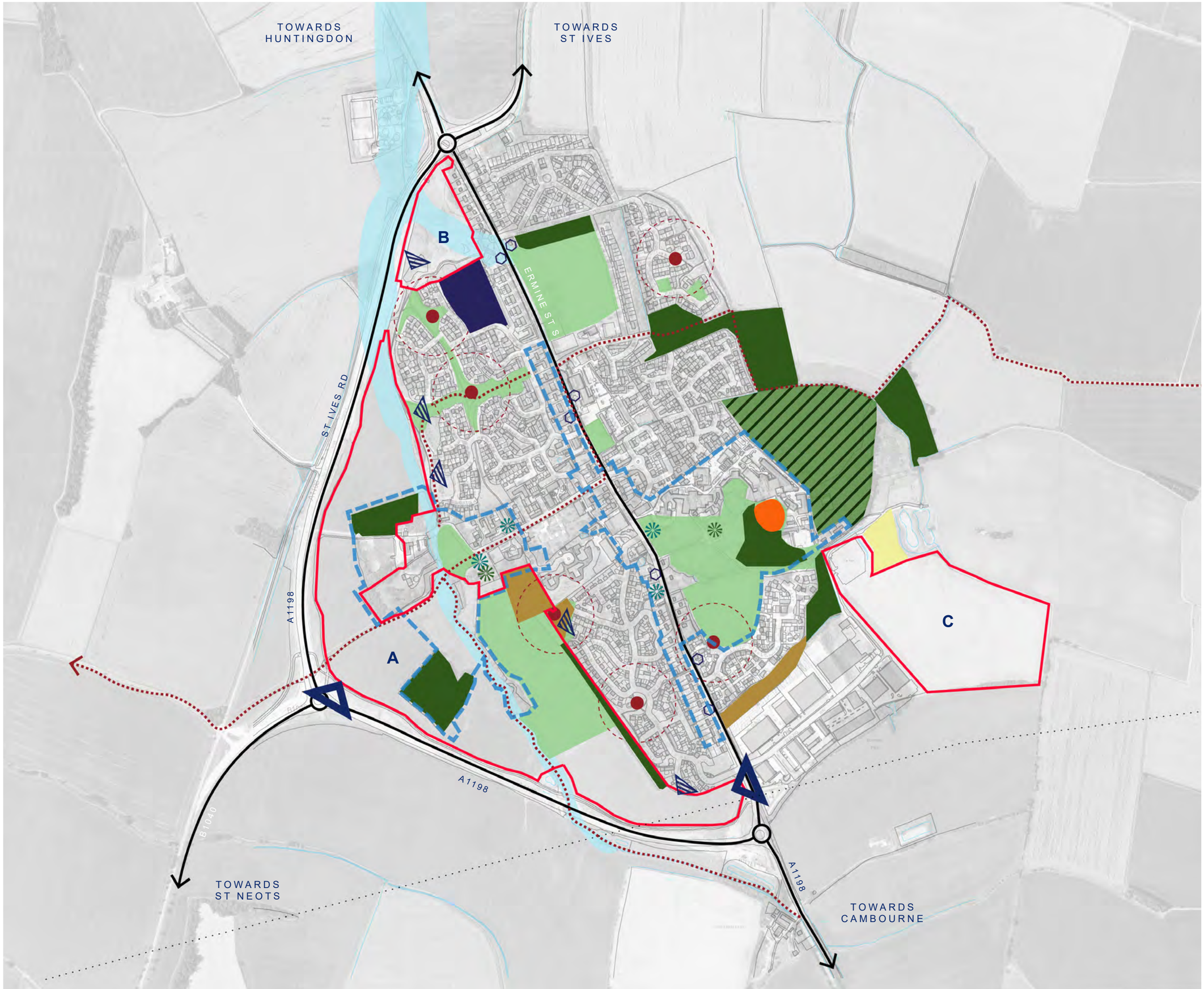
D) The drainage strategy will be restricted to the 1 in 1 year greenfield runoff rate and storage will be provided for all events up to and including the 1 in 100 year + 40% climate change event.

E) There is a 225mm sewer which runs along the eastern boundary of the site in a northerly direction. It is recommended that consultation with Anglian Water is carried out to determine if it is feasible to connect to the sewer and the level of upgrades required. It is likely that due to the topography a pumped foul drainage solution will be required for parts of the site.

6.6 In conclusion, this site is suitable for residential development from a flood risk and drainage perspective. The development will not be at risk of flooding nor cause flooding elsewhere and there are methods to dispose of foul and surface water sustainably within the site.

## Appendices

## Appendix: A - Location Plan




## LEGEND

- Red line boundaries (A,B and C)
- Existing roads
- Drainage channel
- Existing Public Rights of Way
- Conservation Area
- Existing woodland
- Existing significant woodland / SSSI
- Existing informal open space
- Scheduled ancient monument
- Overhead electricity line
- Existing allotments
- Protected amenity
- Pendragon Community Primary School
- Existing LAP and 100m isochrone
- Grade II Listed Building
- Grade II* Listed Building
- Existing bus stop
- Potential vehicular access
- Potential pedestrian / cycle access

| Rev. | Date. | Details. |
|---|---|---|
| - | - | - |

Do not scale from this drawing.
All dimensions to be checked on site.
This plan is to be read with all accompanying documentation.


BIDWELLS
Urban Design studio
Bidwell House, Trumpington Road, Cambridge CB2 9LD

# PAPWORTH ESTATE
# VARRIER JONES FOUNDATION

## PAPWORTH EVERARD CONTEXT

| Job Code: | OS License Number: | | |
|---|---|---|---|
| 57516 | 100017734 | | |
| Drawing Scale: | Date: | Drawn By: | Checked By: |
| NTS | 14.02.20 | HD | DP |
| Drawing Number: | | | Revision: |
| UDS57516-A3-0101 | | | - |


## LEGEND

- Proposed Site Boundary
- Existing Road Network
- Drainage Channel
- Existing Public Right of Way
- Overhead Electricity Line
- Existing Woodland
- Proposed woodland
- Proposed Green Links / Corridors
- Proposed Public Open Space
- Proposed Developable Area
- Proposed Developable within Areas Sensitive to Heritage
- Proposed Vehicular Access
- Proposed Pedestrian / Cycle Access
- Proposed Primary Vehicular Route
- Proposed Pedestrian Routes
- Open Links between Existing Settlement and Proposed Development

| Rev. | Date. | Details. |
|---|---|---|
| - | - | - |



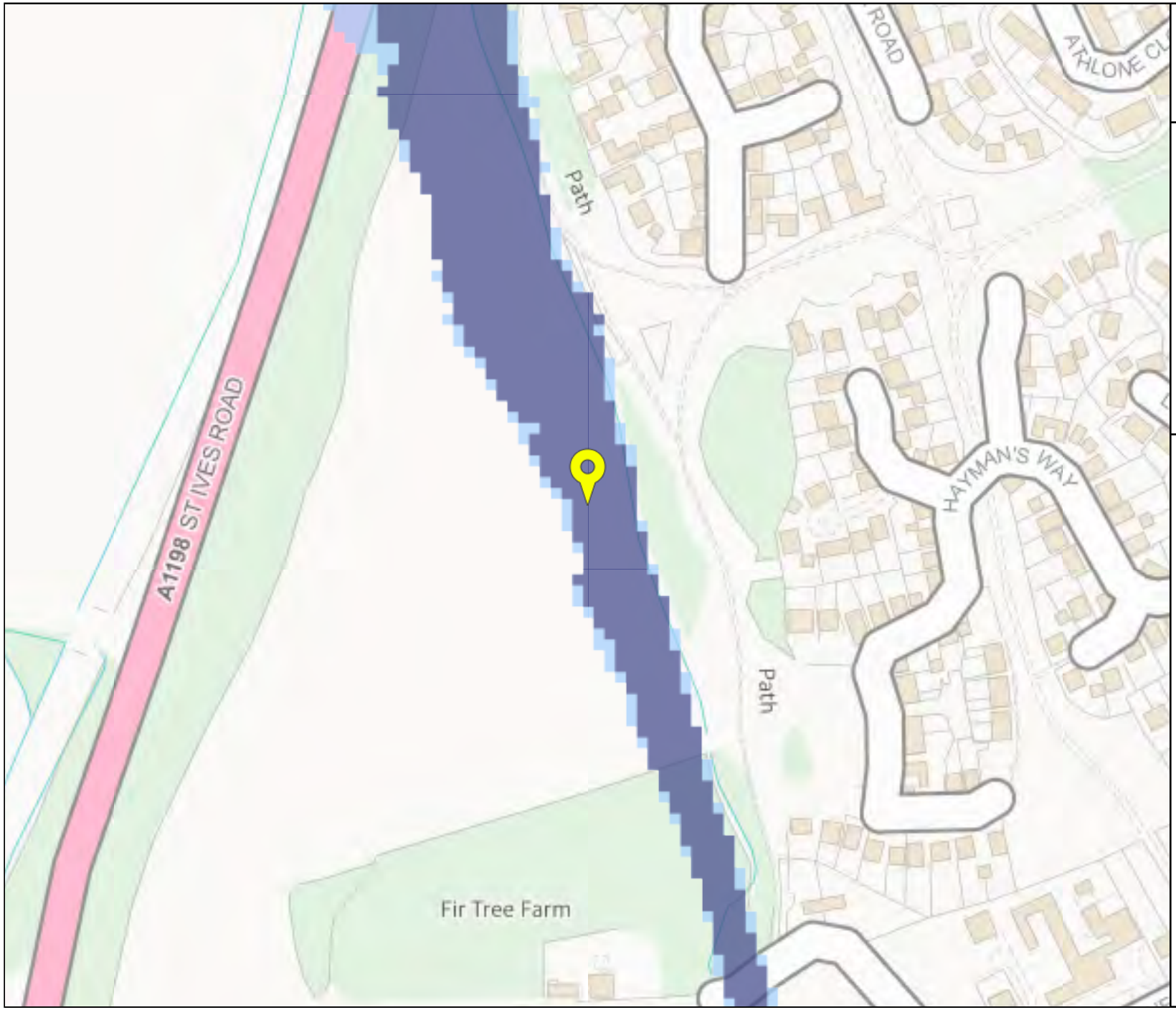
BIDWELLS
Urban Design studio
Bidwell House, Trumpington Road, Cambridge CB2 9LD

# PAPWORTH ESTATE
# VARRIER JONES FOUNDATION

## CONCEPT STRATEGY

| Job Code: | OS License Number: | | |
|---|---|---|---|
| 57516 | 100017734 | | |
| Drawing Scale: | Date: | Drawn By: | Checked By: |
| NTS | 14.02.20 | HD | MS |
| Drawing Number: | | | Revision: |
| UDS57516-A3-0102 | | | - |

## Appendix: B – EA Flood Map for Planning




Environment Agency

## Flood map for planning

Your reference
**Papworth A**

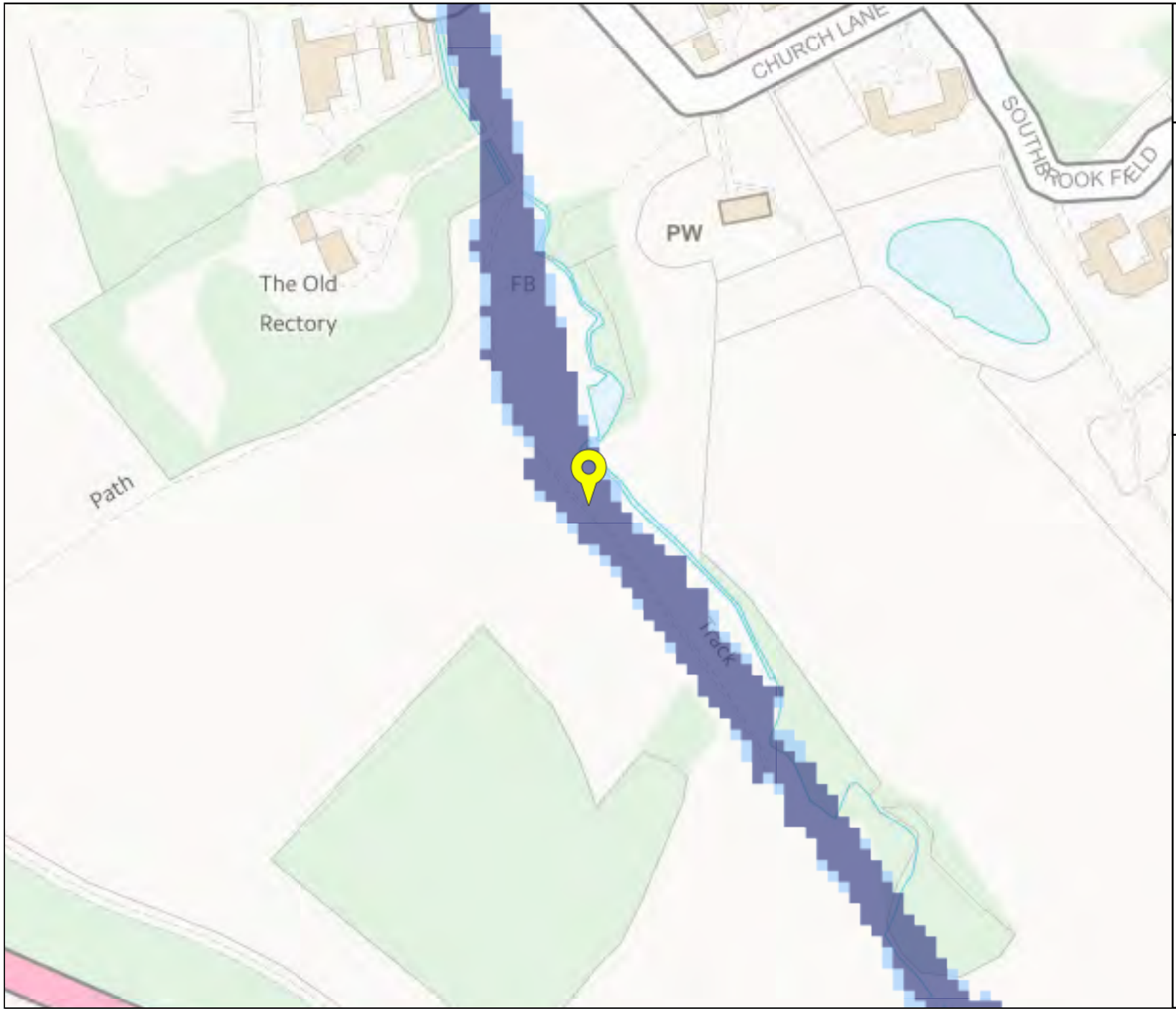
Location (easting/northing)
**528062/262967**

Scale
**1:2500**

Created
**27 Jan 2020 15:54**

- Selected point
- Flood zone 3
- Flood zone 3: areas bene tting from ood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m




Environment Agency

## Flood map for planning

Your reference
**Papworth A**

Location (easting/northing)
**528195/262508**

Scale
**1:2500**

Created
**27 Jan 2020 15:56**

- Selected point
- Flood zone 3
- Flood zone 3: areas bene tting from ood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m


Environment Agency

## Flood map for planning

Your reference
**Papworth A**

Location (easting/northing)
**528591/262200**

Scale
**1:2500**

Created
**27 Jan 2020 15:57**

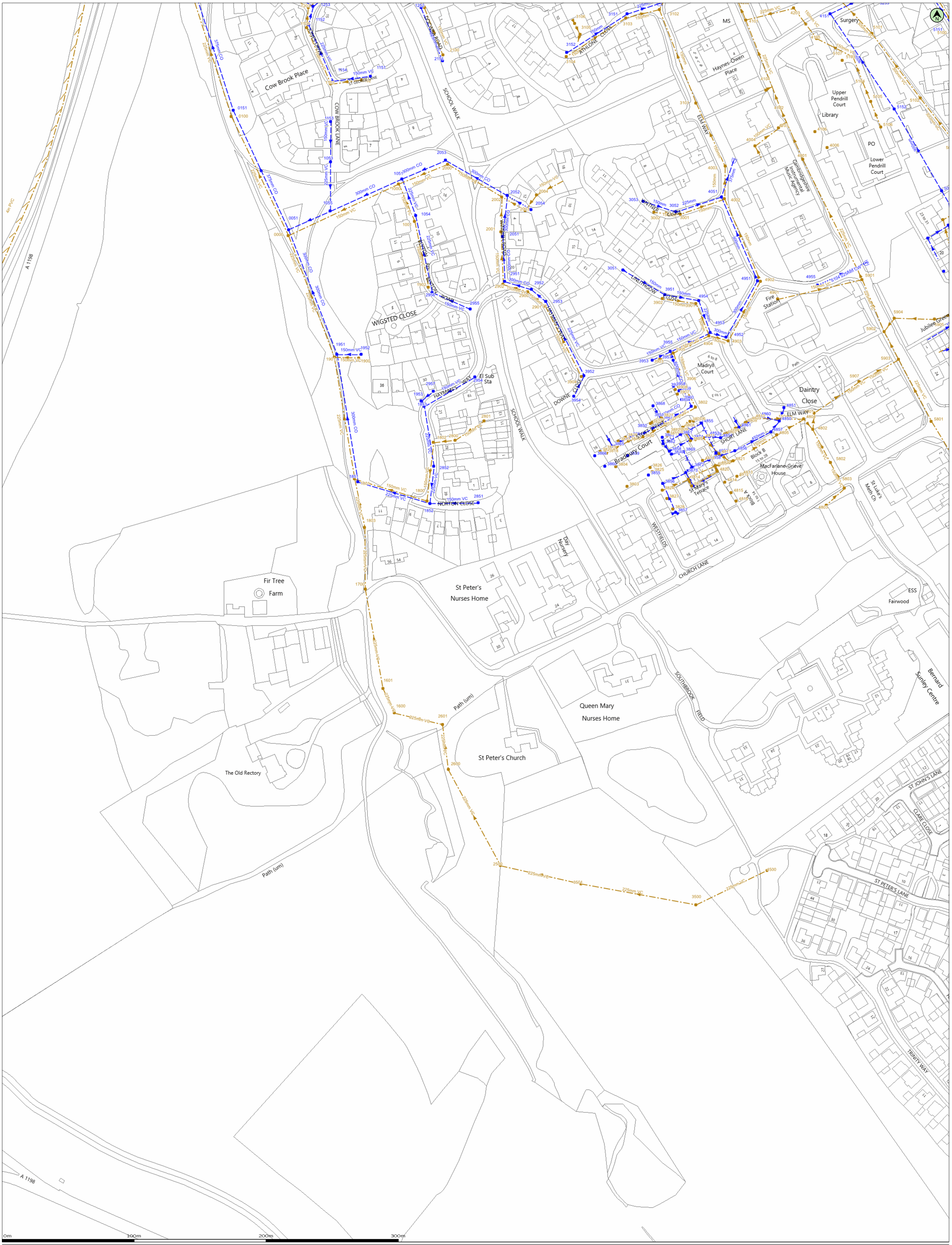
- Selected point
- Flood zone 3
- Flood zone 3: areas bene tting from ood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

## 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 – Anglian Water Sewer Records




(c) Crown copyright and database rights 2020 Ordnance Survey 100019209

Data updated: 02/12/19

Scale: 1:1250 | Date: 27/01/20 | Wastewater Plan A1

Map Centre: 528232,262734 | Our Ref: 365020 - 2 | Powered by digdat

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent Sewer
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station

*(Colour denotes effluent type)

rose.cargill@eastp.co.uk

Papworth A

love every drop anglianwater

| Manhole Reference | Easting | Northing | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|---|---|
| 0000 | 528090 | 263027 | F | - | - | - |
| 0100 | 528047 | 263118 | F | - | - | - |
| 1000 | 528174 | 263067 | F | - | - | - |
| 1001 | 528186 | 263038 | F | - | - | - |
| 1100 | 528104 | 263185 | F | - | - | - |
| 1101 | 528194 | 263200 | F | - | - | - |
| 1102 | 528146 | 263145 | F | - | - | - |
| 1103 | 528123 | 263142 | F | - | - | - |
| 1203 | 528106 | 263200 | F | - | - | - |
| 1600 | 528171 | 262666 | F | 35.812 | 33.282 | 2.53 |
| 1601 | 528162 | 262684 | F | 35.44 | 32.914 | 2.526 |
| 1700 | 528149 | 262760 | F | 34.886 | 32.466 | 2.42 |
| 1800 | 528195 | 262826 | F | - | - | - |
| 1801 | 528141 | 262843 | F | 34.289 | 31.969 | 2.32 |
| 1802 | 528200 | 262871 | F | - | - | - |
| 1803 | 528148 | 262806 | F | 34.819 | 32.179 | 2.64 |
| 1900 | 528144 | 262935 | F | - | - | - |
| 1901 | 528125 | 262935 | F | - | - | - |
| 1902 | 528197 | 262988 | F | - | - | - |
| 2000 | 528211 | 263081 | F | - | - | - |
| 2001 | 528252 | 263030 | F | - | - | - |
| 2002 | 528252 | 263057 | F | - | - | - |
| 2003 | 528270 | 263047 | F | - | - | - |
| 2004 | 528278 | 263058 | F | - | - | - |
| 2100 | 528208 | 263164 | F | - | - | - |
| 2500 | 528251 | 262550 | F | 42.102 | 40.322 | 1.78 |
| 2600 | 528212 | 262623 | F | 40.409 | 38.199 | 2.21 |
| 2601 | 528207 | 262657 | F | 40.314 | 33.554 | 6.76 |
| 2800 | 528217 | 262872 | F | - | - | - |
| 2801 | 528239 | 262887 | F | - | - | - |
| 2900 | 528272 | 262985 | F | - | - | - |
| 2901 | 528285 | 262974 | F | - | - | - |
| 2902 | 528253 | 262990 | F | - | - | - |
| 3001 | 528388 | 263044 | F | - | - | 2.18 |
| 3002 | 528367 | 263045 | F | - | - | 2.67 |
| 3101 | 528399 | 263128 | F | - | - | 2.11 |
| 3102 | 528371 | 263199 | F | - | - | 2.2 |
| 3103 | 528346 | 263192 | F | - | - | 2.3 |
| 3104 | 528301 | 263163 | F | - | - | 2.5 |
| 3105 | 528311 | 263180 | F | - | - | - |
| 3106 | 528307 | 263188 | F | - | - | - |
| 3500 | 528399 | 262521 | F | 50.307 | 45.557 | 4.75 |
| 3501 | 528312 | 262536 | F | 46.915 | 43.855 | 3.06 |
| 3800 | 528359 | 262875 | F | 43.115 | 41.67 | 1.445 |
| 3801 | 528376 | 262884 | F | 41.467 | 40.6 | 0.867 |
| 3802 | 528399 | 262897 | F | 40.789 | 39.3 | 1.489 |
| 3803 | 528347 | 262837 | F | - | - | - |
| 3804 | 528338 | 262852 | F | - | - | - |
| 3805 | 528395 | 262872 | F | - | - | - |
| 3806 | 528397 | 262887 | F | - | - | - |
| 3807 | 528395 | 262887 | F | - | - | - |
| 3808 | 528389 | 262882 | F | - | - | - |
| 3809 | 528384 | 262879 | F | - | - | - |
| 3810 | 528380 | 262877 | F | - | - | - |
| 3811 | 528378 | 262876 | F | - | - | - |
| 3812 | 528378 | 262879 | F | - | - | - |
| 3813 | 528396 | 262838 | F | - | - | - |
| 3814 | 528393 | 262843 | F | - | - | - |
| 3815 | 528348 | 262872 | F | - | - | - |
| 3816 | 528346 | 262875 | F | - | - | - |
| 3817 | 528340 | 262872 | F | - | - | - |
| 3818 | 528331 | 262863 | F | - | - | - |
| 3819 | 528330 | 262865 | F | - | - | - |
| 3820 | 528327 | 262864 | F | - | - | - |
| 3821 | 528373 | 262890 | F | - | - | - |
| 3822 | 528366 | 262886 | F | - | - | - |
| 3823 | 528365 | 262885 | F | - | - | - |
| 3824 | 528374 | 262835 | F | - | - | - |
| 3825 | 528366 | 262849 | F | - | - | - |
| 3826 | 528365 | 262852 | F | - | - | - |
| 3827 | 528377 | 262828 | F | - | - | - |
| 3828 | 528382 | 262820 | F | - | - | - |
| 3901 | 528399 | 262976 | F | - | - | 2 |
| 3902 | 528374 | 262980 | F | - | - | 2.16 |
| 3903 | 528372 | 262934 | F | - | - | - |
| 3904 | 528312 | 262921 | F | - | - | - |
| 3905 | 528382 | 262939 | F | 39.3 | 37.35 | 1.95 |
| 3906 | 528390 | 262915 | F | 40.384 | 38.93 | 1.454 |
| 3907 | 528385 | 262907 | F | - | - | - |
| 3908 | 528384 | 262911 | F | - | - | - |
| 4001 | 528480 | 263085 | F | 33.352 | 30.252 | 3.1 |
| 4002 | 528421 | 263055 | F | - | - | 2.25 |
| 4003 | 528421 | 263080 | F | - | - | 1.98 |
| 4004 | 528444 | 263095 | F | - | - | - |
| 4006 | 528499 | 263094 | F | - | - | - |
| 4101 | 528437 | 263191 | F | 32.444 | 29.174 | 3.27 |
| 4102 | 528463 | 263124 | F | 33.027 | 29.803 | 3.224 |
| 4103 | 528462 | 263109 | F | - | - | - |
| 4104 | 528452 | 263138 | F | - | - | - |
| 4105 | 528491 | 263177 | F | - | - | - |
| 4106 | 528489 | 263106 | F | - | - | - |
| 4203 | 528473 | 263200 | F | 31.159 | 29.739 | 1.42 |
| 4500 | 528453 | 262547 | F | 50.542 | 45.842 | 4.7 |
| 4801 | 528489 | 262893 | F | - | - | 1.8 |
| 4802 | 528488 | 262881 | F | - | - | 0.96 |
| 4803 | 528498 | 262823 | F | - | - | - |
| 4804 | 528481 | 262888 | F | - | - | - |
| 4805 | 528460 | 262876 | F | - | - | - |
| 4806 | 528423 | 262878 | F | - | - | - |
| 4807 | 528421 | 262877 | F | - | - | - |
| 4808 | 528436 | 262886 | F | - | - | - |
| 4809 | 528440 | 262887 | F | - | - | - |
| 4810 | 528443 | 262889 | F | - | - | - |
| 4811 | 528405 | 262874 | F | - | - | - |
| 4812 | 528430 | 262845 | F | - | - | - |
| 4813 | 528433 | 262846 | F | - | - | - |
| 4814 | 528421 | 262841 | F | - | - | - |
| 4815 | 528426 | 262833 | F | - | - | - |
| 4816 | 528430 | 262826 | F | - | - | - |
| 4817 | 528417 | 262862 | F | - | - | - |
| 4818 | 528404 | 262857 | F | - | - | - |
| 4819 | 528414 | 262853 | F | - | - | - |
| 4820 | 528415 | 262849 | F | - | - | - |
| 4821 | 528427 | 262857 | F | - | - | - |
| 4822 | 528417 | 262854 | F | - | - | - |
| 4901 | 528461 | 262979 | F | 36.239 | 34.144 | 2.095 |
| 4902 | 528448 | 262993 | F | - | - | 1.95 |
| 4903 | 528424 | 262948 | F | - | - | 2.15 |
| 4904 | 528409 | 262952 | F | - | - | 2.07 |
| 5101 | 528532 | 263181 | F | - | - | - |
| 5102 | 528569 | 263131 | F | - | - | - |
| 5103 | 528518 | 263163 | F | - | - | - |
| 5104 | 528525 | 263144 | F | - | - | - |
| 5105 | 528531 | 263129 | F | - | - | - |
| 5106 | 528539 | 263110 | F | - | - | - |
| 5107 | 528510 | 263160 | F | - | - | - |
| 5801 | 528577 | 262887 | F | 34.517 | 32.837 | 1.68 |
| 5802 | 528501 | 262855 | F | - | - | - |
| 5803 | 528512 | 262836 | F | - | - | 0.9 |
| 5901 | 528525 | 262994 | F | 33.854 | 31.244 | 2.61 |
| 5902 | 528542 | 262955 | F | 34.045 | 31.935 | 2.11 |
| 5903 | 528553 | 262934 | F | - | - | 2.11 |
| 5904 | 528549 | 262965 | F | - | - | - |
| 5905 | 528580 | 262964 | F | - | - | - |
| 5907 | 528523 | 262917 | F | - | - | 2.7 |
| 0051 | 528091 | 263032 | S | - | - | - |
| 0151 | 528049 | 263123 | S | - | - | - |
| 1051 | 528176 | 263070 | S | - | - | - |
| 1053 | 528122 | 263083 | S | - | - | - |
| 1054 | 528187 | 263043 | S | - | - | - |
| 1055 | 528122 | 263046 | S | - | - | - |
| 1151 | 528153 | 263148 | S | - | - | - |
| 1152 | 528106 | 263187 | S | - | - | - |
| 1153 | 528123 | 263114 | S | - | - | - |
| 1154 | 528124 | 263144 | S | - | - | - |
| 1252 | 528191 | 263200 | S | - | - | - |
| 1253 | 528109 | 263201 | S | - | - | - |
| 1851 | 528143 | 262841 | S | - | - | - |
| 1852 | 528198 | 262824 | S | - | - | - |
| 1853 | 528193 | 262898 | S | - | - | - |

| Manhole Reference | Easting | Northing | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|---|---|
| 1951 | 528127 | 262937 | S | - | - | - |
| 1952 | 528146 | 262937 | S | - | - | - |
| 1953 | 528191 | 262902 | S | - | - | - |
| 2051 | 528253 | 263027 | S | - | - | - |
| 2052 | 528256 | 263058 | S | - | - | - |
| 2053 | 528210 | 263084 | S | - | - | - |
| 2054 | 528274 | 263047 | S | - | - | - |
| 2151 | 528207 | 263160 | S | - | - | - |
| 2851 | 528234 | 262825 | S | - | - | - |
| 2852 | 528201 | 262853 | S | - | - | - |
| 2951 | 528254 | 262993 | S | - | - | - |
| 2952 | 528275 | 262987 | S | - | - | - |
| 2953 | 528285 | 262977 | S | - | - | - |
| 2954 | 528232 | 262920 | S | - | - | - |
| 2955 | 528228 | 262972 | S | - | - | - |
| 2956 | 528199 | 262984 | S | - | - | - |
| 2957 | 528200 | 262909 | S | - | - | - |
| 3051 | 528344 | 263001 | S | - | - | - |
| 3052 | 528384 | 263045 | S | - | - | 2.03 |
| 3053 | 528359 | 263053 | S | - | - | 1.93 |
| 3151 | 528347 | 263195 | S | - | - | 1.05 |
| 3152 | 528301 | 263166 | S | - | - | 2.33 |
| 3850 | 528360 | 262878 | S | 43.115 | 41.48 | 1.635 |
| 3851 | 528374 | 262886 | S | 41.896 | 39.93 | 1.966 |
| 3854 | 528396 | 262898 | S | 40.721 | 38.7 | 2.021 |
| 3855 | 528363 | 262846 | S | - | - | - |
| 3856 | 528374 | 262840 | S | - | - | - |
| 3857 | 528384 | 262818 | S | - | - | - |
| 3858 | 528379 | 262864 | S | - | - | - |
| 3859 | 528347 | 262861 | S | - | - | - |
| 3860 | 528330 | 262853 | S | - | - | - |
| 3861 | 528387 | 262877 | S | - | - | - |
| 3862 | 528375 | 262870 | S | - | - | - |
| 3863 | 528374 | 262875 | S | - | - | - |
| 3864 | 528350 | 262876 | S | - | - | - |
| 3865 | 528336 | 262868 | S | - | - | - |
| 3866 | 528323 | 262861 | S | - | - | - |
| 3867 | 528373 | 262888 | S | - | - | - |
| 3868 | 528367 | 262899 | S | - | - | - |
| 3869 | 528390 | 262864 | S | - | - | - |
| 3870 | 528381 | 262862 | S | - | - | - |
| 3871 | 528397 | 262838 | S | - | - | - |
| 3872 | 528396 | 262852 | S | - | - | - |
| 3873 | 528391 | 262848 | S | - | - | - |
| 3874 | 528396 | 262873 | S | - | - | - |
| 3951 | 528375 | 262983 | S | - | - | 1.98 |
| 3952 | 528314 | 262921 | S | - | - | - |
| 3953 | 528366 | 262933 | S | - | - | - |
| 3954 | 528307 | 262906 | S | - | - | - |
| 3955 | 528380 | 262940 | S | 39.3 | 37.8 | 1.5 |
| 3956 | 528389 | 262911 | S | 40.535 | 38.26 | 2.275 |
| 3957 | 528382 | 262933 | S | 39.613 | 37.85 | 1.763 |
| 3958 | 528382 | 262913 | S | - | - | - |
| 3959 | 528386 | 262910 | S | - | - | - |
| 3960 | 528388 | 262903 | S | - | - | - |
| 4051 | 528418 | 263057 | S | - | - | 1.19 |
| 4151 | 528501 | 263195 | S | 7.555 | 6.345 | 1.21 |
| 4850 | 528462 | 262887 | S | - | - | - |
| 4851 | 528466 | 262897 | S | - | - | - |
| 4852 | 528414 | 262863 | S | - | - | - |
| 4853 | 528408 | 262876 | S | - | - | - |
| 4854 | 528418 | 262874 | S | - | - | - |
| 4855 | 528403 | 262885 | S | - | - | - |
| 4856 | 528429 | 262865 | S | - | - | - |
| 4857 | 528456 | 262879 | S | - | - | - |
| 4858 | 528409 | 262858 | S | - | - | - |
| 4859 | 528409 | 262875 | S | - | - | - |
| 4860 | 528447 | 262891 | S | - | - | - |
| 4861 | 528432 | 262882 | S | - | - | - |
| 4951 | 528446 | 262993 | S | - | - | 1.82 |
| 4952 | 528422 | 262950 | S | - | - | 1.98 |
| 4953 | 528410 | 262954 | S | - | - | 1.78 |
| 4954 | 528401 | 262978 | S | - | - | 1.92 |
| 4955 | 528491 | 262990 | S | - | - | - |
| 5050 | 528585 | 263061 | S | - | - | - |
| 5152 | 528550 | 263123 | S | - | - | - |

| Manhole Reference | Easting | Northing | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|---|---|