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MR ADRIAN SHOOTER

THE BEECHES AT STEEPLE ASTON

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

MARCH 2019

wardell armstrong

Wardell Armstrong
2 Devon Way, Longbridge, Birmingham, West Midlands, B31 2TS, United Kingdom
Telephone: +44 (0)121 580 0909 www.wardell-armstrong.com

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MARCH 2019

PREPARED BY:

Adriana Garcia Engineer

REVIEWED BY:

Kerry Whitehouse Associate Director

APPROVED BY:

Graham Whitehouse Technical Director

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EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) & Drainage Strategy is part of a suite of documents that supports the outline planning application by Mr Adrian Shooter, for the erection of up to 8 dwellings with all matters reserved except the means of access on to Heyford Road at the Beeches in the village of Steeple Aston within the administrative area of Cherwell District Council in Oxfordshire.

The development covers a total area of approximately 1.34 hectare. The site currently comprises a large residential house with surrounding green spaces. The proposed work involves the construction of 8 residential dwellings with associated infrastructure on land surrounding the existing house.

This FRA & Drainage Strategy assesses the risk of flooding from all sources, including from fluvial, tidal, surface water, groundwater, existing and proposed drainage infrastructure and other artificial sources in accordance with the National Planning Policy Framework. The Site is located wholly within Flood Zone 1 (low risk of fluvial and tidal flooding) and is at low risk of flooding from all other sources.

To ensure that the development does not have any adverse offsite impacts and increases flood risk elsewhere it is also necessary to demonstrate that the sustainable drainage of surface water and foul drainage from the proposed development can be achieved. This FRA & Drainage Strategy demonstrates the principles of surface water drainage to be adopted, which ensure that surface water runoff is sustainably managed and disposed of at greenfield runoff rates. In order to achieve this restriction, the use of on plot lined soakaways and permeable access road and drives are proposed for the development which will serve the highways and residential areas.

Preliminary infiltration tests have not been carried out to date. However, based on the geology of the site, it is believed that the ground has potential for infiltration. Therefore, the drainage strategy for the development is to dispose of surface water via infiltration.

Foul water will be connected to the existing Thames Water sewer network. A pumping station at the Beeches will pump the sewage from the development to the Thames Water nearest manhole (MH 7301) just north in Heyford Road. Thames Water have confirmed that there is capacity within the existing network to receive flows from this development.

The impact of climate change has been considered throughout this assessment, both when considering flood risk and in designing the surface water drainage system. The Proposed

Development is therefore considered to be safe and appropriate in this regard and can be suitably drained for the lifetime of the development.

1 INTRODUCTION

1.1.1 Wardell Armstrong was instructed by Mr Adrian Shooter on behave of their client Adrian Shooter to produce a Flood Risk Assessment (FRA) & Drainage Strategy for the erection of up to 8 dwellings with all matters reserved except the means of access on to Heyford Road at the Beeches in the village of Steeple Aston.

1.1.2 This report assesses the flood risk at the Site from all sources in accordance with the National Planning Policy Framework and details the proposed foul and surface water drainage strategy. The potential for Sustainable Drainage Systems (SuDS) will also be discussed and suitable features proposed.

1.2 Structure of Report

1.2.1 The purpose of this report is to provide a technical appraisal of the flood risk pre and post development by assessing all potential sources of flood risk. In addition, this report provides a comprehensive site wide surface water and foul drainage strategy, demonstrating the principles of sustainable surface water management and foul treatment disposal. This report will form part of a larger suite of information to support an outline planning application for the proposed development of the site.

1.2.2 This report describes the results of the assessment and takes into account the recommendations of National Planning Policy Framework (NPPF) published in March 2012 and updated by the Ministry of Housing, Communities and Local Government (MHCLG) in February 2019. This report has been developed through consultation of Thames Water.

1.2.3 The desk study comprises existing site information, including a topographical survey, existing flood risk, ground investigations, geological and other available mapping, and the development proposals. Information from the following sources has been used:

- The Environment Agency (EA);
- Cherwell District Council (CDC);
- Oxfordshire County Council (OCC);
- The British Geological Survey (BGS); and
- Thames Water.

1.3 Acknowledgements

1.3.1 Within this report, data from the BGS website has been 'Reproduced with the permission of the British Geological Survey © NERC. All Rights Reserved'. Reproduction of any BGS materials does not amount to an endorsement by NERC or any of its employees of any product or service and no such endorsement should be stated or implied.

1.3.2 Data from the Environment Agency has also been used in this report. Flood zone data is now classed as Open Data. 'Open Data can be accessed, used and shared by anybody. It allows access to our data under the Open Government Licence – free of charge and free of restriction, even for commercial use.'

2 EXISTING SITE CONDITIONS

2.1 The Site and Surrounding Area

2.1.1 The 1.34-hectare (ha) site is located to the south of Steeple Aston. The nearest postcode is OX25 4SN and an approximate grid reference at the centre of the Site is SP 47689 25234. The Site is wholly located within the administrative area of Cherwell District Council in Oxfordshire.

2.1.2 The site is located at the south edge of the village and bounded by agricultural land to the south, west and north-west and to the east and north-east by residential properties and Heyford Road. Within the boundaries of the site to the east there is a large residential property. An approximate 1 mile long private light railway currently borders the garden of the site resembling an eight shape, there is also a station, and various small buildings. The Site is roughly rectangular with a projection to the east where the access drive to the existing house meets Heyford Road, Refer to Figure 1 for a Site Boundary Plan.

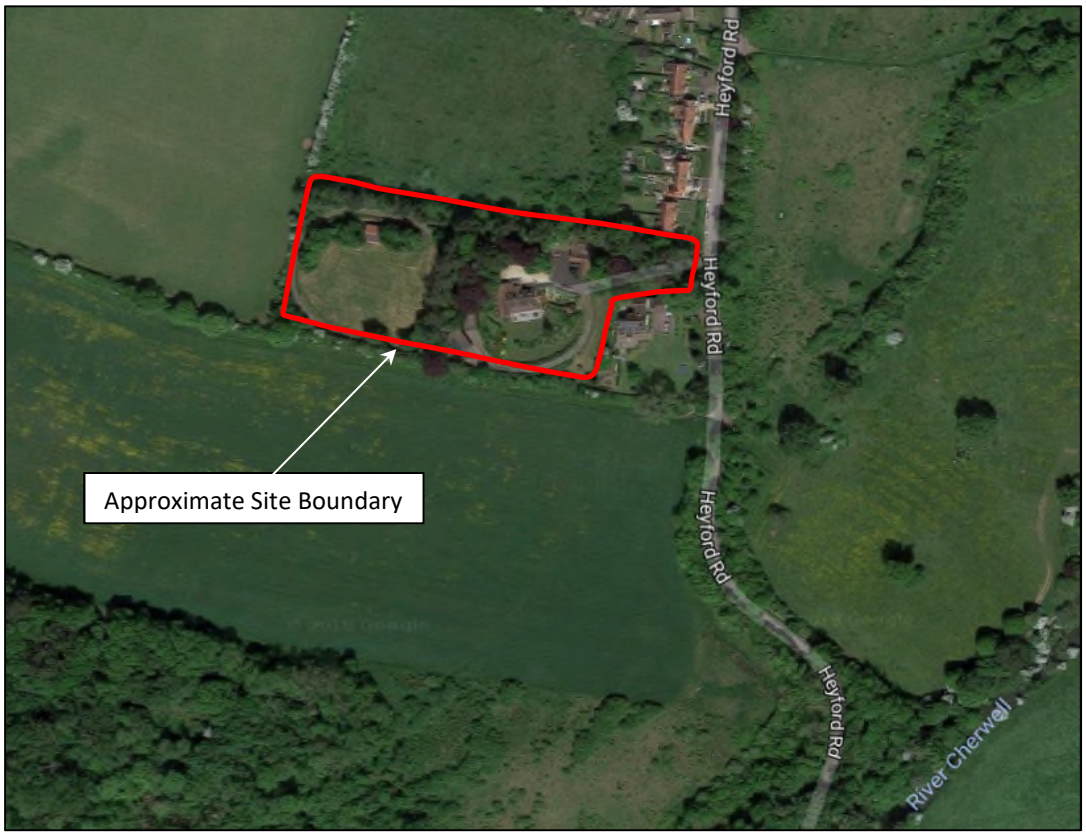


Figure 1: Aerial Image Showing the Approximate Site Boundary (Source: Google - January 2019)

2.1.3 A Topographical Survey was completed by Interlocks Surveys Limited in January 2019, which show levels to vary between approximately 102m AOD towards the east of the site where the access drive is located, rising to approximately 114 AOD, please refer to drawing 190001 for details.

2.2 Proximity to Watercourses

2.2.1 There are no open watercourses or natural water features present within the site boundary. The closest main river to the site is the River Cherwell approximately 300 metres south east from the proposed site boundary flowing south through Oxfordshire.

2.2.2 The Oxford canal is located approximately 800m to the South-East of the Site.

2.3 Geology and Ground Conditions

2.3.1 Online mapping produced by the BGS has been reviewed as part of this report. The mapping indicates that bedrock geology underlying the Site comprises two different types of Sandstone; to the west of the site the Sandstone is Horsehay Sand Formation and to the East (directly underneath the existing building) is Northampton Sand Formation. BGS does not hold records of the Superficial geology of the site. Therefore, the site may have potential for infiltration. See records included in Appendix A.

2.3.2 There is a 15.24m deep borehole near the site boundary (Borehole ref. SP42NE37). There are no details of the soil strata, nonetheless the records described it as '*probably sited on Clypeus Grit'*. The borehole log indicates that water was found at a depth of 26 feet (7.9m). There is another borehole 250m north of the site in the NR.WAR Memorial, this borehole is 46.33m and recorded Lower Estuarine Series, Northampton Sand, Upper Lias and Marlstone Rockbed (Borehole ref. SP42NE36). See records included in Appendix A.

3 ASSESSMENT OF FLOOD RISK

3.1.1 The main sources of flooding identified by the Planning Practice Guidance (PPG) are '…from rivers and the sea, directly from rainfall on the ground (pluvial), surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources'

3.2 Fluvial Flooding

3.2.1 Fluvial (river) flooding occurs when the capacity of watercourses (including streams, brooks and ditches etc.) are exceeded due to intense or prolonged rainfall events. The Environmental Agency have produced mapping to indicate areas which may be at risk of fluvial flooding, called Flood Zones, depicted on the Flood Map for Planning.

3.2.2 According to the Flood Map for Planning, as shown in Figure 2, the Site is located entirely within Flood Zone 1 and as such is at a low probability of flooding from rivers and seas.

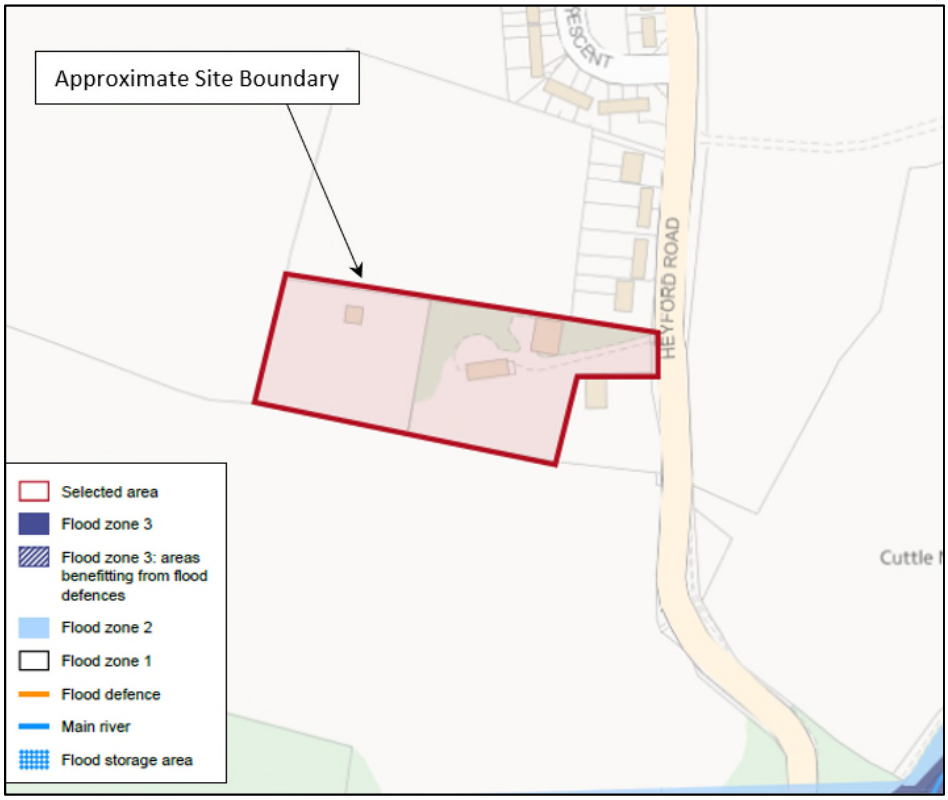


Figure 2 – Flood Map for Planning (Rivers and Sea)
(Source: http://maps.environment-agency.gov.uk)

3.3 Tidal Flooding

3.3.1 Tidal flooding is caused by exceptionally high sea levels and extreme wave heights. Tidal flooding is incorporated into the Environment Agency's Flood Map for Planning and Flood Zone designation.

3.3.2 The Site is not considered to be a risk from tidal flooding.

3.4 Pluvial/Surface Water Flooding

3.4.1 Surface water flooding is caused by rain falling onto surfaces which do not reach watercourses or drainage infrastructure. The Environment Agency's 'Risk of Flooding from Surface Water' Map examines the risk of flooding from surface water.

3.4.2 The likelihood of surface water flooding is split into four categories; 'Very Low', 'Low', 'Medium' and 'High Risk'. The 'Very Low' category indicates areas that have a chance of flooding of less than 1 in 1000 (0.1%) each year. 'Low' risk is defined as an area that has a chance of flooding of between 1 and 1,000 (0.1%) and 1 in 100 (1%) in any year with a depth of water between 0-300mm. The 'Medium' risk category is defined as an area that has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%) with a depth of water between 300mm-900mm, and the 'High' risk category has a chance of flooding of greater than 1 in 30 (3.3%) with a depth of water of over 900mm.

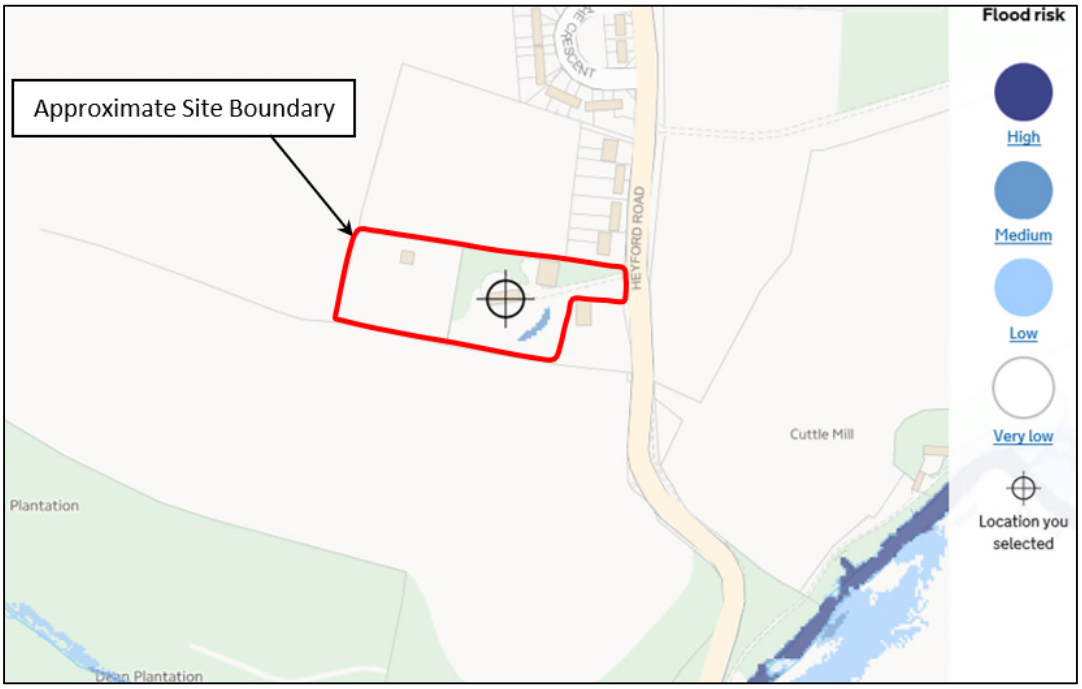


Figure 3 – Risk of Flooding from Surface Water
(*Source:* *flood-warning-information.service.gov.uk/long-term-flood-risk)*

3.4.3 The Environment Agency's 'Risk of Flooding from Surface Water' mapping is shown in Figure 3. Surface water flood risk shown by the Environment Agency mapping identifies the site to be at very low risk. The map shows a small area of localised flooding within the development boundary, just south east of the existing house, it is believed that this is due to a depression on the surface, when the site is developed this will be collected in the surface water network serving the site.

3.4.4 Surface water flooding is therefore not considered to be a risk at this Site.

3.5 Groundwater Flooding

3.5.1 Groundwater flooding can occur anywhere where groundwater levels rise above the ground surface. Groundwater flooding can be difficult to predict and identify, and is often mistaken for surface water flooding.

Source Protection Zones

3.5.2 Groundwater provides a third of drinking water in England and Wales, and maintains the flow in many of our rivers. The Environment Agency have identified Source Protection Zones (SPZ's) for 2,000 groundwater sources such as springs, boreholes and wells used for the public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area – the closer the activity the greater the risk. The maps show three main zones - Inner (Zone 1), Outer (Zone 2) and Total Catchment (Zone 3) and a fourth zone of special interest (Zone 4), which occasionally applies to a groundwater source.

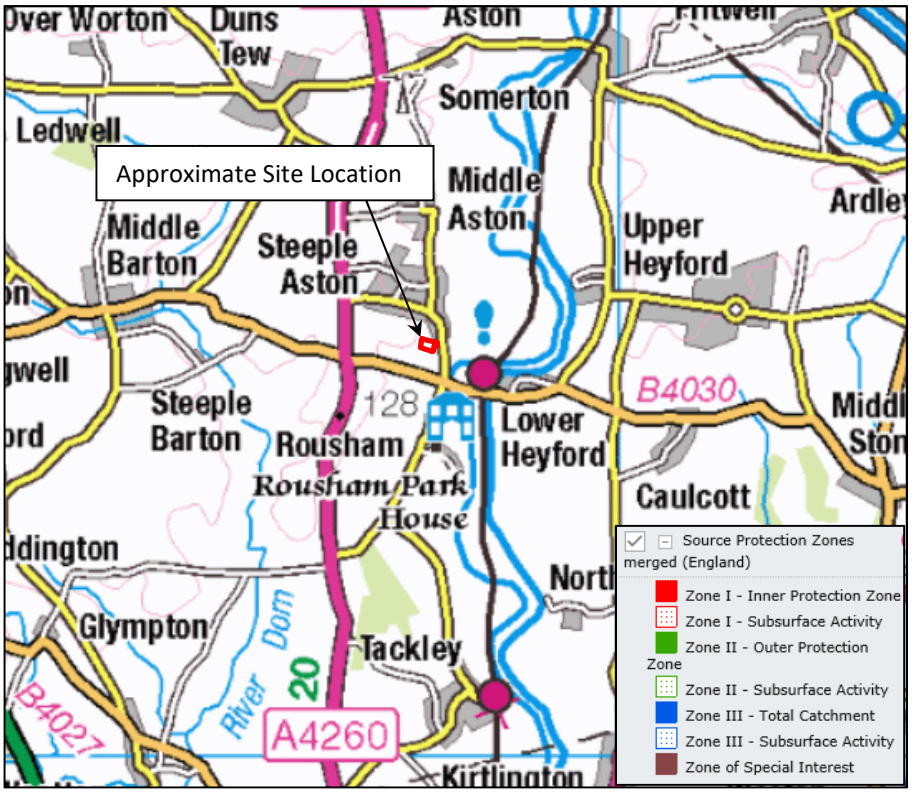


Figure 4 – Groundwater Source Protection Zones
(Source: https://magic.defra.gov.uk/MagicMap.aspx)

3.5.3 According to Environment Agency mapping, the Site is not within an area of groundwater SPZ (Figure 4).

Aquifers

3.5.4 Aquifers are underground layers of water-bearing permeable rock or drift deposits from which groundwater can be extracted. Aquifer designations reflect their importance in terms of groundwater as a resource (drinking water supply), but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data as shown on Environment Agency mapping is based on geological mapping provided by the BGS, which is updated regularly to reflect ongoing improvements.

3.5.5 The vulnerability of an aquifer is based on how contaminants released at the soil surface are transported down to the water table taking account of protective layers such as soils, drifts and unsaturated zones.

3.5.6 Figure 5 shows the aquifer designation bedrock geology for the site. According to the map the site is underlain by a Secondary Aquifers A. This aquifer designation means that is a "*…permeable strata capable of supporting water supplies at a local rather*

than strategic scale and in some cases forming an important source of base flow to rivers".

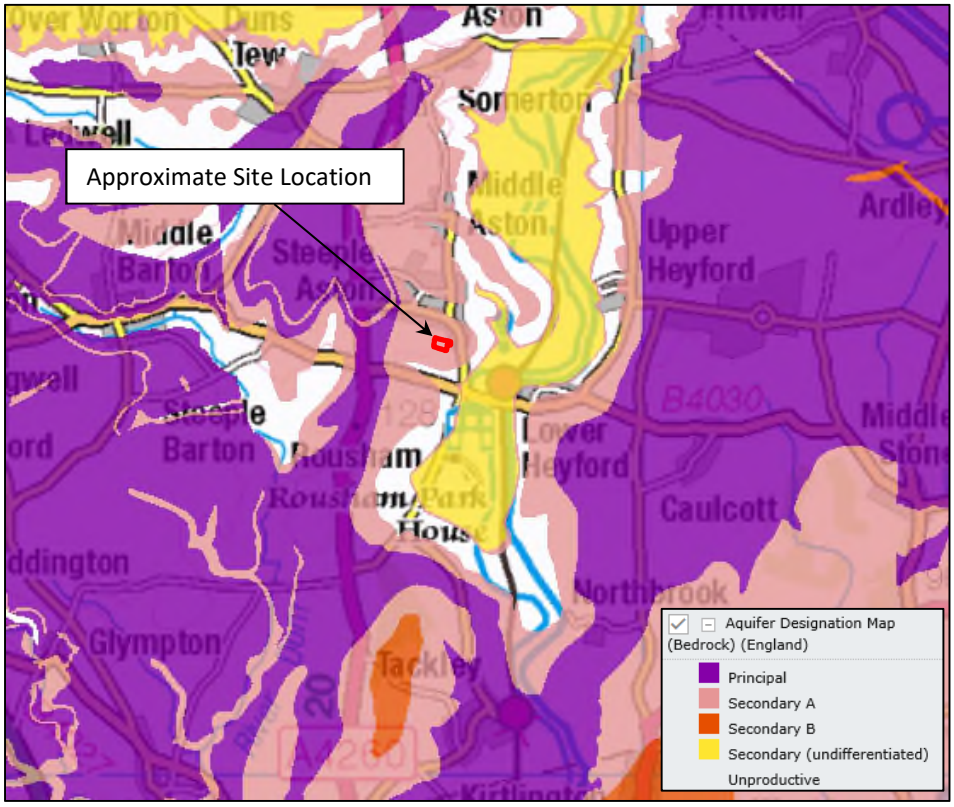


Figure 5 – Aquifer Designation Maps (Bedrock)
(*Source: https://magic.defra.gov.uk/MagicMap.aspx*)

3.5.7 There are no records of groundwater flooding affecting this Site.

3.5.8 Groundwater flooding is not considered to be a risk at this Site.

3.6 Existing Sewers and Drains

3.6.1 Foul and Surface water sewers are at risk of surcharging during extreme rainfall events with flooding occurring principally from manholes and gullies. Surcharging sewers can result in overland flow, which depending on the topography, can potentially pose a flood risk to properties.

3.6.2 Records from Thames Water show that there are no public surface water sewers in the vicinity of the Site.

3.6.3 The closest public foul sewer network is in Hayford Road, approximately 120m north from site the boundary flowing in a north westerly direction towards the Steeple Aston village.

3.6.4 According with Oxfordshire County Council Preliminary Flood Risk Assessment Report, the only site within the Cherwell District that has experienced sewer flooding problems is Spiceball Park Road in Bambury.

3.6.5 The site is considered to be at low risk of flooding from existing sewers and drains.

3.7 Reservoirs, Canals and Lakes

3.7.1 Flooding from reservoirs, canals and lakes occurs when their associated dams, embankments or other retaining structures fail or are breached.

3.7.2 The Oxford canal is located approximately 800m to the south-east of the site in lower lying land and therefore is not considered to pose a risk.

3.7.3 The EA long term risk of flooding from reservoir map in Figure 6 shows that the site is at low risk of flooding from reservoirs, canals and lakes.

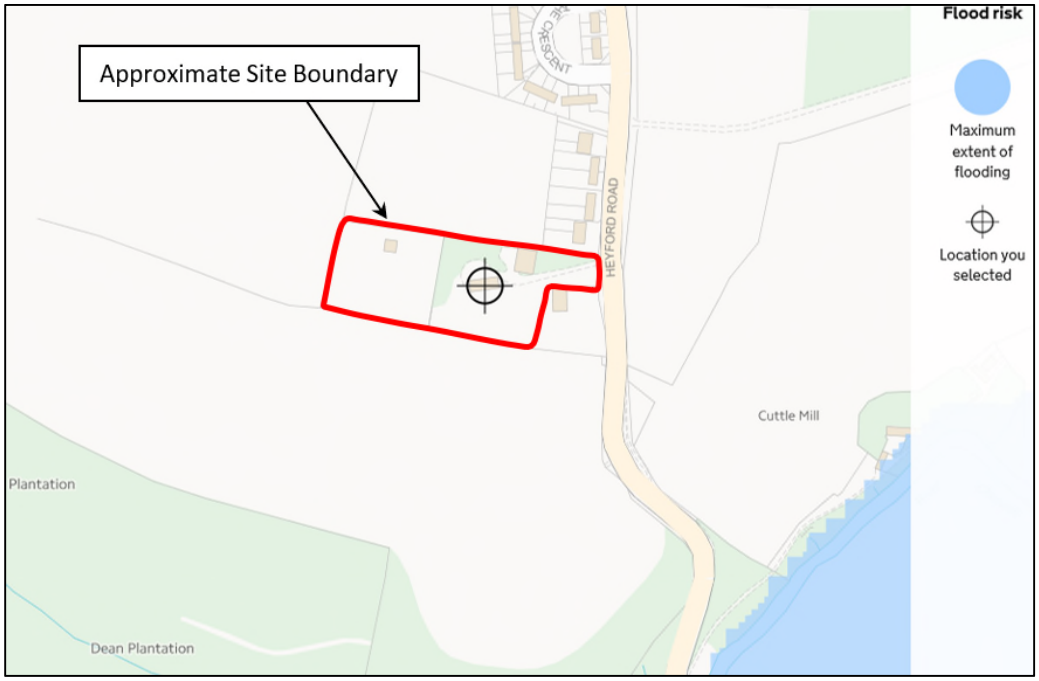


Figure 6 – Risk of Flooding from Reservoirs
(*Source: flood-warning-information.service.gov.uk/long-term-flood-risk)*

3.8 Other Artificial Sources

3.8.1 There are no other artificial sources of flooding in the vicinity of the Site. Therefore, the risk of flooding from other artificial sources in this location is considered to be low.

3.9 Historic Flooding

3.9.1 Maps produced as part of the Oxfordshire Preliminary Flood Risk Assessment were assessed and there are no records of historic flooding on the Site from surface water,

groundwater or the Oxford canal, not even during the July 2007 flooding event which had a major impact in the county and at a wider national scale.

3.9.2 The Strategic Flood Risk Assessment for the Cherwell District summarises historic flood events in the Cherwell District. The SFRA mentions flooding in the highway in Steeple Aston in Oct-Dec 2012 and Jan-Mar 2013. The specific location of this flooding is not given and therefore is not considered to be a risk for this site.

4 BACKGROUND AND KEY DOCUMENTS

4.1 National Planning Policy

4.1.1 The National Planning Policy Framework (NPPF) was published in 2012 and revised by the Ministry of Housing, Communities and Local Government (MHCLG) in February 2019. It sets out the Government's national policies on flood risk management in relation to land use planning in England.

4.1.2 NPPF is accompanied by Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change' which was published in March 2014. PPG is a web-based resource which advises how planning can take account of the risks associated with flooding and coastal change, both in plan making and the planning application process.

4.1.3 This section will review the risk of flooding at the site from all sources, both pre- and post-development. Reference will be made to local and strategic policies and documents as relevant.

4.2 Flood Zones

4.2.1 The Environment Agency has published various maps identifying areas at risk of flooding from fluvial, tidal, pluvial / overland flow, reservoirs and groundwater. These maps are based on improved hydraulic modelling and detailed local data and are published on the Environment Agency website. 'Flood Zones' are designated based on their predicted flood risk (Table 1).

Table 1: Flood Zones extracted from Table 1 of the PPG: Flood Risk and Coastal Change

Flood Zone	Flood Zone Classification	Description
Flood Zone 1	Low Probability	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%)
Flood Zone 2	Medium Probability	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year
Flood Zone 3	High Probability	This zone comprises land assessed as having a 1 in 100 or greater annual probability or river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5% in any year
Flood Zone 3b	Functional Floodplain	The zone comprises land where water has to flow or be stored in times of flood

4.2.2 The PPG states that all development within Flood Zones 2 or 3 and/or are over 1 hectare in size must be accompanied by a site-specific FRA undertaken as part of the planning application process.

4.2.3 As previously discussed in Section 3.1.2 Environment Agency mapping indicates that the Proposed Development is located wholly within Flood Zone 1. However, as the Site is over 1 ha, a FRA needs to be undertaken on this basis.

4.3 Description of Proposed Development

4.3.1 The development of The Beeches at Steeple Aston will provide residential accommodation for up to 8 dwellings with associated infrastructure including a footpath and open spaces, car parking and vehicular access. The proposed site plan indicates that six of the properties will be built in the grounds west to the existing property and two more will be located north east of the existing house across the driveway. Refer to drawing 372A01_101 - Indicative Site Plan for details.

4.3.2 Indicative proposed areas are as follows:

- Total Indicative Site Area – 1.34ha
- Existing Property including new double garage Approx. Area – 0.041ha
- Driveway Existing house – 0.034ha
- Residential Properties including drives Approx. Area – 0.212ha
- Access Road Approx. Area – 0.166ha
- Gardens and public open space – 0.887ha

4.4 Flood Risk Vulnerability

4.4.1 Table 2 of the PPG identifies the Flood Risk Vulnerability Classification of development types. Development types are classed as ‘Essential Infrastructure’, ‘Highly Vulnerable’, ‘More Vulnerable’, ‘Less Vulnerable’ and ‘Water Compatible Development’ depending on their use and vulnerability.

4.4.2 ‘More Vulnerable’ development includes ‘Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.’ It also includes ‘Non-residential uses for health services, nurseries and educational establishments.

4.4.3 As residential dwellings are proposed, the Proposed Development is considered to be ‘More Vulnerable’ in accordance with the NPPF.

4.5 The Sequential & Exception Tests

4.5.1 The PPG details the Sequential and Exception Tests. The Sequential Test is a planning tool which aims to steer new development to areas with the lowest probability of flooding (Flood Zone 1, followed by Flood Zone 2). The PPG states that '*Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required'.* The Flood Zones and Strategic Flood Risk Assessments (SFRA's) are the starting point for applying the Sequential Test.

4.5.2 Table 3 of the PPG identifies when the Exception Test should be applied, and is reproduced in Table 2 below:

Table 2: Flood Risk Vulnerability Classification (Department for Local Communities for Local Communities & Local Government, 2015)

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	X	Exception Test Required	✓	✓
Zone 3b	Exception Test Required	X	X	X	✓

Notes
✓ Development is appropriate
× Development should not be permitted

4.5.3 As this 'More Vulnerable' development is located wholly within Flood Zone 1, the Sequential Test is not required and is therefore sequentially preferable. According to PPG Table 3, 'More Vulnerable' uses are considered appropriate for Flood Zone 1 without the need to apply the Exception Test.

4.6 Preliminary Flood Risk Assessment

4.6.1 Preliminary Flood Risk Assessments (PFRA's) were a requirement of the Flood Risk Regulations (2009), and were produced by Lead Local Flood Authorities (LLFA's). Their

purpose is to provide information on significant historical flood events and summarise future flood risk from all sources of flooding.

4.6.1 The PFRA for Oxfordshire County Council was completed in June 2011 by JBA Consulting and reviewed in 2017. The Addendum published By Oxfordshire County Council in 2017 estates that "…there is no change to the assessment of risk following the review". Some key points of the PFRA relevant to this Site include:

- The PFRA for Oxfordshire County Council includes 5 major flooding events with adverse consequences in Oxfordshire: February 2001, October 2006, January 2007, July 2007 and June 2008. During these events 2,824 properties were affected, mainly all of them during the July 2007.
- A review of Indicative Flood Risk Areas in Oxfordshire identified 5 flood risk 'clusters': Reading (a small part of the Reading cluster is in Oxfordshire), Oxford (named Barton by the analysis), Banbury, Witney and Abingdon.
- The PFRA estimates that approximately 37,900 people in Oxfordshire are at risk of flooding during a rainfall event with a 1 in 200 annual chance, with flooding to a depth >0.3m depth.

4.6.2 The PFRA does not highlight Steeple Aston as a site at risk of flooding.

4.7 Strategic Flood Risk Assessment

4.7.1 The NPPF states that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA), which refines information regarding the probability of flooding, taking other sources of flooding and the impacts of climate change into account. SFRA's provide the foundation for applying the Sequential Test, on the basis of the flood zones.

4.7.2 Level 1 SFRA's examine flood risk issues at a borough wide scale. They also identify the requirement for a more detailed analysis of flood risk at key locations as part of a Level 2 SFRA. Level 2 SFRA's provide a more detailed analysis of flood risk at key locations, building on the work of the Level 1 SFRA, it also identifies sites for potential allocation within the emerging District Plan.

4.7.3 The Level 1 and 2 SFRA for Cherwell District Council was completed by AECOM Infrastructure & Environment UK Limited in May 2017. Some key points relevant to this Site include:

- The summary of historic flood events in the Cherwell District contains records of flooding in the highway in Steeple Aston in Oct-Dec 2012 and Jan-Mar 2013.

4.7.4 The SFRA does not raise any concerns for the Site.

4.8 Local Flood Risk Management Strategy for Oxfordshire

4.8.1 Local Flood Risk Management Strategies (LFRMS) are produced by LLFA's. The strategy should assess local flood risk, set out objectives to manage local flooding, list costs and benefits of measures proposed to meet those objectives, and detail how the measures will be funded.

4.8.2 The LFRMS for Oxfordshire was developed by Oxfordshire County Council in partnership with the City and District Councils and the EA. However, Oxfordshire County Council remains the lead authority in developing and delivering the strategy. The key principles of the OCC LFRMS include:

- Oxfordshire largely falls within the areas of low to moderate flood risk.
- Oxfordshire County Council will understand and manage flood risk by:
  - Working in partnership with other risk management authorities.
  - Having an appreciation of where flooding is likely to occur, how often and its potential impact.
  - Taking reasonable steps to reduce the probability of events occurring.
  - Identifying and implementing (where funding permits) measures that reduce the consequences of flooding when this does occur.
  - Building on the information prepared for the Preliminary Flood Risk Assessment.
  - Developing a clear picture of the flooding caused by different sources and how they interact.
  - Understanding the causes of historic flood events and understanding likely impacts in the future.

4.9 Local Development Framework

4.9.1 A Local Development Framework (LDF) is a spatial planning strategy for district councils in England and Wales. The LDF comprises of Local Development Documents (including Local Plans), Supplementary Planning Documents (SPD's), Statements of Community Involvement, and other documents as required.

Cherwell District Council Local Plan

4.9.2 The Cherwell Local Plan sets out the Council's planning framework for the district. It identifies how the district will grow and develop. The Cherwell District Local Plan was adopted in July 2015 and is valid until 2031 and sets out the long-term special vision for the District and contains policies to help deliver that vision. Planning policies for Cherwell are grouped around three themes: Developing a Sustainable local Economy (DSC), Building Sustainable Communities (BSC) and Ensuring Sustainable Development (ESD).

4.9.3 Policy ESD 1: *Mitigating and Adapting to Climate Change; The incorporation of suitable adaptation measures in new development to ensure that development is more resilient to climate change impacts will include consideration of the following:*

- *Taking into account the known physical and environmental constraints when identifying locations for development.*
- *Demonstration of design approaches that are resilient to climate change impacts including the use of passive solar design for heating and cooling.*
- *Minimising the risk of flooding and making use of sustainable drainage methods and*
- *Reducing the effects of development on the microclimate (through the provision of green infrastructure including open space and water, planting, and green roofs).*

4.9.4 Policy ESD 6: Sustainable Flood Risk Management: *The Council will manage and reduce flood risk in the District through using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where necessary the exceptions test as set out in the NPPF and NPPG. Development will only be permitted in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.*

- *In addition to safeguarding floodplains from development, opportunities will be sought to restore natural river flows and floodplains, increasing their amenity and biodiversity value. Building over or culverting of watercourses should be avoided and the removal of existing culverts will be encouraged.*
- *Existing flood defences will be protected from damaging development and where development is considered appropriate in areas protected by such defences it must*

allow for the maintenance and management of the defences and be designed to be resilient to flooding.

- *Site specific flood risk assessments will be required to accompany development proposals in the following situations:*

  a) All development proposals located in flood zones 2 or 3

  b) Development proposals of 1 hectare or more located in flood zone 1

  c) Development sites located in an area known to have experienced flooding problems

  d) Development sites located within 9m of any watercourses.

- *Flood risk assessments should assess all sources of flood risk and demonstrate that:*

  a) There will be no increase in surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event with an allowance for climate change (the design storm event)

  b) Developments will not flood from surface water up to and including the design storm event or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site.

- *Development should be safe and remain operational (where necessary) and proposals should demonstrate that surface water will be managed effectively on site and that the development will not increase flood risk elsewhere, including sewer flooding.*

4.9.5 Policy ESD 7: Sustainable Drainage Systems (SuDS)

- *All development will be required to use sustainable drainage systems (SuDS) for the management of surface water run-off.*

  Where site specific Flood Risk Assessments are required in association with development proposals, they should be used to determine how SuDS can be used on particular sites and to design appropriate systems.

  In considering SuDS solutions, the need to protect ground water quality must be taken into account, especially where infiltration techniques are proposed. Where possible, SuDS should seek to reduce flood risk, reduce pollution and provide landscape and wildlife benefits. SuDS will require the approval of Oxfordshire County Council as LLFA and SuDS Approval Body, and proposals must include an

agreement on the future management, maintenance and replacement of the SuDS features.

5 PROPOSED SURFACE WATER DRAINAGE

5.1 Principles of the Surface Water Management Strategy

5.1.1 Site-specific surface water drainage infrastructure will need to be installed to serve the development.

5.1.2 PPG requires that SuDS measures are implemented to manage surface water runoff within new developments.

5.1.3 The Non-Statutory Technical Standards for Sustainable Drainage Systems sets out general recommendations for the control of development runoff, including the requirement to ensure that runoff from the site is not increased by the development, and the requirement to manage surface water runoff from events up to and including the 1 in 100 year (including an allowance for the projected impacts of climate change).

5.1.4 PPG advises that climate change allowances should be determined with reference to the guidance provided in the Environment Agency document 'Flood Risk Assessment: Climate Change Allowances' (February 2016). As the Site is proposed for residential dwellings, the development is assumed to have a design life of 100 years.

5.1.5 In accordance with Table 2 of the February 2016 guidance, for developments with a design life extending beyond the year 2070, climate change allowances of 20% and 40% should be considered against design rainfall intensities.

5.1.6 As such it is proposed that the surface water drainage strategy will be based on a provision of surface water attenuation on site which will accommodate the 1 in 100 year plus 40% climate change rainfall event.

5.1.7 All new drainage systems will be designed and constructed in accordance with the latest version of Sewers for Adoption (SfA), currently 7th edition.

5.2 Method of Surface Water Disposal

5.2.1 The most appropriate method of surface water discharge is determined based on the hierarchy of surface water disposal as set out in Building Regulations – Approved Document H, as listed below in order of priority:

1) Infiltration;
2) Watercourse; and
3) Public Sewer.

5.2.2 Based on the geological context described in Section 2.3, infiltration is considered a viable method of surface water disposal for this site. Therefore, the drainage strategy for the development is to dispose of surface water through infiltration. Infiltration test will be required at detailed design stage to confirm the infiltration rate of the site.

5.3 Attenuation Requirements

5.3.1 An infiltration rate of $5X10^{-5}$m/s has been assumed for the purpose of this assessment.

5.3.2 To ensure that the development does not have any adverse offsite impacts and increases flood risk elsewhere surface water runoff will be sustainably managed and disposed of via infiltration. To achieve predeveloped conditions, the use of on plot lined soakaways and permeable access roads are proposed. This storage volume has been determined using MicroDrainage (Appendix B).

5.4 Lined Soakaways Requirements

5.4.1 The on-plot lined soakaways have been designed using MicroDrainage. Dimensions have been calculated as shown in Table 3. These provide the required storage volume based on a 100 Yr + 40% climate change return period storm event. Refer to the strategy drawing BM11730-002 for details.

Table 3: On-Plot Soakaways Dimensions

Location	Drainage Area (m2)	Pit Depth (m)	Ring Diameter (m)	Pit Width (m)
Plots 3 to 8	325	1.7	2.1	4.2
Plots 1 & 2	100	1.5	1.2	2.4
Garage Existing House	40	1	1	2

5.4.2 This design does not consider any storage within the pipe network and therefore additional storage volume would be attenuated on site above the 1 in 100-year + 40% climate change event.

5.5 Permeable Access Road - Infiltration Blanket Requirements

5.5.1 Infiltration blankets are proposed for access roads and the existing house driveway, these have been designed using MicroDrainage. Please refer to the drainage strategy drawing BM11730-002 for details.

5.5.2 The infiltration blankets will run under all the access road, visitor's car park spaces and the driveway of the existing house and will be 150mm deep. These will provide the

required storage volume based on a Q100 Yr + 40% climate change return period storm event.

Table 4: Infiltration Blankets Dimensions		
Location	**Drainage Area (m2)**	**Depth (m)**
Access Road	1660	0.15
Existing House Driveway	340	0.15

5.6 Sustainable Drainage Systems

5.6.1 It is a requirement of the NPPF that SuDS are used in all major development if feasible. The LLFA also strongly advocate the use of SuDS within new development as demonstrated through '*Water.People.Places A guide for master planning sustainable drainage into developments*' in the South East (2013).

5.6.2 CIRIA report C753 'The SuDS Manual' outlines the various types of SuDS, their benefits and limitations and design considerations associated with each. Not all SuDS components/methods are feasible or appropriate for all developments due to factors such as ground conditions, available space and site levels, which will influence the different methods adopted as part of a particular development.

5.6.3 Source control SuDS (e.g. water butts and/or rainwater recycling) will be considered (as appropriate). Such features will provide further betterment in terms of surface water runoff rates and volumes not accounted for in the drainage design.

5.7 Water Quality

5.7.1 The surface water drainage system which will incorporate SuDs will ensure that a sufficient level of water quality treatment is provided to ensure that the proposed development does not have any adverse impact on of the receiving network.

5.7.2 According to CIRIA C753, runoff from residential developments (roof and highway runoff) is considered to present a 'medium' source of runoff pollution, therefore at least two treatment stages will be provided within the SuDS system. The first 5mm of rainfall is known as the 'first flush' and generally has a higher pollutant load than subsequent runoff. This flow will be contained within the Site, through provision of the SuDs techniques outlined above.

5.7.3 Effective upstream pre-treatment should be provided to prevent sediments and silt loads from clogging the soakaways.

6 PROPOSED FOUL DRAINAGE STRATEGY

6.1.1 This section outlines how foul flows from the proposed development will be managed in accordance with national and regional policy requirements and best practice guidance.

6.2 Existing Foul Water Drainage

6.2.1 The closest public foul sewer is located on Heyford Road north of the site flowing in a northerly direction.

6.3 Design Foul Flows Strategy

6.3.1 The design of the foul drainage network was based on *Sewers for Adoption (7th Ed. Pre-Implementation)*. A peak flow rate of 4,000 litres per dwelling per day has been used, this equates to **0.42l/s** for 9 dwellings (8 new dwellings and the existing property).

6.3.2 The preferred point of connection is manhole 7301 located in Heyford Road. However, due to the topography of the site a pumping station (PS) will be required. According to SFA 7th edition this would be a Type 2 and would require a 10m easement from the wet well to habitable dwellings (refer to drawing BM11730-002).

6.3.3 Using actual water consumption rates, the peak flow rate has been calculated to be **0.3l/s**. This is based on the following:

- 9 dwellings;
- Water consumption of 160 litres per person per day;
- 2.7 people per property; and
- 6 Dry Weather Flow (DWF) (typical diurnal profile).
- 10% infiltration rate

6.4 Public Sewer Capacity

6.4.1 A developer enquiry has been submitted to Thames Water to confirm capacity within the existing foul water network. A response was received on 4th February 2019 and confirmed that there is sufficient sewer capacity in the network to accept the foul flows from the proposed development, therefore a point of discharge is available. their response is included in Appendix C.

7 ADOPTION AND MAINTENANCE

7.1.1 As of 6th April 2015, SuDS are a planning requirement for all 'Major Developments'. In addition, LLFA became Statutory Consultees with effect from 15th April 2015. LPA's, in considering planning applications, will consult the relevant LLFA on the management of surface water; satisfy themselves that the proposed minimum standards of operation are appropriate; and ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for the ongoing maintenance of SuDS over the lifetime of the Proposed Development.

7.2 Thames Water

7.2.1 Thames Water is the appointed water company for this area and are responsible for the operation and maintenance of existing public foul drainage and public surface water drainage network.

7.3 Oxfordshire County Council

7.3.1 OCC is the LLFA for Cherwell District Council and as such, is responsible for and has a duty to:

- Promote SuDS on all new developments;
- Review and approve all proposed SuDS;
- Ensure all proposed SuDS have appropriate adoption and maintenance arrangements;
- Comply with the Flood and Water Management Act (2010);
- Investigate significant flood events in Oxfordshire (Section 19 investigations);
- Designate structures and assets which have significant flood risk implications;
- Maintain a public register of adopted SuDS;
- Maintain a public register of designated flood risk assets;
- Consent to works affecting ordinary watercourses; and
- Carry out enforcement concerning ordinary watercourses.

7.4 Adoption and Maintenance Arrangements

7.4.1 All drainage on site, including the on-plot soakaways and drives will remain private and the access road will be offered to OCC or Cherwell District Council for adoption

subject to a Section 106 agreement and provision of a commuted sum. Alternatively, a Private Management Company may be appointed to maintain the effective operation of any SuDS features on site the funding of which will be provided through a service charge arrangement.

7.4.2 A typical maintenance schedule for on plot soakaways and permeable paving can be seen in Appendix D.

8 RESIDUAL FLOOD RISK & MITIGATION MEASURES

8.1 Finished Floor Levels

8.1.1 In accordance with Building Regulations, FFL's of new residential properties should be set at least 150mm above surrounding ground levels. This will provide some protection to properties from extreme flood events or flooding of the drainage system due to blockages or collapse etc.

8.2 Safe Access & Egress

8.2.1 All residential units will be located within Flood Zone 1 and will therefore have dry access and egress to Heyford Road during fluvial flood events up to and including up to the 1 in 1,000-year flood event.

8.3 Designing for Exceedance

8.3.1 The surface water drainage system has been designed to minimise the risk of flooding to properties in the event of exceedance of the system capacity during storm events in in excess of the design storm of 1 in 100 years including an allowance for climate change.

8.3.2 Overland flood routing during extreme rainfall events (such as the 1 in 1,000-year event) could generate shallow depths of water. Excess rainfall will be directed away from the dwellings towards rear gardens and access road following the site topography. A drop in the kerb will allow for extreme rainfall to be directed to a scrape of ground located south of the access road close to the site entrance, see Drainage Strategy Plan BM11730-002 for details, with any excess directed south to the existing drainage in Heyford Road.

9 CONCLUSIONS

9.1 Conclusions

9.1.1 This FRA and Drainage Strategy has been prepared by Wardell Armstrong to support an outline planning application for a proposed development of 8 residential properties on 1.34ha of undeveloped land surrounding an existing dwelling.

9.1.2 Environment Agency mapping indicates that the Site is located wholly in Flood Zone 1. The Site is at low risk of flooding from all other sources. The flood risk to the development is considered to be low overall. As this 'More Vulnerable' development is located wholly within Flood Zone 1, the Sequential Test is not required and the Site is therefore sequentially preferable. According to PPG Table 3, 'More Vulnerable' uses are considered appropriate for Flood Zone 1 without the need to apply the Exception Test.

9.1.3 To ensure that the development does not have any adverse offsite impacts and increases flood risk elsewhere surface water runoff will be sustainably managed and disposed of via infiltration. On site Infiltration tests have not been carried out at this stage. However, based on the geology of the site it is anticipated that infiltration is a viable option. Nevertheless, it is recommended that infiltration tests are carried out at detail design stage to confirm onsite infiltration rates.

9.1.4 In order to achieve predeveloped conditions, the use of on plot lined soakaways and infiltration blanket on access roads and drives is proposed. This has been calculated for the 1 in 100year + 40% rainfall event.

9.1.5 A Thames Water sewer capacity check has confirmed there is capacity available in the existing network to accommodate the flows from the proposed development. Foul flows will require pumping to reach the Thames Water closest manhole located in Heyford Road.

9.1.6 In conclusion, it is demonstrated that the proposals within this report are compliant with NPPF, PPG and local planning policy. It is therefore considered that on implementation of this strategy, the Proposed Development will remain safe from flood risk and can be suitably drained for the lifetime of the development.

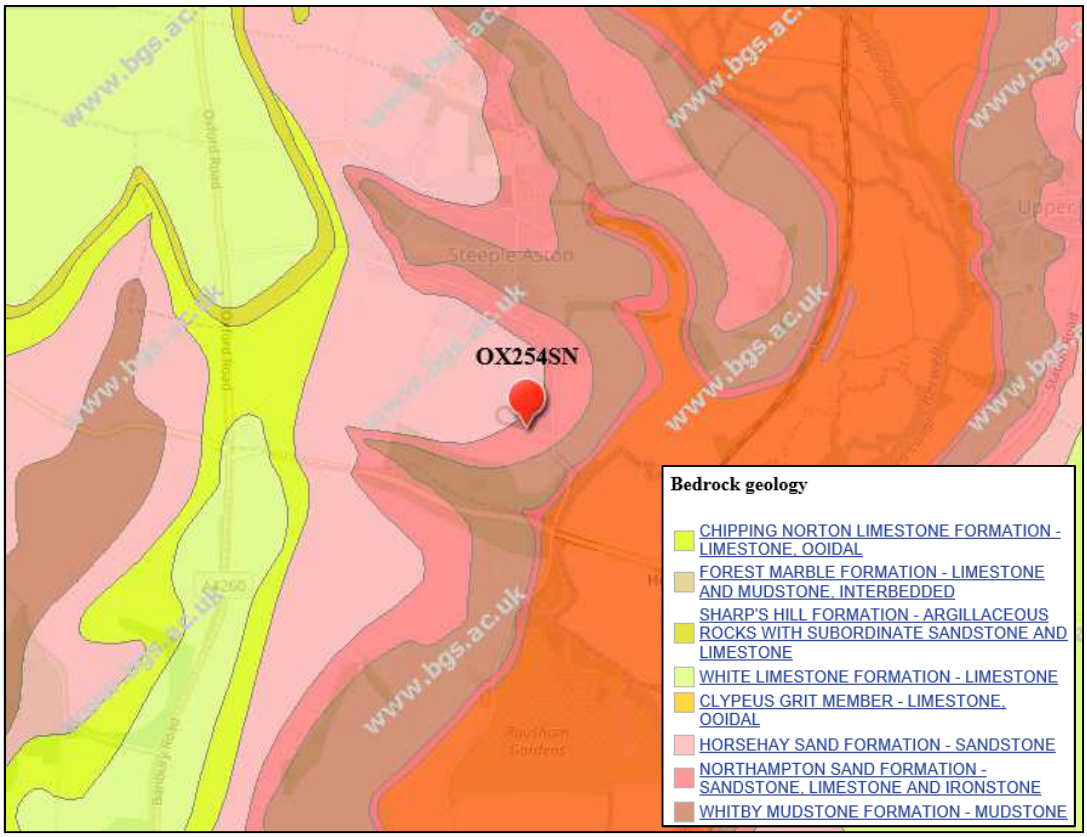
APPENDIX A

BGS Records

Appendix B – Geology

British Geological Survey

1.1 Bedrock Geology



BGS Bedrock Geology

(Source: http://mapapps.bgs.ac.uk/geologyofbritain/home.html)

- **Bedrock Geology East of Site**

1:50 000 scale bedrock geology description: Northampton Sand Formation - Sandstone, Limestone And Ironstone. Sedimentary Bedrock formed approximately 170 to 174 million years ago in the Jurassic Period. Local environment previously dominated by shallow seas.

Setting: shallow seas. These sedimentary rocks are shallow-marine in origin. They are detrital, ranging from coarse- to fine-grained (locally with some carbonate content) forming interbedded sequences.

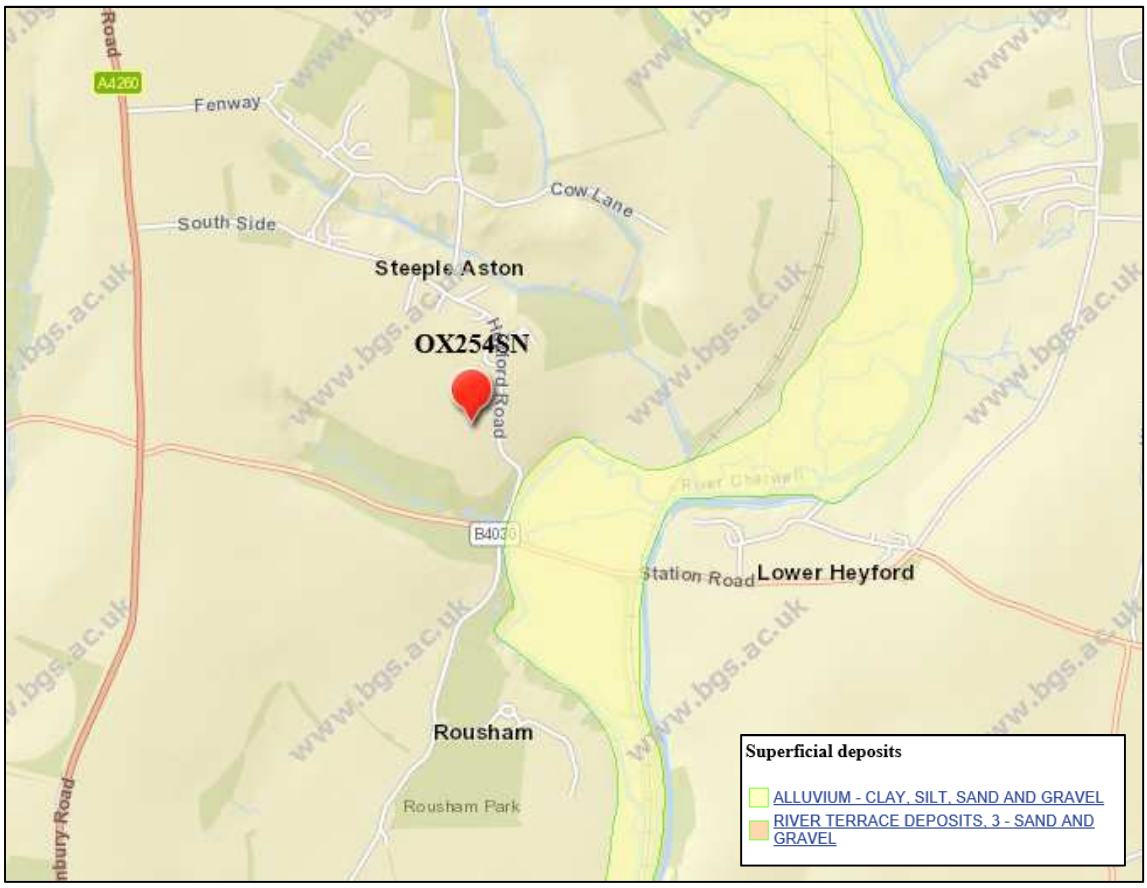
- **Bedrock Geology West of Site**

1:50 000 scale bedrock geology description: Horsehay Sand Formation - Sandstone. Sedimentary Bedrock formed approximately 166 to 170 million years ago in the Jurassic Period. Local environment previously dominated by shallow seas.

Setting: shallow seas. These sedimentary rocks are shallow-marine in origin. They are detrital, ranging from coarse- to fine-grained (locally with some carbonate content) forming interbedded sequences.

1.2 Superficial Geology

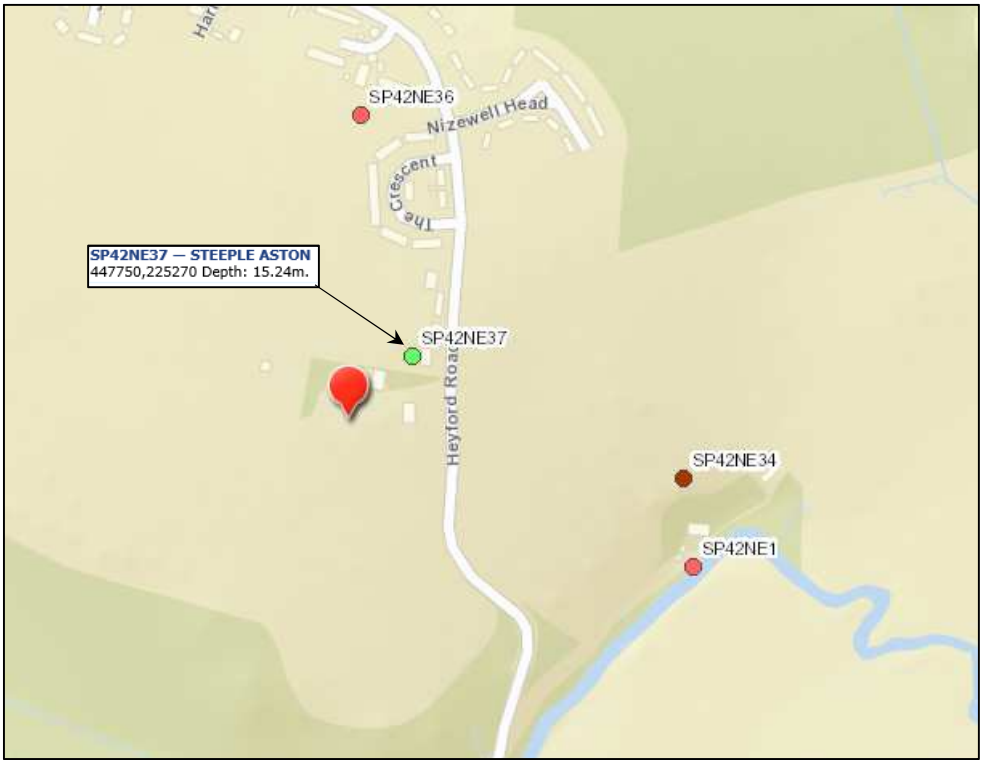
There are no records of superficial Geology for the site.



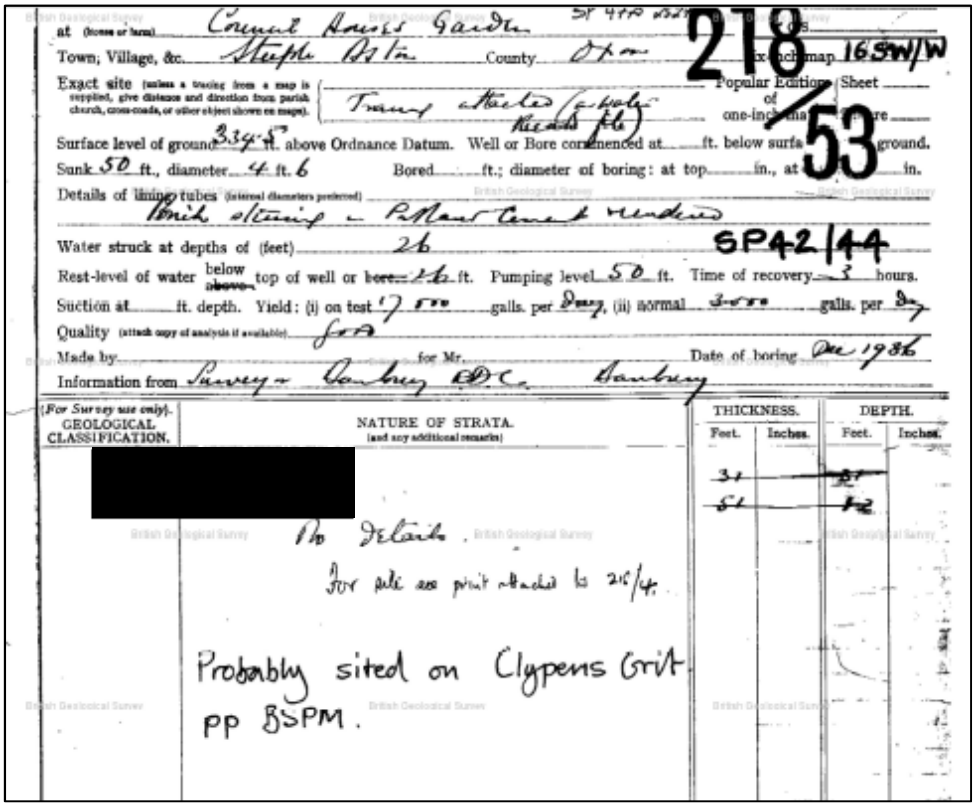
BGS Superficial Geology

(Source: http://mapapps.bgs.ac.uk/geologyofbritain/home.html)

1.3 British Geological Survey Boreholes



BGS Geology of Britain Viewer - Borehole Scan
(Source: http://mapapps.bgs.ac.uk/geologyofbritain/home.html)



BGS Borehole ref. SP42NE37
(Source: http://scans.bgs.ac.uk/sobi_scans/boreholes/331014/images/14820085.html)

APPENDIX B

MicroDrainage and Design Calculations

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 76 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.399	0.899	0.4	2.3	O K
30 min Summer	99.623	1.123	0.4	2.8	O K
60 min Summer	99.760	1.260	0.4	3.2	Flood Risk
120 min Summer	99.783	1.283	0.5	3.2	Flood Risk
180 min Summer	99.741	1.241	0.4	3.1	Flood Risk
240 min Summer	99.680	1.180	0.4	3.0	O K
360 min Summer	99.566	1.066	0.4	2.7	O K
480 min Summer	99.469	0.969	0.4	2.4	O K
600 min Summer	99.385	0.885	0.4	2.2	O K
720 min Summer	99.309	0.809	0.3	2.0	O K
960 min Summer	99.182	0.682	0.3	1.7	O K
1440 min Summer	98.993	0.493	0.3	1.2	O K
2160 min Summer	98.805	0.305	0.2	0.8	O K
2880 min Summer	98.684	0.184	0.2	0.5	O K
4320 min Summer	98.558	0.058	0.2	0.1	O K
5760 min Summer	98.541	0.041	0.1	0.1	O K
7200 min Summer	98.534	0.034	0.1	0.1	O K
8640 min Summer	98.530	0.030	0.1	0.1	O K
10080 min Summer	98.526	0.026	0.1	0.1	O K
15 min Winter	99.514	1.014	0.4	2.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.394	0.0	23
30 min Summer	90.786	0.0	35
60 min Summer	56.713	0.0	60
120 min Summer	34.218	0.0	92
180 min Summer	25.118	0.0	126
240 min Summer	20.049	0.0	160
360 min Summer	14.556	0.0	228
480 min Summer	11.596	0.0	296
600 min Summer	9.714	0.0	360
720 min Summer	8.402	0.0	426
960 min Summer	6.677	0.0	552
1440 min Summer	4.823	0.0	798
2160 min Summer	3.478	0.0	1164
2880 min Summer	2.755	0.0	1524
4320 min Summer	1.981	0.0	2208
5760 min Summer	1.566	0.0	2880
7200 min Summer	1.304	0.0	3672
8640 min Summer	1.123	0.0	4368
10080 min Summer	0.989	0.0	5048
15 min Winter	138.394	0.0	23

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.771	1.271	0.4	3.2	Flood Risk
60 min Winter	99.938	1.438	0.5	3.6	Flood Risk
120 min Winter	99.956	1.456	0.5	3.7	Flood Risk
180 min Winter	99.895	1.395	0.5	3.5	Flood Risk
240 min Winter	99.810	1.310	0.5	3.3	Flood Risk
360 min Winter	99.643	1.143	0.4	2.9	O K
480 min Winter	99.506	1.006	0.4	2.5	O K
600 min Winter	99.388	0.888	0.4	2.2	O K
720 min Winter	99.287	0.787	0.3	2.0	O K
960 min Winter	99.121	0.621	0.3	1.6	O K
1440 min Winter	98.890	0.390	0.2	1.0	O K
2160 min Winter	98.679	0.179	0.2	0.5	O K
2880 min Winter	98.561	0.061	0.2	0.2	O K
4320 min Winter	98.538	0.038	0.1	0.1	O K
5760 min Winter	98.530	0.030	0.1	0.1	O K
7200 min Winter	98.525	0.025	0.1	0.1	O K
8640 min Winter	98.521	0.021	0.1	0.1	O K
10080 min Winter	98.519	0.019	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.786	0.0	35
60 min Winter	56.713	0.0	60
120 min Winter	34.218	0.0	96
180 min Winter	25.118	0.0	134
240 min Winter	20.049	0.0	172
360 min Winter	14.556	0.0	244
480 min Winter	11.596	0.0	314
600 min Winter	9.714	0.0	382
720 min Winter	8.402	0.0	448
960 min Winter	6.677	0.0	578
1440 min Winter	4.823	0.0	828
2160 min Winter	3.478	0.0	1192
2880 min Winter	2.755	0.0	1504
4320 min Winter	1.981	0.0	2208
5760 min Winter	1.566	0.0	2872
7200 min Winter	1.304	0.0	3648
8640 min Winter	1.123	0.0	4264
10080 min Winter	0.989	0.0	5112

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.402	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.010

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.003	4	8	0.003	8	12	0.003

Model Details

Storage is Online Cover Level (m) 100.000

Lined Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.18000	Ring Diameter (m)	1.20
Infiltration Coefficient Side (m/hr)	0.18000	Pit Multiplier	2.0
Safety Factor	2.0	Number Required	1
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	98.500	Cap Infiltration Depth (m)	0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 119 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.267	0.967	0.8	7.5	O K
30 min Summer	99.523	1.223	1.0	9.4	O K
60 min Summer	99.709	1.409	1.0	10.9	Flood Risk
120 min Summer	99.760	1.460	1.1	11.3	Flood Risk
180 min Summer	99.732	1.432	1.0	11.1	Flood Risk
240 min Summer	99.681	1.381	1.0	10.7	O K
360 min Summer	99.574	1.274	1.0	9.8	O K
480 min Summer	99.482	1.182	0.9	9.1	O K
600 min Summer	99.397	1.097	0.9	8.5	O K
720 min Summer	99.319	1.019	0.9	7.9	O K
960 min Summer	99.181	0.881	0.8	6.8	O K
1440 min Summer	98.961	0.661	0.7	5.1	O K
2160 min Summer	98.727	0.427	0.6	3.3	O K
2880 min Summer	98.566	0.266	0.6	2.1	O K
4320 min Summer	98.383	0.083	0.5	0.6	O K
5760 min Summer	98.344	0.044	0.4	0.3	O K
7200 min Summer	98.337	0.037	0.3	0.3	O K
8640 min Summer	98.332	0.032	0.3	0.2	O K
10080 min Summer	98.328	0.028	0.3	0.2	O K
15 min Winter	99.390	1.090	0.9	8.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.514	0.0	24
30 min Summer	90.826	0.0	37
60 min Summer	56.713	0.0	62
120 min Summer	34.204	0.0	102
180 min Summer	25.103	0.0	134
240 min Summer	20.035	0.0	168
360 min Summer	14.542	0.0	238
480 min Summer	11.583	0.0	306
600 min Summer	9.702	0.0	374
720 min Summer	8.391	0.0	440
960 min Summer	6.667	0.0	570
1440 min Summer	4.815	0.0	824
2160 min Summer	3.471	0.0	1192
2880 min Summer	2.749	0.0	1540
4320 min Summer	1.977	0.0	2216
5760 min Summer	1.563	0.0	2912
7200 min Summer	1.301	0.0	3672
8640 min Summer	1.120	0.0	4344
10080 min Summer	0.987	0.0	5024
15 min Winter	138.514	0.0	24

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.684	1.384	1.0	10.7	O K
60 min Winter	99.906	1.606	1.1	12.4	Flood Risk
120 min Winter	99.974	1.674	1.1	12.9	Flood Risk
180 min Winter	99.940	1.640	1.1	12.7	Flood Risk
240 min Winter	99.873	1.573	1.1	12.1	Flood Risk
360 min Winter	99.721	1.421	1.0	11.0	Flood Risk
480 min Winter	99.585	1.285	1.0	9.9	O K
600 min Winter	99.463	1.163	0.9	9.0	O K
720 min Winter	99.352	1.052	0.9	8.1	O K
960 min Winter	99.161	0.861	0.8	6.6	O K
1440 min Winter	98.871	0.571	0.7	4.4	O K
2160 min Winter	98.584	0.284	0.6	2.2	O K
2880 min Winter	98.406	0.106	0.5	0.8	O K
4320 min Winter	98.341	0.041	0.4	0.3	O K
5760 min Winter	98.332	0.032	0.3	0.2	O K
7200 min Winter	98.327	0.027	0.2	0.2	O K
8640 min Winter	98.323	0.023	0.2	0.2	O K
10080 min Winter	98.320	0.020	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.826	0.0	37
60 min Winter	56.713	0.0	62
120 min Winter	34.204	0.0	108
180 min Winter	25.103	0.0	142
240 min Winter	20.035	0.0	180
360 min Winter	14.542	0.0	256
480 min Winter	11.583	0.0	328
600 min Winter	9.702	0.0	400
720 min Winter	8.391	0.0	468
960 min Winter	6.667	0.0	604
1440 min Winter	4.815	0.0	860
2160 min Winter	3.471	0.0	1224
2880 min Winter	2.749	0.0	1560
4320 min Winter	1.977	0.0	2196
5760 min Winter	1.563	0.0	2912
7200 min Winter	1.301	0.0	3600
8640 min Winter	1.120	0.0	4416
10080 min Winter	0.987	0.0	5008

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.403	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.032

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.011	4	8	0.011	8	12	0.011

Model Details

Storage is Online Cover Level (m) 100.000

Lined Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.18000	Ring Diameter (m)	2.10
Infiltration Coefficient Side (m/hr)	0.18000	Pit Multiplier	2.0
Safety Factor	2.0	Number Required	1
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	98.300	Cap Infiltration Depth (m)	0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 53 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.491	0.491	0.2	0.9	O K
30 min Summer	99.605	0.605	0.2	1.1	O K
60 min Summer	99.657	0.657	0.2	1.1	O K
120 min Summer	99.643	0.643	0.2	1.1	O K
180 min Summer	99.602	0.602	0.2	1.1	O K
240 min Summer	99.559	0.559	0.2	1.0	O K
360 min Summer	99.480	0.480	0.2	0.8	O K
480 min Summer	99.415	0.415	0.2	0.7	O K
600 min Summer	99.359	0.359	0.2	0.6	O K
720 min Summer	99.310	0.310	0.2	0.5	O K
960 min Summer	99.232	0.232	0.1	0.4	O K
1440 min Summer	99.127	0.127	0.1	0.2	O K
2160 min Summer	99.052	0.052	0.1	0.1	O K
2880 min Summer	99.041	0.041	0.1	0.1	O K
4320 min Summer	99.029	0.029	0.1	0.1	O K
5760 min Summer	99.023	0.023	0.1	0.0	O K
7200 min Summer	99.020	0.020	0.0	0.0	O K
8640 min Summer	99.017	0.017	0.0	0.0	O K
10080 min Summer	99.015	0.015	0.0	0.0	O K
15 min Winter	99.556	0.556	0.2	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.514	0.0	22
30 min Summer	90.826	0.0	34
60 min Summer	56.713	0.0	54
120 min Summer	34.204	0.0	88
180 min Summer	25.103	0.0	122
240 min Summer	20.035	0.0	156
360 min Summer	14.542	0.0	222
480 min Summer	11.583	0.0	286
600 min Summer	9.702	0.0	350
720 min Summer	8.391	0.0	412
960 min Summer	6.667	0.0	534
1440 min Summer	4.815	0.0	770
2160 min Summer	3.471	0.0	1104
2880 min Summer	2.749	0.0	1468
4320 min Summer	1.977	0.0	2204
5760 min Summer	1.563	0.0	2920
7200 min Summer	1.301	0.0	3648
8640 min Summer	1.120	0.0	4336
10080 min Summer	0.987	0.0	5128
15 min Winter	138.514	0.0	23

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.688	0.688	0.2	1.2	O K
60 min Winter	99.751	0.751	0.3	1.3	Flood Risk
120 min Winter	99.727	0.727	0.2	1.3	Flood Risk
180 min Winter	99.666	0.666	0.2	1.2	O K
240 min Winter	99.602	0.602	0.2	1.1	O K
360 min Winter	99.489	0.489	0.2	0.9	O K
480 min Winter	99.399	0.399	0.2	0.7	O K
600 min Winter	99.324	0.324	0.2	0.6	O K
720 min Winter	99.262	0.262	0.2	0.5	O K
960 min Winter	99.166	0.166	0.1	0.3	O K
1440 min Winter	99.054	0.054	0.1	0.1	O K
2160 min Winter	99.037	0.037	0.1	0.1	O K
2880 min Winter	99.030	0.030	0.1	0.1	O K
4320 min Winter	99.021	0.021	0.0	0.0	O K
5760 min Winter	99.017	0.017	0.0	0.0	O K
7200 min Winter	99.014	0.014	0.0	0.0	O K
8640 min Winter	99.012	0.012	0.0	0.0	O K
10080 min Winter	99.011	0.011	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.826	0.0	34
60 min Winter	56.713	0.0	56
120 min Winter	34.204	0.0	94
180 min Winter	25.103	0.0	130
240 min Winter	20.035	0.0	166
360 min Winter	14.542	0.0	236
480 min Winter	11.583	0.0	302
600 min Winter	9.702	0.0	366
720 min Winter	8.391	0.0	430
960 min Winter	6.667	0.0	550
1440 min Winter	4.815	0.0	756
2160 min Winter	3.471	0.0	1088
2880 min Winter	2.749	0.0	1468
4320 min Winter	1.977	0.0	2164
5760 min Winter	1.563	0.0	2936
7200 min Winter	1.301	0.0	3744
8640 min Winter	1.120	0.0	4352
10080 min Winter	0.987	0.0	5072

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.403	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.004

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.001	4	8	0.001	8	12	0.001

Model Details

Storage is Online Cover Level (m) 100.000

Lined Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.18000	Ring Diameter (m)	1.00
Infiltration Coefficient Side (m/hr)	0.18000	Pit Multiplier	2.0
Safety Factor	2.0	Number Required	1
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	99.000	Cap Infiltration Depth (m)	0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 7 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.893	0.043	35.9	21.6	Flood Risk
30 min Summer	99.898	0.048	39.6	23.7	Flood Risk
60 min Summer	99.895	0.045	37.6	22.5	Flood Risk
120 min Summer	99.887	0.037	30.9	18.5	Flood Risk
180 min Summer	99.881	0.031	25.9	15.4	Flood Risk
240 min Summer	99.877	0.027	22.2	13.3	Flood Risk
360 min Summer	99.871	0.021	17.2	10.4	Flood Risk
480 min Summer	99.867	0.017	14.3	8.6	Flood Risk
600 min Summer	99.865	0.015	12.2	7.4	Flood Risk
720 min Summer	99.863	0.013	11.0	6.5	Flood Risk
960 min Summer	99.861	0.011	8.9	5.3	Flood Risk
1440 min Summer	99.858	0.008	6.4	3.8	Flood Risk
2160 min Summer	99.856	0.006	4.8	2.8	Flood Risk
2880 min Summer	99.855	0.005	3.9	2.3	Flood Risk
4320 min Summer	99.853	0.003	2.7	1.6	Flood Risk
5760 min Summer	99.853	0.003	2.3	1.3	Flood Risk
7200 min Summer	99.852	0.002	1.9	1.1	Flood Risk
8640 min Summer	99.852	0.002	1.9	1.0	Flood Risk
10080 min Summer	99.852	0.002	1.5	0.8	Flood Risk
15 min Winter	99.898	0.048	39.6	23.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.514	0.0	19
30 min Summer	90.826	0.0	27
60 min Summer	56.713	0.0	42
120 min Summer	34.204	0.0	72
180 min Summer	25.103	0.0	102
240 min Summer	20.035	0.0	132
360 min Summer	14.542	0.0	194
480 min Summer	11.583	0.0	254
600 min Summer	9.702	0.0	314
720 min Summer	8.391	0.0	372
960 min Summer	6.667	0.0	492
1440 min Summer	4.815	0.0	736
2160 min Summer	3.471	0.0	1080
2880 min Summer	2.749	0.0	1464
4320 min Summer	1.977	0.0	2148
5760 min Summer	1.563	0.0	2936
7200 min Summer	1.301	0.0	3672
8640 min Summer	1.120	0.0	4360
10080 min Summer	0.987	0.0	5032
15 min Winter	138.514	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.902	0.052	41.5	25.7	Flood Risk
60 min Winter	99.896	0.046	38.0	22.8	Flood Risk
120 min Winter	99.884	0.034	28.4	17.0	Flood Risk
180 min Winter	99.877	0.027	22.2	13.4	Flood Risk
240 min Winter	99.872	0.022	18.5	11.1	Flood Risk
360 min Winter	99.867	0.017	13.9	8.3	Flood Risk
480 min Winter	99.863	0.013	11.0	6.7	Flood Risk
600 min Winter	99.861	0.011	9.3	5.6	Flood Risk
720 min Winter	99.860	0.010	8.1	4.9	Flood Risk
960 min Winter	99.858	0.008	6.4	3.8	Flood Risk
1440 min Winter	99.856	0.006	4.8	2.8	Flood Risk
2160 min Winter	99.854	0.004	3.5	2.0	Flood Risk
2880 min Winter	99.853	0.003	2.7	1.6	Flood Risk
4320 min Winter	99.853	0.003	2.3	1.3	Flood Risk
5760 min Winter	99.852	0.002	1.9	1.0	Flood Risk
7200 min Winter	99.852	0.002	1.5	0.8	Flood Risk
8640 min Winter	99.852	0.002	1.5	0.8	Flood Risk
10080 min Winter	99.851	0.001	1.0	0.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.826	0.0	27
60 min Winter	56.713	0.0	42
120 min Winter	34.204	0.0	74
180 min Winter	25.103	0.0	104
240 min Winter	20.035	0.0	134
360 min Winter	14.542	0.0	194
480 min Winter	11.583	0.0	258
600 min Winter	9.702	0.0	316
720 min Winter	8.391	0.0	378
960 min Winter	6.667	0.0	500
1440 min Winter	4.815	0.0	728
2160 min Winter	3.471	0.0	1084
2880 min Winter	2.749	0.0	1488
4320 min Winter	1.977	0.0	2156
5760 min Winter	1.563	0.0	3000
7200 min Winter	1.301	0.0	3704
8640 min Winter	1.120	0.0	4184
10080 min Winter	0.987	0.0	5168

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.403	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.166

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.055	4	8	0.055	8	12	0.055

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Blanket Structure

Infiltration Coefficient Base (m/hr)	0.18000	Diameter/Width (m)	8.3
Safety Factor	2.0	Length (m)	200.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	99.850		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 7 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.893	0.043	7.4	4.4	Flood Risk
30 min Summer	99.898	0.048	8.1	4.9	Flood Risk
60 min Summer	99.895	0.045	7.7	4.6	Flood Risk
120 min Summer	99.887	0.037	6.3	3.8	Flood Risk
180 min Summer	99.881	0.031	5.3	3.2	Flood Risk
240 min Summer	99.877	0.027	4.5	2.7	Flood Risk
360 min Summer	99.871	0.021	3.5	2.1	Flood Risk
480 min Summer	99.867	0.017	2.9	1.8	Flood Risk
600 min Summer	99.865	0.015	2.5	1.5	Flood Risk
720 min Summer	99.863	0.013	2.3	1.3	Flood Risk
960 min Summer	99.861	0.011	1.8	1.1	Flood Risk
1440 min Summer	99.858	0.008	1.3	0.8	Flood Risk
2160 min Summer	99.856	0.006	1.0	0.6	Flood Risk
2880 min Summer	99.855	0.005	0.8	0.5	Flood Risk
4320 min Summer	99.853	0.003	0.6	0.3	Flood Risk
5760 min Summer	99.853	0.003	0.5	0.3	Flood Risk
7200 min Summer	99.852	0.002	0.4	0.2	Flood Risk
8640 min Summer	99.852	0.002	0.4	0.2	Flood Risk
10080 min Summer	99.852	0.002	0.3	0.2	Flood Risk
15 min Winter	99.898	0.048	8.1	4.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.514	0.0	19
30 min Summer	90.826	0.0	27
60 min Summer	56.713	0.0	42
120 min Summer	34.204	0.0	72
180 min Summer	25.103	0.0	102
240 min Summer	20.035	0.0	132
360 min Summer	14.542	0.0	194
480 min Summer	11.583	0.0	254
600 min Summer	9.702	0.0	314
720 min Summer	8.391	0.0	372
960 min Summer	6.667	0.0	492
1440 min Summer	4.815	0.0	736
2160 min Summer	3.471	0.0	1080
2880 min Summer	2.749	0.0	1464
4320 min Summer	1.977	0.0	2148
5760 min Summer	1.563	0.0	2936
7200 min Summer	1.301	0.0	3672
8640 min Summer	1.120	0.0	4360
10080 min Summer	0.987	0.0	5032
15 min Winter	138.514	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.902	0.052	8.5	5.3	Flood Risk
60 min Winter	99.896	0.046	7.8	4.7	Flood Risk
120 min Winter	99.884	0.034	5.8	3.5	Flood Risk
180 min Winter	99.877	0.027	4.5	2.7	Flood Risk
240 min Winter	99.872	0.022	3.8	2.3	Flood Risk
360 min Winter	99.867	0.017	2.8	1.7	Flood Risk
480 min Winter	99.863	0.013	2.3	1.4	Flood Risk
600 min Winter	99.861	0.011	1.9	1.1	Flood Risk
720 min Winter	99.860	0.010	1.7	1.0	Flood Risk
960 min Winter	99.858	0.008	1.3	0.8	Flood Risk
1440 min Winter	99.856	0.006	1.0	0.6	Flood Risk
2160 min Winter	99.854	0.004	0.7	0.4	Flood Risk
2880 min Winter	99.853	0.003	0.6	0.3	Flood Risk
4320 min Winter	99.853	0.003	0.5	0.3	Flood Risk
5760 min Winter	99.852	0.002	0.4	0.2	Flood Risk
7200 min Winter	99.852	0.002	0.3	0.2	Flood Risk
8640 min Winter	99.852	0.002	0.3	0.2	Flood Risk
10080 min Winter	99.851	0.001	0.2	0.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.826	0.0	27
60 min Winter	56.713	0.0	42
120 min Winter	34.204	0.0	74
180 min Winter	25.103	0.0	104
240 min Winter	20.035	0.0	134
360 min Winter	14.542	0.0	194
480 min Winter	11.583	0.0	258
600 min Winter	9.702	0.0	316
720 min Winter	8.391	0.0	378
960 min Winter	6.667	0.0	500
1440 min Winter	4.815	0.0	728
2160 min Winter	3.471	0.0	1084
2880 min Winter	2.749	0.0	1488
4320 min Winter	1.977	0.0	2156
5760 min Winter	1.563	0.0	3000
7200 min Winter	1.301	0.0	3704
8640 min Winter	1.120	0.0	4184
10080 min Winter	0.987	0.0	5168

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.403	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.034

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.011	4	8	0.011	8	12	0.011

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Blanket Structure

Infiltration Coefficient Base (m/hr)	0.18000	Diameter/Width (m)	8.5
Safety Factor	2.0	Length (m)	40.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	99.850		

APPENDIX C

Thames Water Correspondence

Asset location search

Property Searches

Wardell Armstrong LLP
2 Devon Way
Longbridge
BIRMINGHAM
B31 2TS

Search address supplied

The Beeches
Heyford Road
Steeple Aston
Bicester
OX25 4SN

Your reference The Beeches at Steeple Aston

Our reference ALS/ALS Standard/2019_3931073

Search date 3 January 2019

Keeping you up-to-date

Notification of Price Changes

From 1 September 2018 Thames Water Property Searches will be increasing the price of its Asset Location Search in line with RPI at 3.23%.

For further details on the price increase please visit our website: www.thameswater-propertysearches.co.uk
Please note that any orders received with a higher payment prior to the 1 September 2018 will be non-refundable.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

searchcode

Asset location search

Property Searches

Search address supplied: The Beeches, Heyford Road, Steeple Aston, Bicester, OX25 4SN

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and

pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2019_3931073

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 447667,225229

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

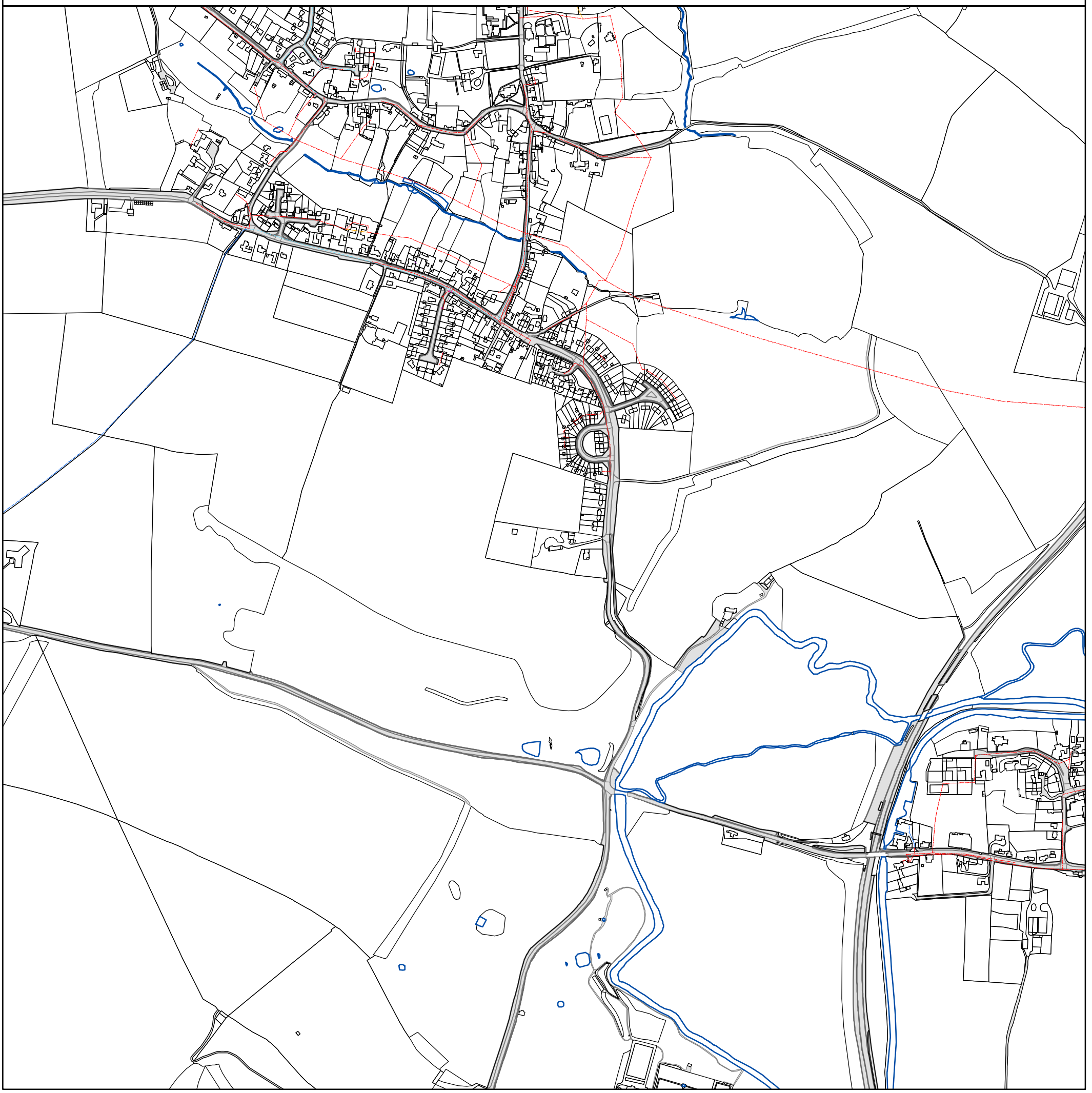
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7301	106.95	103.94
731A	n/a	n/a
731B	n/a	n/a
7401	107.81	103.28
741E	n/a	n/a
741J	n/a	n/a
741F	n/a	n/a
741K	n/a	n/a
741L	n/a	n/a
741M	n/a	n/a
741R	n/a	n/a
741N	n/a	n/a
741S	n/a	n/a
741O	n/a	n/a
741P	n/a	n/a
741Q	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2019_3931073



0 45 90 180 270 360
Meters

Scale:	1:7161
Width:	2000m
Printed By:	SAsirvat
Print Date:	03/01/2019
Map Centre:	447667,225229
Grid Reference:	SP4725SE

Comments:

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2019_3931073

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 447667, 225229.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if the Ombudsman finds that you have suffered actual loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Web site: www.tpos.co.uk
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Mr Adrian Shooter
The Beeches, Heyford Road
Steeple Aston
Bicester
Oxfordshire
OX25 4SN

Wastewater pre-planning
Our ref DS6057615

04 February 2019

Pre-planning enquiry: Confirmation of sufficient capacity

Dear Mr Shooter,

Thank you for providing information on your development:

The Beeches, Heyford Road, Steeple Aston, Bicester, Oxfordshire, OX25 4SN

Existing: 1 x 4 bedroom house discharging foul to a septic tank and surface water assumed to infiltrate.

Proposed: Development of 8 additional 3 and 5 bedroom houses to discharge foul water into the foul water manhole MH7301. Surface water to infiltrate to the ground.

We have completed the assessment of the foul water flows based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection.

If you've any further questions, please contact me on 0203 577 9811.

Yours sincerely

Siva Rajaratnam - Adoptions Engineer

Thames Water

Planning your wastewater

We've put together some information on sewerage to help you plan your new development.

How long does it take to get consent to connect to a sewer?

If you're applying for consent to connect to a sewer under Section 106 of the Water Industry Act 1991, you'll need to give us 21 days' notice.

I think I'll need to connect to a trunk sewer – is that possible?

Connecting directly to trunk sewers can be complex and dangerous, and we won't permit this at all in London. If you're considering a trunk sewer as a point of connection, please contact us as soon as possible to discuss.

How do I handle trade effluent and groundwater discharges?

You mustn't discharge non-domestic waste to our sewers without a valid trade effluent consent - doing this is an offence under Section 109(1) of the Water Industry Act 1991. You can call our trade effluent team on 0203 577 9200 to get help with trade effluent consents and ground water discharge permits.

Where can I discharge surface water?

The Lead Local Flood Authority, or if you are in a London Borough, 'The London Plan', advises that your development should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so. You should aim to achieve greenfield run-off rates and ensure you manage surface water run-off as close to its source as possible in line with the following drainage hierarchy:

1. Store rainwater for later use.
2. Use infiltration techniques, such as porous surfaces in non-clay areas.
3. Attenuate rainwater in ponds or open water features for gradual release.
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release.
5. Discharge rainwater direct to a watercourse.
6. Discharge rainwater to a surface water sewer or drain.
7. Discharge rainwater to a combined sewer.

Please note that if you're discharging surface water anywhere other than to a public sewer – such as to a watercourse – you'll need approval from the relevant authority, for example the Environment Agency, the local authority or the Canals and Rivers Trust.

If you don't follow the surface water hierarchy you may not be granted planning permission, and Thames Water may seek to put conditions on the planning application.

There's no right of discharge of highway drainage into the public sewerage system, and we'd need to agree this with the relevant highway authority under Section 115 of the Water Industry Act 1991. You can contact us to discuss this further.

What can I do about redundant sewers and rising mains on my site?

On brownfield sites where existing sewers or rising mains need to be made redundant or diverted, the developer will need to fund the work, as set out in Section 185 of the Water Industry Act. If there's no practical way of making a diversion, we'll apply the standoff distances in Sewers for Adoption 7th edition to assess the width of easement required.

APPENDIX D

Typical Maintenance Schedule

Sustainable Drainage Systems (SuDS):
Typical Maintenance Schedule

Soakaway

Regular Maintenance	
Monthly	• Mow grasses (where required) and remove resultant clippings (during growing season only) • Inspect/check all inlets, outlets, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required
Six Monthly	• Not applicable
Annually	• Remove sediment and debris from pre-treatment devices and floor of chamber • Clean gutters and filters on downpipes (where applicable) • Trim any roots causing blockages • Inspect and document the presence of wildlife
Remedial Actions: Significant storms may cause significant damage to SuDS. As such, a number of actions may be required following such events	
Following all significant storm events	• Inspect and carry out essential recovery works to return the feature to full working order

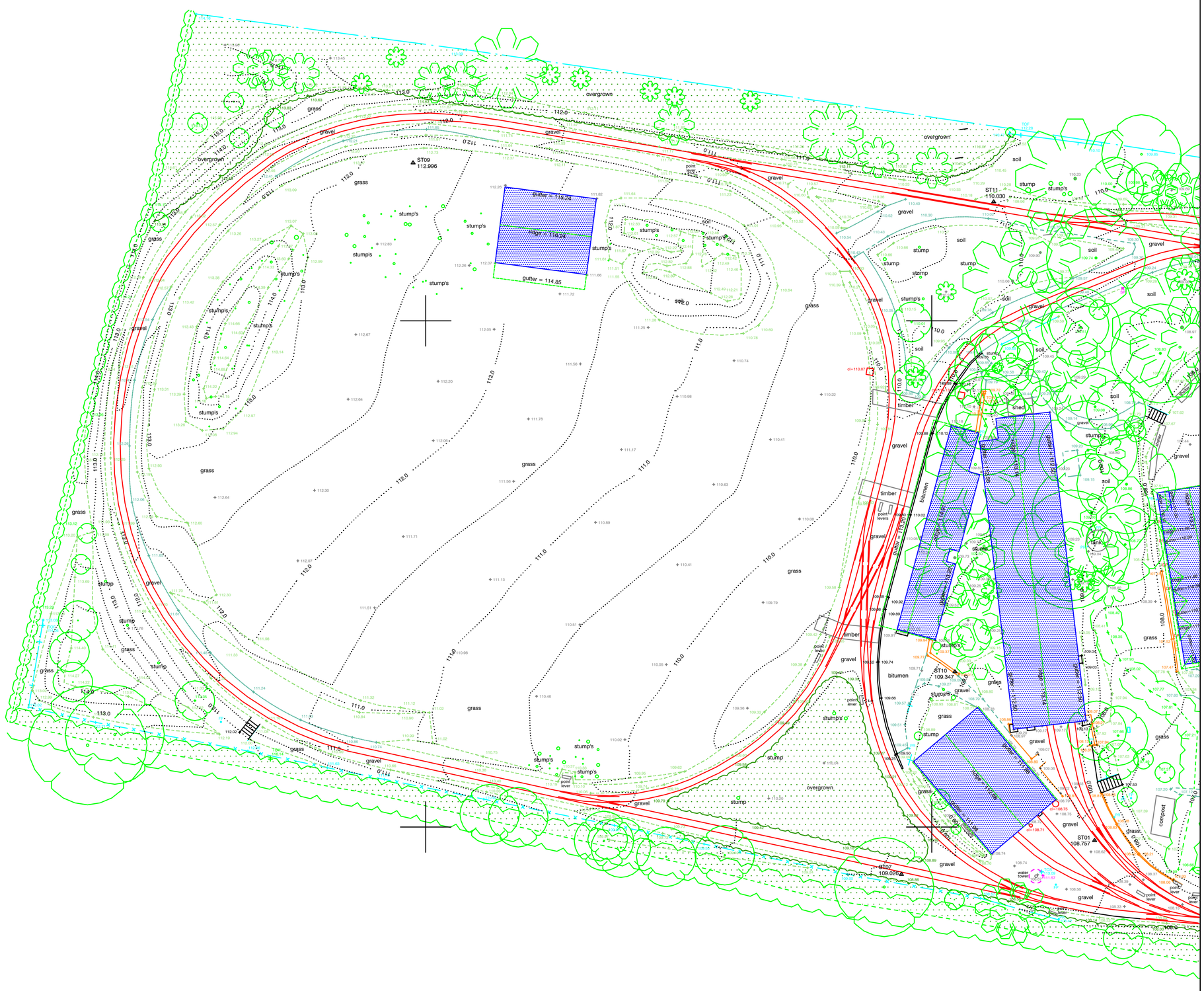
Sustainable Drainage Systems (SuDS):
Typical Maintenance Schedule

Permeable Paving

Regular Maintenance	
Monthly	• Refer to manufacturer specifications • For sealed systems, inspection of outfalls should be undertaken
Six Monthly	• Brushing and vacuuming to manufacturer requirements. Re-grit where necessary after brushing.
Annually	• Not applicable
As Required	• Inspect/check all inlets, outlets, inspection chambers, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required (for 3 months following installation) • Removal of weeds where required • Stabilizing and mowing of contributing areas where required
Remedial Actions: Significant storms may cause significant damage to SuDS. As such, a number of actions may be required following such events	
Following all significant storm events	• Inspect and carry out essential recovery works to return the feature to full working order

DRAWING

447250E
447600E
447950E
225350N
225300N
225250N
225200N
225150N



Symbol & Abbreviation Key.

- BARBED WIRE FENCE
- POST & RAIL FENCE
- CLOSE BOARD FENCE
- RAILINGS
- CHAIN LINK FENCE
- OTHER FENCE
- KERB
- DROPPED KERB
- GULLY CHANNEL
- TOP / BOTTOM OF BANK
- FOLIAGE
- DITCH
- VERGE
- OVERHEAD CABLES
- GATE
- HEDGE
- TREE - BROAD LEAVED
- TREE - CONIFEROUS
- BUSH
- BUILDING
- BOREHOLE
- SURVEY STATION
- ORDNANCE SURVEY BENCH MARK

A/C	AIR CONDITIONING UNIT	KO	KERB OFFLET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BOREHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	RODDING POINT
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STOP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
ER	EARTH ROD	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TOF	TOP OF FENCE
EM	ELECTRICITY MARKER	TOH	TOP OF HEDGE
FB	FUSE BOX	TOR	TOP OF RAILINGS
FH	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
IL	INVERT LEVEL	WO	WASH OUT

General.

This survey has been prepared with a scaling accuracy for a plot at a scale of 1:200.

All tree heights and spreads are approximate. We have tried to identify tree types, however if tree species are critical specialist advice should be gained.

Drainage pipe sizes have been measured from the surface. Chamber access has not been gained for safety reasons, therefore sizes should be regarded as approximate.

Some detail may have been omitted due to parked vehicles.

Notes.

Coordinates related to OS National Grid from ST01 by GPS (No scale factor added).
Levels related to GPS.

INDICATIVE ONLY

Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
SJ	SJ	18/01/19	APK	23/01/19	APK	23/01/19

Interlocks Surveys Limited
St. Andrews House
Radford Semele
Leamington Spa
Warwickshire
CV31 1TF

T: 01926 330123
F: 01926 330120
E: info@interlocksurveys.co.uk

Client.

FRAMPTONS
ORIEL HOUSE
42 NORTH BAR
BANBURY
OXFORDSHIRE, OX16 0TH

Title.

TOPOGRAPHICAL SURVEY

THE BEECHES
HEYFORD ROAD
STEEPLE ASTON
BICESTER, OX25 4SN

Dwg No. **190001** Sheet **1 of 2**

Scale 1:200 A0 Sheet Rev. -

447200E
447250E
447300E
225350N
225300N
225250N
225200N
225150N

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Levels related to GPS.

HEYFORD ROAD

INDICATIVE ONLY

Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
SJ	SJ	18/01/19	APK	23/01/19	APK	23/01/19

Interlocks Surveys Limited
St. Andrews House
Radford Semele
Leamington Spa
Warwickshire
CV31 1TF

T: 01926 330123
F: 01926 330120
E: info@interlocksurveys.co.uk

Client.

FRAMPTONS
ORIEL HOUSE
42 NORTH BAR
BANBURY
OXFORDSHIRE, OX16 0TH

Title.

TOPOGRAPHICAL SURVEY

THE BEECHES
HEYFORD ROAD
STEEPLE ASTON
BICESTER, OX25 4SN

Dwg No. **190001** Sheet **2 of 2**

Scale 1:200 A0 Sheet Rev. -

Key:

- Site Boundary
- Site entrance
- Existing Footpath
- Existing Buildings
- Existing buildings/ structures to be removed
- Proposed New Dwellings
- Existing Access Drive Widened
- Proposed New Roads (Permeable surface with below ground surface water attenuation - subject to civil eng's advice)
- New/existing private gravel driveways
- No dig construction
- Existing Cat A Trees
- Existing Cat B Trees
- Existing Cat C Trees
- Existing Cat U Trees
- Existing Trees Proposed to be Removed
- Root Protection Areas
- Proposed Replacement Tree Planting
- Proposed new planting/ boundary reinforcement
- PS — Pumping Station - refer to drainage strategy
- Allocated on-plot parking spaces
- V — Unallocated visitors parking spaces
- New fencing protecting buffer to site boundary

NOTE: Retention of trees T73 & T76 subject to feasibility of provid ng adequate root protection during demolition of existing adjacent buildings. Should retention not prove feasible replacement trees to be provided as part of detailed landscape scheme.

SCALE BAR
0m 5m 10m 20m 30m 40m

Rev	Amendments	Date

Client
Mr & Mrs Shooter

Project
The Beeches
Steeple Aston

Drawing
Indicative Site Plan

Date	Purpose
Feb 2019	Planning

Scale	Drawing Size
1:500	@ A2

N

Project No.	Drawing No.	Revision
372A01	101	

Malcolm Payne Group
Malcolm Payne Group Limited
174 Holliday Street, Birmingham, B1 1TJ
Telephone: +44(0)121 643 3159
info@malcolmpaynegroup.co.uk
www.malcolmpaynegroup.co.uk
Architecture | Design | Conservation

INDICATIVE SITE PLAN

THE BEECHES, STEEPLE ASTON

DO NOT SCALE FROM THIS DRAWING

REFERENCE

- SITE BOUNDARY
- EXISTING TW PUBLIC FOUL GRAVITY SEWER
- EXISTING TW FOUL WATER MANHOLE
- ACCESS ROAD INFILTRATION BLANKET. DEPTH 0.15m
- EXISTING HOUSE DRIVEWAY INFILTRATION BLANKET. DEPTH 0.15m
- ON PLOT SOAKAWAYS, SEE NOTES FOR DETAILS
- PROPOSED FOUL WATER PUMPING STATION
- PROPOSED GROUND SCRAPING
- PROPOSED DROP KERB
- PROPOSED RISING MAIN
- DIRECTION OF EXISTING GROUND FALL

741T
7401
150
150
18
24
731A
731B
106.5m
7301
23
HEYFORD ROAD
28
29
29a
DROP KERB TO DIRECT EXCESS RAINFALL TO ATTENUATION FEATURE
PROPOSED RISING MAIN FROM PUMPING STATION, TO EXISTING THAMES WATER FOUL MANHOLE 7301
SCRAPE OF GROUND TO ACT AS ATTENUATION FEATURE FOR EXTREME RAINFALL EVENTS
PROPOSED LOCATION OF PUMPING STATION (TYPE 2). 10m MINIMUM DISTANCE FROM WET WELL TO HABITABLE BUILDINGS
1
2
3
4
5
6
7
8
The Beeches
Orchard House
Hillside
97.7m

0m 20m 40m 60m 80m 100m
SCALE 1:1000

NOTES

1. LAYOUT BASED ON SCHEME 3 - INDICATIVE SITE PLAN BY MALCOLM PAYNE GROUP, DRG NO. 372A01 101

ON PLOT SOAKAWAYS:
PLOTS 1 AND 2
SURFACE AREA = 2.4m x 2.4m
RING DIAMETER = 1.2m
DEPTH = 1.5m.

PLOTS 3 TO 8
SURFACE AREA = 4.2m x 4.2m
RING DIAMETER = 2.10m
DEPTH = 1.7m.

EXISTING HOUSE GARAGE, SOAKAWAY
SURFACE AREA = 2m x 2m
RING DIAMETER = 1m
DEPTH = 1m.

ON PLOT SOAKAWAYS AND INFILTRATION BLANKETS HAVE BEEN DESIGNED WITH AN ASSUMED INFILTRATION RATE OF $5x10^{-5}$m/s SUBJECT TO DETAILED SOAKAWAY TEST.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	First Issue	12/03/19	HRK	AG	KW

CLIENT
MR ADRIAN SHOOTER

PROJECT
THE BEECHES AT STEEPLE ASTON

DRAWING TITLE
DRAINAGE STRATEGY PLAN

DRG No.		REV
BM11730-002		A
DRG SIZE	SCALE	DATE
A2	1:1000	12/03/19
DRAWN BY	CHECKED BY	APPROVED BY
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wardell-armstrong.com

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)178 227 6700

BIRMINGHAM
Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

CARDIFF
Tudor House
16 Cathedral Road
Cardiff
CF11 9LJ
Tel: +44 (0)292 072 9191

CARLISLE
Marconi Road
Burgh Road Industrial Estate
Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)122 855 0575

EDINBURGH
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GLASGOW
2 West Regent Street
Glasgow
G2 1RW
Tel: +44 (0)141 433 7210

LONDON
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

MANCHESTER (City Centre)
76 King Street
Manchester
M2 4NH
Tel: +44 (0)161 817 5038

MANCHESTER (Greater)
41-50 Futura Park
Aspinall Way
Middlebrook
Bolton
BL6 6SU
Tel: +44 (0)120 422 7227

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle Upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

International offices:
ALMATY
29/6 Satpaev Avenue
Regency Hotel Office Tower
Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

MOSCOW
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: +7(495) 626 07 67

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