BANNERS GATE

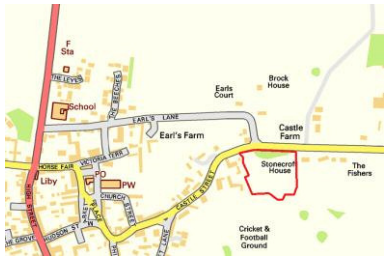
CIVIL, STRUCTURAL AND
TRANSPORTATION ENGINEERS

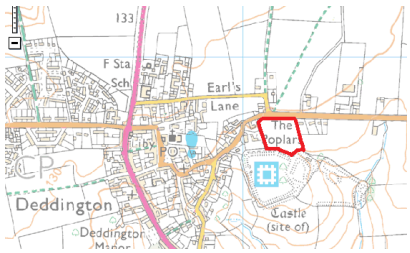
Banners Homes Midlands Limited

Clifton Road, Deddington

Flood Risk Assessment

March 2014





Prepared for:
Banner Homes

BANNER HOMES

Revision Schedule

Clifton Road, Deddington – Flood Risk Assessment
13166 FRA Draft

Rev	Date	Details	Prepared by	Reviewed by	Approved by
00	07/03/2014	Draft	**Scott Marshall** Civil Engineer	**Scott Marshall** Civil Engineer	**Steve Foxall** Managing Director

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1 INTRODUCTION & BRIEF

1.1 Background Information

1.1.1 Banners Gate Limited was commissioned by Banner Homes in November 2013 to prepare a Flood Risk Assessment to support a Planning Application for a proposed residential development on a Greenfield Site off Clifton Road in Deddington, Oxfordshire.

1.2 Study Objectives and Methodology

1.2.1 The objectives of this Report are as follows:

- Determine likely sources of flooding,
- Assess the proposals in the context of the National Planning Policy Framework,
- Propose an appropriate drainage strategy, and
- Determine appropriate mitigation and / or protection measures.

1.2.2 The methodology followed in the preparation of this report included the following:

- Investigation of the flood risk within and external to the Site,
- Consideration of the pre-development and post-development storm water run-off and identification of a means of storm water disposal, and
- Consideration of storm events up to and including the 100 year return period storm, including climate change, and calculation of the required volume of attenuation storage, where applicable.

1.2.3 This Report deals with environmental issues as they are impacted by flooding, other impacts on the environment are not considered. Existing sources of flood risk have been assessed, including ground water and urban drainage systems although as directed by the Environment Agency Guidance Note 1, this Report focuses primarily on the management of surface water run-off.

1.3 Policy Background

1.3.1 With the publication of the 'National Planning Policy Framework' (NPPF) in March 2012 it became a requirement that all affected planning applications be accompanied by a site-specific flood risk assessment.

1.3.2 The Technical Guidance to the National Planning Policy Framework (NPPF-TG) provides additional guidance to ensure the effective implementation of the planning policy as set out

in the NPPF and retains key elements of Planning Policy Statement 25: Development and Flood Risk.

1.3.3 The NPPF-TG requires a site-specific flood risk assessment (FRA) to assess the risk to a development Site and demonstrate how flood risk from all sources of flooding to the development itself and flood risk to others will be managed now, and taking climate change into account.

1.4 Climate Change

1.4.1 The NPPF-TG requires that climate change is taken into account in assessing the flood risk for developments. Table 5 of the NPPF-TG provides sensitivity ranges which may provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities and river flows. The table (adapted to demonstrate effects on rivers) is shown below:

Table 1: Recommended national precautionary sensitivity ranges for peak rainfall intensities and peak river flows.

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		

1.4.2 The design horizon of the proposed development is beyond 2085 and therefore in accordance with the above table, peak rainfall intensity has, where applicable, been increased by 30% to represent anticipated climate change.

1.5 Background to Report

1.5.1 The Report has been prepared using the following documents for guidance:

- The NPPF and the NPPF-TG,
- EA 'Flood Risk Assessment (FRA) Guidance Note 1 – Development within a Critical Drainage area or greater than 1 hectare (ha) in Flood Zone 1',
- DEFRA/EA R&D Technical Report W5-074 Rev D – Preliminary rainfall runoff management for developments,
- DEFRA/EA R&D Technical Report FD2320/TR2 – Flood Risk Assessment Guidance for New Development,

- CIRIA Report C624 – Development and Flood Risk – Guidance for the Construction Industry,
- CIRIA Report C697 – The SUDS manual,
- National SUDS Working Group – Interim Code of Practice for Sustainable Drainage Systems,
- Cherwell and West Oxfordshire Level 1 Strategic Flood Risk Assessment, Scott Wilson, dated April 2009.

1.6 Strategic Flood Risk Assessment

1.6.1 The Strategic Flood Risk Assessment (SFRA) Final Report dated April 2009, prepared by Scott Wilson, was commissioned by Cherwell District Council, West Oxfordshire District Council and Oxfordshire County Council to assess and map the different levels and types of flood risk in the study area for the land use planning process.

1.6.2 The Site has not been identified as a potential development site.

1.6.3 The following extracts from the SFRA are relevant:

1.6.4 The predominant risk of flooding within the Cherwell and West Oxfordshire Districts is due to flooding from rivers and watercourses.

1.6.5 Flooding from the land caused by overland flow or as a result of sudden intense downpours has led to wide scale flooding of varying degrees across both Cherwell and West Oxfordshire.

1.6.6 There have been numerous historical flood events in the Cherwell study area. The most severe flood event recorded in Cherwell District, along the River Cherwell Corridor, in terms of danger to life and property occurred in April 1998 when flood levels reached what were at the time considered to have return period of greater than 1 in 100 years.

1.6.7 All new development should have flood risk management factored in at the planning stage to include the rigorous application of PPS25 with the use of Sustainable Flood Management measures encouraged where possible.

1.6.8 Development should be directed to Flood Zone 1 wherever possible.

1.6.9 All sources of flooding must be considered when looking to locate new development. Other sources of flooding that require consideration when site new development allocations include:

- *Flooding from the Land – Surface Water;*

- *Flooding from Groundwater;*
- *Flooding from Sewers and Drains, and*
- *Flooding from Manmade or Artificial Sources.*

1.6.10 *Wherever possible, SuDS techniques should seek to contribute to each of the three goals identified below, with the preferred system contributing significantly to each objective. SuDS solutions for specific sites should seek to:*

- *Reduce flood risk (to the site and neighbouring areas);*
- *Reduce pollution, and*
- *Provide landscape and wildlife benefits.*

1.6.11 *In the following situations a Flood Risk Assessment should always be provided with a planning application:*

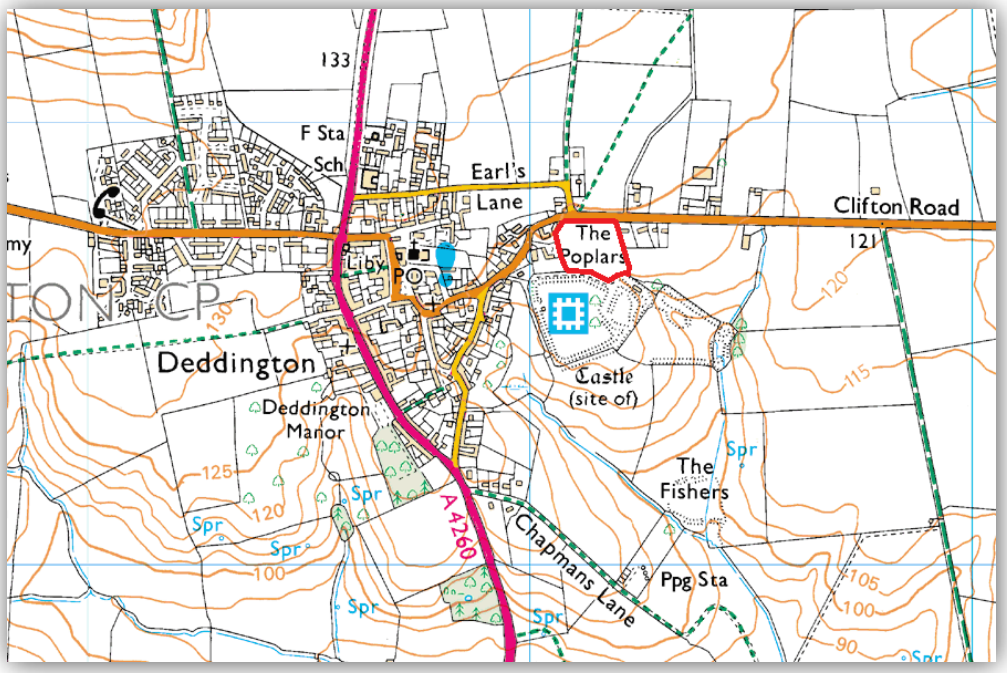
- *Development sites located in Flood Zone 2 or 3;*
- *Proposed development that is classified as a major development and located in Flood Zone 1. These are residential developments consisting of sites greater than 0.5 ha or greater than 10 dwellings and commercial developments that are greater than 1 ha or have a floor area greater than 1000 m^2. Since the risk of fluvial flooding is minimal such FRAs should focus on the management of surface water;*

2 EXISTING CONDITIONS

2.1 Site Location

2.1.1 The Site is located to the east of Deddington at approximate OS Grid Reference 447153, 231739 and post code OX15 0TH. The Site location is shown, outlined in red, in Figure 1 below.

Figure 1: Site Location Plan



2.2 Site Description

2.2.1 The Site has a gross area of approximately 1.65 hectares and is Greenfield.

2.2.2 The Site is bounded to the north by Clifton Road and beyond by open fields, to the south by extensive earthworks marking the site of the 11th century Deddington Castle, to the east by residential dwellings and open fields, and to the west by residential dwellings.

2.2.3 The Site falls from north to south, from approximately 124.86m to 120.50m at an overall gradient of approximately 1 in 34.

2.2.4 A copy of the Topographical Survey is included in Appendix II.

2.3 Local Watercourses

2.3.1 Roadside ditches exist on both sides of Clifton Road collecting highway run-off. The northernmost ditch is culverted below Clifton Road, at the Earls Lane junction, and outfalls into the southernmost ditch within the Site boundary where they open out prior to entering a 300mm diameter culvert which appears to cross the Site in a south-easterly direction. At the time of writing the specific details of the pipe are unknown and its outfall has yet to be located; further investigation is required prior to the detailed design phase.

2.3.2 The River Swere and the Deddington Brook are located approximately 1.5km to the north and south of the Site respectively. Both watercourses flow in as easterly direction towards the river Cherwell which is located approximately 2.0km to the east of the Site.

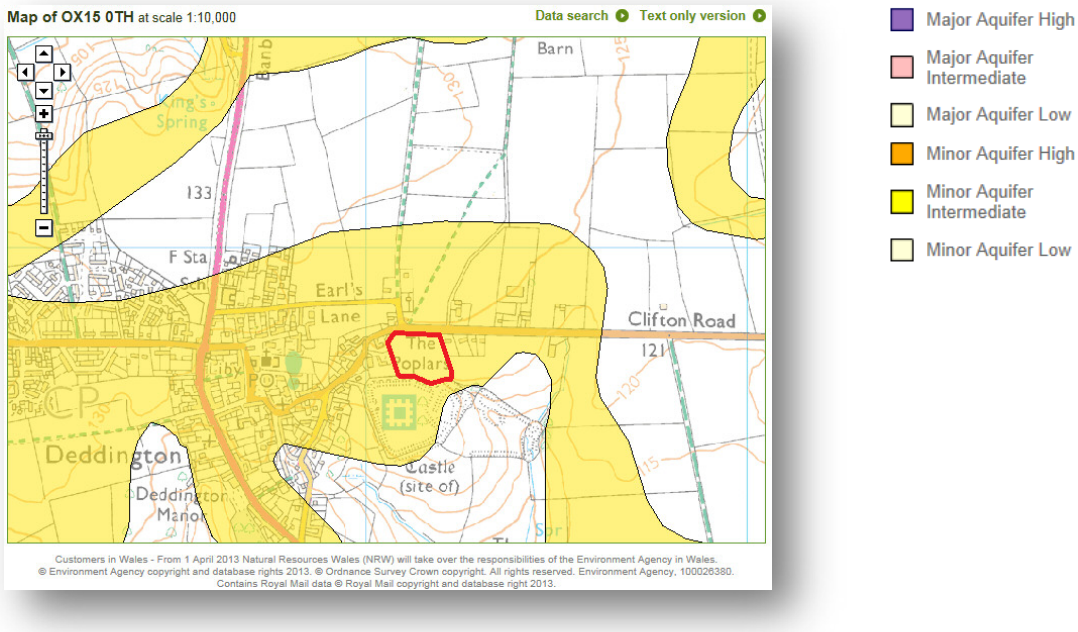
2.3.3 The Oxford Canal is located approximately 2.6km to the east of the site.

2.4 Underlying Geology

2.4.1 The 1:50,000 British Geological Survey maps have been analysed to establish the underlying geology of the area and show the Site to be underlain by Marlstone Rock Formation – Ferruginous Limestone and Ironstone.

2.4.2 The 1:10,000 Environment Agency Groundwater Vulnerability Zone map for the area, shown in Figure 2 below, shows the Site is underlain by Secondary Aquifer.

Figure 2: Environment Agency Groundwater Vulnerability Map



2.5 Groundwater

2.5.1 Due to the absence of ground investigation data at this stage there is no site-specific groundwater information available.

2.5.2 An analysis of the Source Protection Zone (SPZ) maps published by the Environment Agency show that the site does not lie within an Environment Agency SPZ with regard to the protection of the quality of groundwater that is abstracted for potable supply.

2.6 Existing Drainage

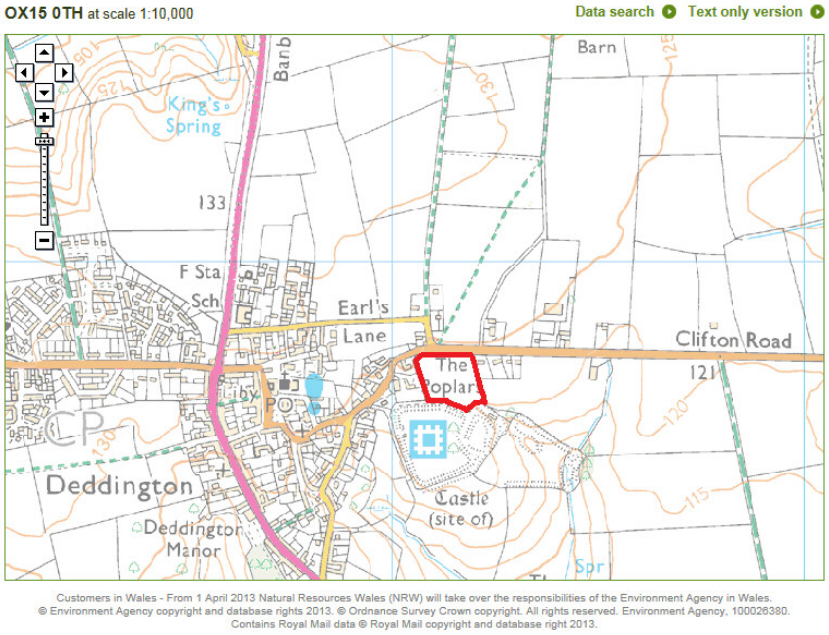
2.6.1 The existing site does not appear to be served by any positive drainage systems.

2.6.2 The Thames Water Sewer Map, presented in Appendix I, shows a 150mm diameter public foul water sewer to the north within Clifton Road; there are no public surface water sewers in close proximity to the Site.

2.7 Existing and Historic Flood Risk

2.7.1 The Environment Agency's Flood Zone Map for the Site is shown in Figure 3 below. The map shows that the Site is situated within Flood Zone 1 – Low Probability.

Figure 3: Environment Agency Flood Zone Map



2.7.2 The definitions of each flood zone given in the NPPF-TG are as follows:

Table 2: Flood Zone Definitions

Flood Zone	Annual Probability of Flooding
Zone 1 Low Probability	River <0.1% Tidal/Coastal <0.1%
Zone 2 Medium Probability	River 1% - 0.1% Tidal/Coastal 0.5% - 0.1%
Zone 3a High Probability	River – 1% or greater Tidal/Coastal – 0.5% or grater
Zone 3b Functional Floodplain	Land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood.

2.8 Potential Sources of Flooding

2.8.1 The most likely potential source of flooding is from surface water, which is considered in more detail in Section 3.3.

3 THE DEVELOPMENT PROPOSALS

3.1 Proposed Layout

3.1.1 The proposed residential development comprises a total of twenty-six dwellings with supporting infrastructure, car parking spaces and access roads.

3.1.2 A single vehicular access to the development off the B4031 (Clifton Road) is proposed.

3.1.3 A car parking area, for up to forty vehicles, for users of the recreational facilities at Deddington Castle is to be provided within the southern boundary of the Site.

3.1.4 The proposed Site Layout is presented in Appendix II.

3.2 Proposed Levels

3.2.1 Proposed levels are anticipated to closely resemble existing levels. This will minimise the import and export of materials as far as reasonably possible.

3.3 Proposed Drainage

3.3.1 This section relates to surface water run-off resulting from rainfall over the post-developed site and the methods of disposing of that surface water. It is also concerned with the risk of flooding due to the capacity of the post-development internal drainage.

3.3.2 In accordance with the requirements of Part H of the Building Regulations the disposal of surface water shall be to one of the following, listed in order of priority:

- Infiltration to the ground, or where that is not reasonably practicable,
- A watercourse, or where that is not reasonably practicable,
- A sewer.

3.3.3 In the absence of a Site Investigation, reference has been made to the UK Soil Survey of Britain (1978) which indicates that the Site has a Winter Rain Acceptance Potential (WRAP) Class 1, which indicates a very high soil infiltration rate.

3.3.4 Infiltration techniques are therefore, for the purposes of this assessment, considered viable as the primary method of surface water disposal however infiltration testing, in accordance with BRE Digest 365, should be undertaken throughout the Site during detailed design to ascertain soil percolation rates to inform the detailed drainage design.

3.3.5 Depending on the outcome of the further investigative work required to ascertain the details of the 300mm diameter pipe presumed to cross the Site it may be necessary to intercept and divert the pipe into the proposed surface water system serving the Site; provision to accommodate the flows from the catchment served will need to be included within the detailed drainage design.

3.3.6 The proposed development will produce a foul water effluent of a domestic nature only. Thames Water in their email dated 21st February 2014, refer to Appendix I, advised that in isolation the proposed development should not cause any detriment to the existing foul water network.

3.3.7 Thames Water do however state that a number of small developments are proposed in close proximity to the Site and advise that an Impact Study may be required should any of these development proceed in advance of this Site.

3.3.8 Due to the topography of the Site a foul water pumping station(s) will be required to serve part, if not all, of the proposed dwellings. It is recommended that consideration be given to incorporating an adoptable pumping station within, or adjacent to, the car parking area for Deddington Castle.

3.4 Design Standard

3.4.1 At the detailed design stage where infiltration systems are proposed groundwater levels must be checked to ensure that the infiltration surface is at least 1m above the maximum anticipated groundwater level. Design should be undertaken in accordance with published design guides such as 'The SUDS Manual' and 'BRE 365' to prevent uncontrolled flooding during storm events up to and including the 1 in 100 year return period.

3.4.2 It is proposed that sewers within the Site are designed in accordance with the latest industry standards. Thus it is proposed to follow the guidelines of Sewers For Adoption 7th Edition which will ensure sufficient velocities are achieved in the sewers that will reduce to a minimum the deposition of silt and prevent excessive detention.

3.5 Area Take-off

3.5.1 The pre-developed Site is Greenfield. Table 3 summarises the preliminary area take-off for the pre and post-developed Sites.

Table 3: Area Take-Off.

Category	Area Take-off		Increase due to development
	Pre-Developed Site (ha)	Post-Developed Site (ha)	Absolute (ha)
Impermeable Area (Road/Paved)	0.00	0.10	0.10
Impermeable Area (Private Road)	0.00	0.23	0.23
Impermeable Area (Roof)	0.00	0.24	0.24
Impermeable Area (Total)	0.00	0.57	0.57
Permeable Area (Total)	1.65	1.08	-0.57
Site Area (Total)	1.65	1.65	0.00

3.5.2 The above area take-off is based on the Topographical Survey and Site Layout, presented in Appendix II.

3.5.3 The approximate existing and proposed percentage impermeable areas are 0% and 35% respectively.

3.6 Volumetric Runoff Coefficients

3.6.1 Sewers For Adoption 7th Edition, Section C5 *Hydraulic Design* recommends a 100% runoff coefficient for impermeable areas only, implying a 0% runoff from permeable areas. In practice the use of certain SUDs techniques provide highly modified runoff characteristics and the storage provided by these should be taken into consideration during detailed design.

3.7 Sustainable Urban Drainage Systems (SUDS)

3.7.1 In accordance with national and local guidance it is a requirement for any new development to include sustainable surface water drainage systems as a technique to manage surface water regimes sustainably.

3.7.2 The Environment Agency have published “A Practical Guide” to assist in the design of SUDS. The guide lists various SUDS techniques which are described as varying from the most to the least sustainable. It is worth noting that all of the techniques shown offer the benefit of flood reduction. The techniques offering benefits of Pollution Reduction and Wildlife Benefit determine those described as “Most Sustainable.”

Table 4: SUDS Techniques

Most Sustainable ↑ / Least Sustainable ↓	SUDs Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living Roofs	✓	✓	✓
	Basins and Ponds - Constructed Wetlands - Balancing Ponds - Detention Basins - Retention Ponds	✓	✓	✓
	Filter strips and Swales	✓	✓	✓
	Infiltration Devices - Soakaways - Infiltration Trenches and Basins	✓	✓	✓
	Permeable surfaces and filter drains - Gravelled areas - Solid Paving Blocks - Porous Paviours	✓	✓	
	Tanked Systems - Over-sized pipes/tanks - Storm cells	✓		

3.7.3 Based upon the anticipated high soil infiltration rates it is recommended that surface water run-off is disposed of via infiltration techniques which could, subject to detailed design, include:

- Soakaways,
- Infiltration Trenches, and
- Permeable Surfaces

4 ASSESSMENT OF FLOOD RISK

4.1 Fluvial Flooding

4.1.1 The Site is located in Flood Zone 1 and is considered to be at low risk from fluvial flooding.

4.2 Groundwater Flooding

4.2.1 From the Environment Agency's mapping information and anecdotal evidence there is no indication that groundwater flooding is an issue.

4.3 Urban Drainage Flooding

4.3.1 According to the Environment Agency's indicative maps the Site is in an area that currently has a 'Very Low' chance of flooding from surface water.

4.3.2 Through the use of appropriate infiltration techniques the proposals will ensure that the development does not result in any increase in the risk of on-site or off-site sewerage flooding.

4.4 Tidal Flooding and Other Risk Sources

4.4.1 The Site is not located within a coastal area and is not subject to tidal influences.

4.4.2 From inspection of the Environment Agency's Indicative Maps the site is not at risk from reservoir flooding.

4.5 Sequential and Exception Tests

4.5.1 Under the NPPF it is a requirement to locate development proposals in an area of lowest risk. As such, various types of development have been classified as to their vulnerability, and tables 2 and 3 of the NPPF-TG set out the type of development that is acceptable within each of the risk zones. Proposed residential use is categorised as "More Vulnerable" in accordance with tables 2 and 3, and acceptable in Flood Zone 1 without any restrictions.

4.5.2 As all development within Flood Zone 1 is described as 'appropriate' the Exception Test is not required for the Site.

5 CONCLUSIONS

5.1.1 Based on the work carried out in the preparation of this report the following conclusions are made:

5.1.2 It is proposed to develop a 1.65 ha Greenfield Site located to the east of the village of Deddington, to provide twenty-six residential dwellings.

5.1.3 The Site is characterised as Flood Zone 1 'Low Probability'.

5.1.4 The use of infiltration techniques is considered viable as the primary method of surface water disposal.

5.1.5 The proposed development will not impede flood flow, will not result in a net loss of floodplain and will not impact flood risk within or external to the Site.

5.1.6 Where storm events are described within this report this includes a 30% increase in rainfall intensities, where applicable, to allow for climate change.

5.1.7 The Coastal and fluvial morphology will not be adversely affected by the proposed development.

5.1.8 It is therefore considered that Planning Consent should not be withheld on flood risk grounds.

6 RECOMMENDATIONS

6.1.1 Based on the work carried out in the preparation of this report the following recommendations are made:

6.1.2 A Ground Investigation is required to ascertain groundwater levels and soil infiltration rates throughout the site to inform the detailed drainage design.

6.1.3 Further investigation is required to ascertain the details of the 300mm diameter surface water pipe serving Clifton Road.

6.1.4 Storm water drainage should be designed in accordance with Sewers For Adoption and to prevent uncontrolled flooding for a 100 year return period event, including climate change.

6.1.5 Detailed Design should consider which SUDS techniques are suitable for inclusion within the proposed development, in consultation with the Environment Agency and Local Planning Authority

6.1.6 Consideration should be given to incorporating an adoptable foul water pumping station within or adjacent to the Deddignton Castle car park to serve part, or all, of the proposed development.

6.1.7 Appropriate pollution prevention methods should be incorporated within the surface water drainage strategy.

APPENDIX I – SUPPORTING INFORMATION

- Thames Water email dated 21st February 2014
- Thames Water public sewer records

To: Scott Marshall[ScottMarshall@bannersgate.com]
From: Geoff Nokes
Sent: Fri 21/02/2014 12:17:23 PM
Importance: **Normal**
Subject: Lnd Sth of Clifton Rd Deddington OX15 0TH IR1011652762 PDE

Scott

This site should not be a problem to our existing network alone, however there are a number of other small developments proposed close to yours and an impact study may be required if any of those developments progress before yours and a condition may be put in the planning process for this reason.

Regards

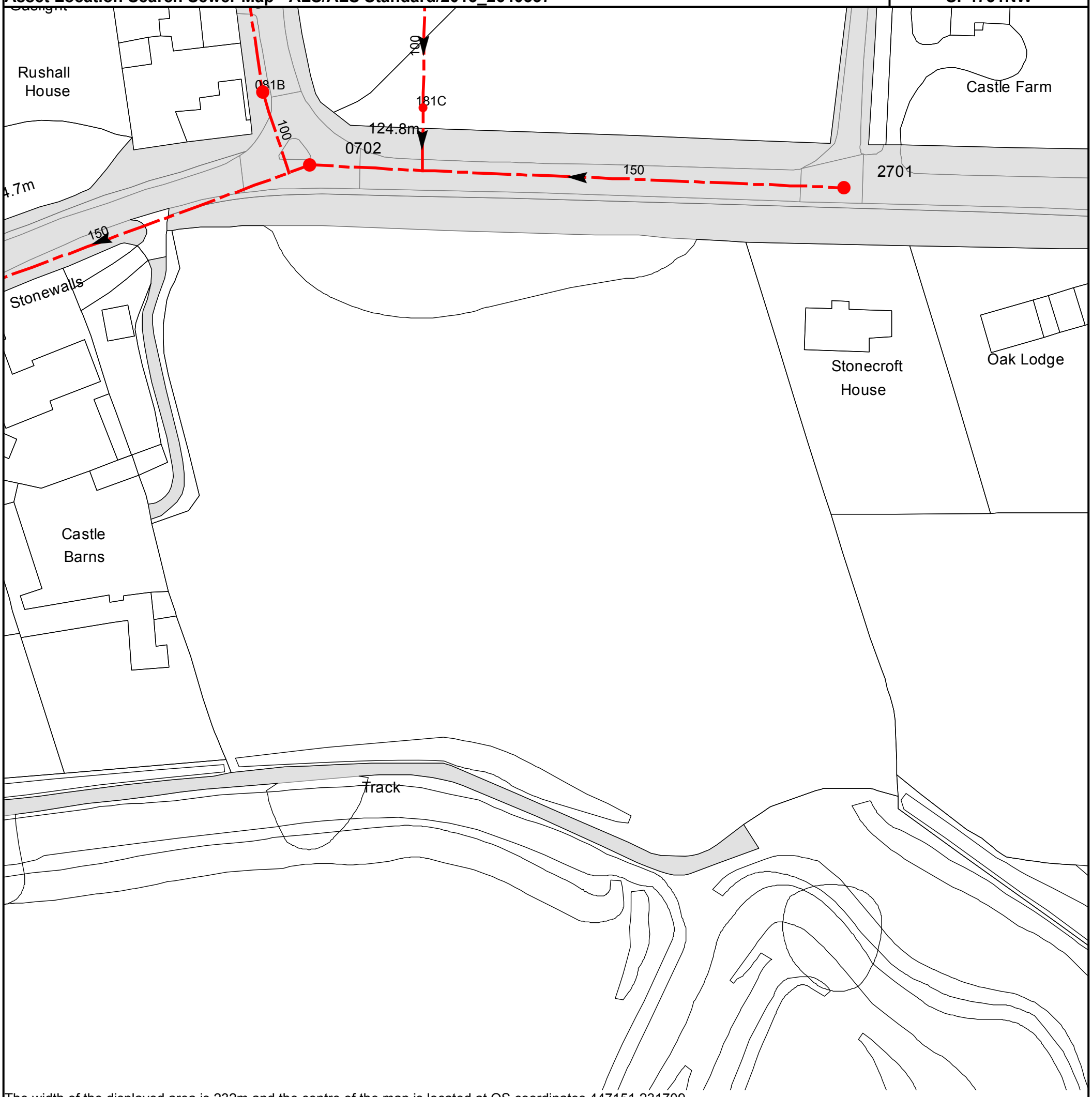
Geoff Nokes
Development Engineer - Waste

*Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, RG1 8DB

(helpdesk 0845 850 2777 direct [redacted]

[redacted]

Asset Location Search Sewer Map - ALS/ALS Standard/2013_2640337 | **SP4731NW**



The width of the displayed area is 232m and the centre of the map is located at OS coordinates 447151,231709

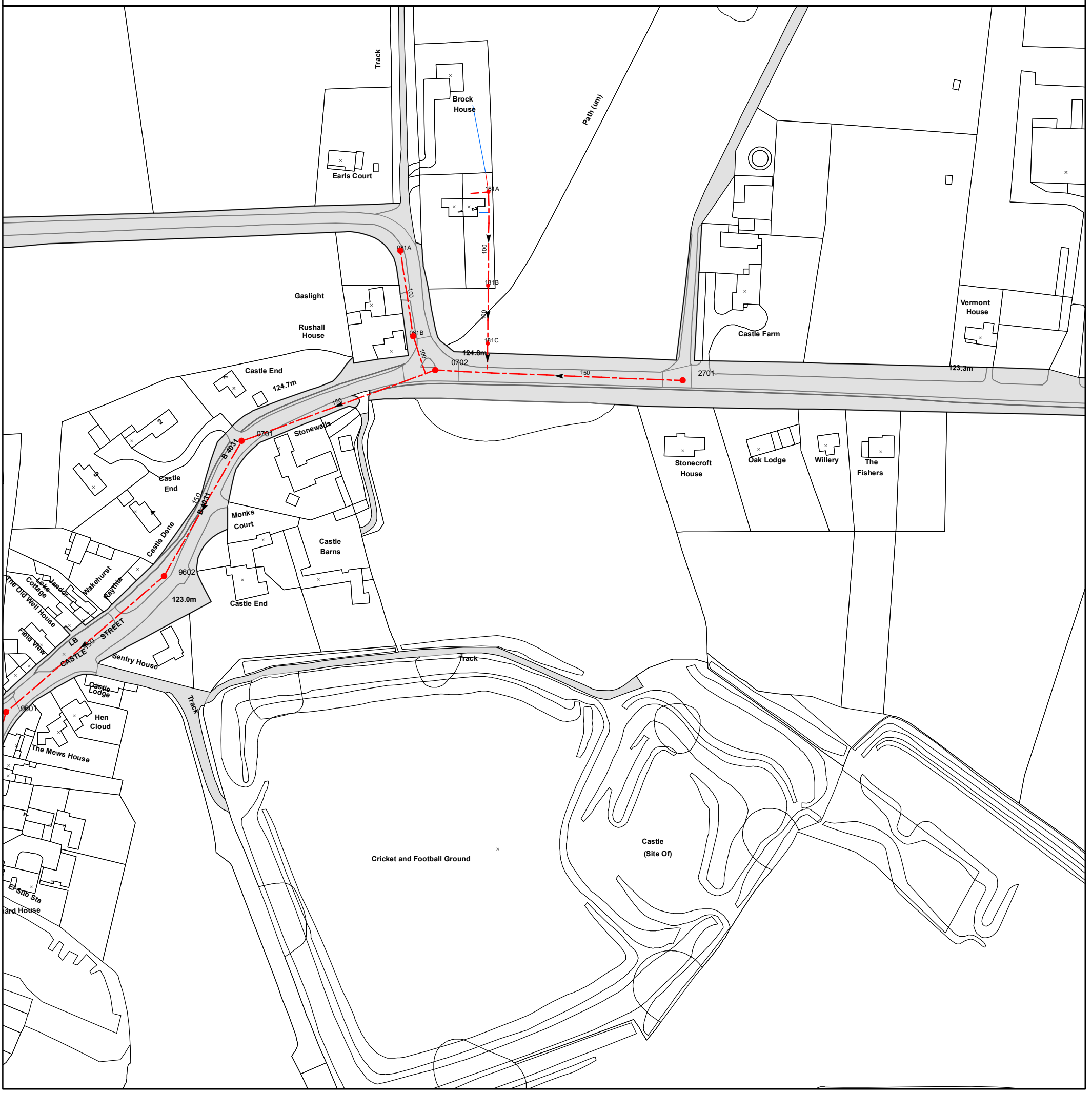
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
081B	n/a	n/a
0702	124.85	122.16
181C	n/a	n/a
-	-	-
2701	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/2013_2640337



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Meters

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Width:	500m
Printed By:	mabdul
Print Date:	04/12/2013
Map Centre:	447151,231709
Grid Reference:	SP4731NW

Comments:

ALS/ALS Standard/2013_2640337

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
081A		
9601	122.88	119.08
0701	124.57	121.08
0702	124.85	122.16
181B		

REFERENCE	COVER LEVEL	INVERT LEVEL
181A		
9602	123.01	120.21
081B		
181C		
2701		

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.

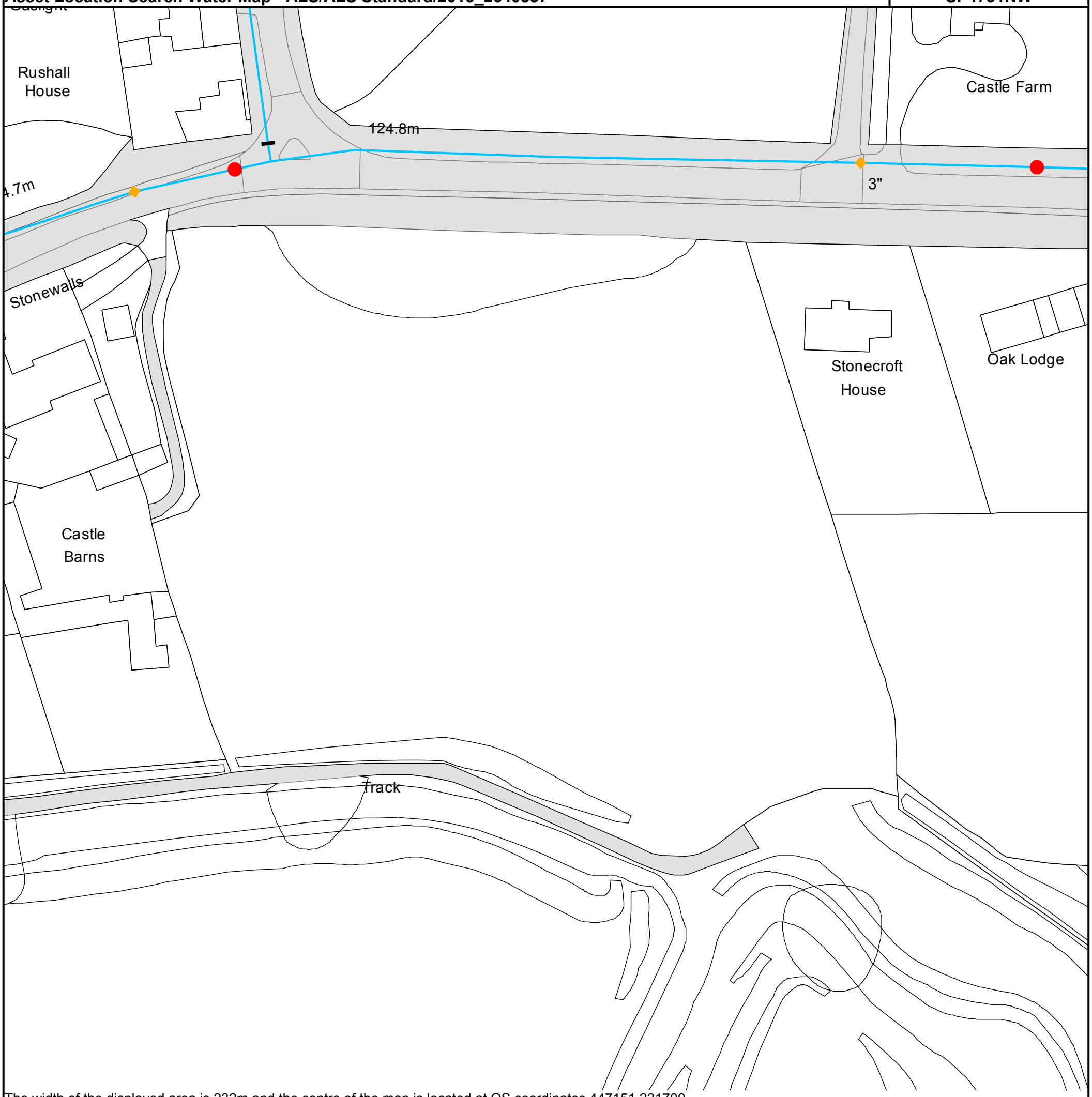
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

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/2013_2640337 | **SP4731NW**



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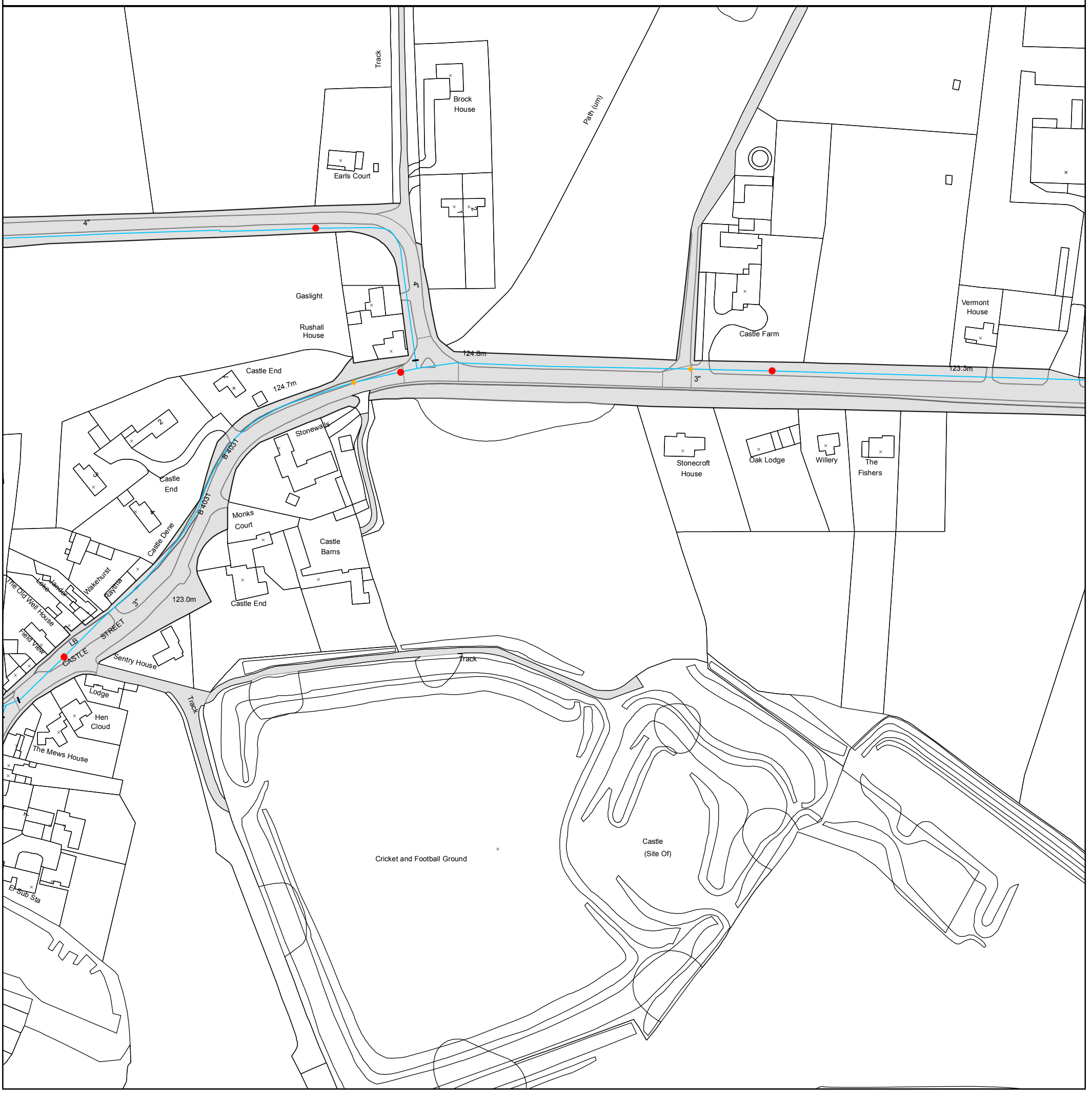

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Meters

Scale:	1:1791
Width:	500m
Printed By:	mabdul
Print Date:	04/12/2013
Map Centre:	447151,231709
Grid Reference:	SP4731NW

Comments:

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.

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')

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

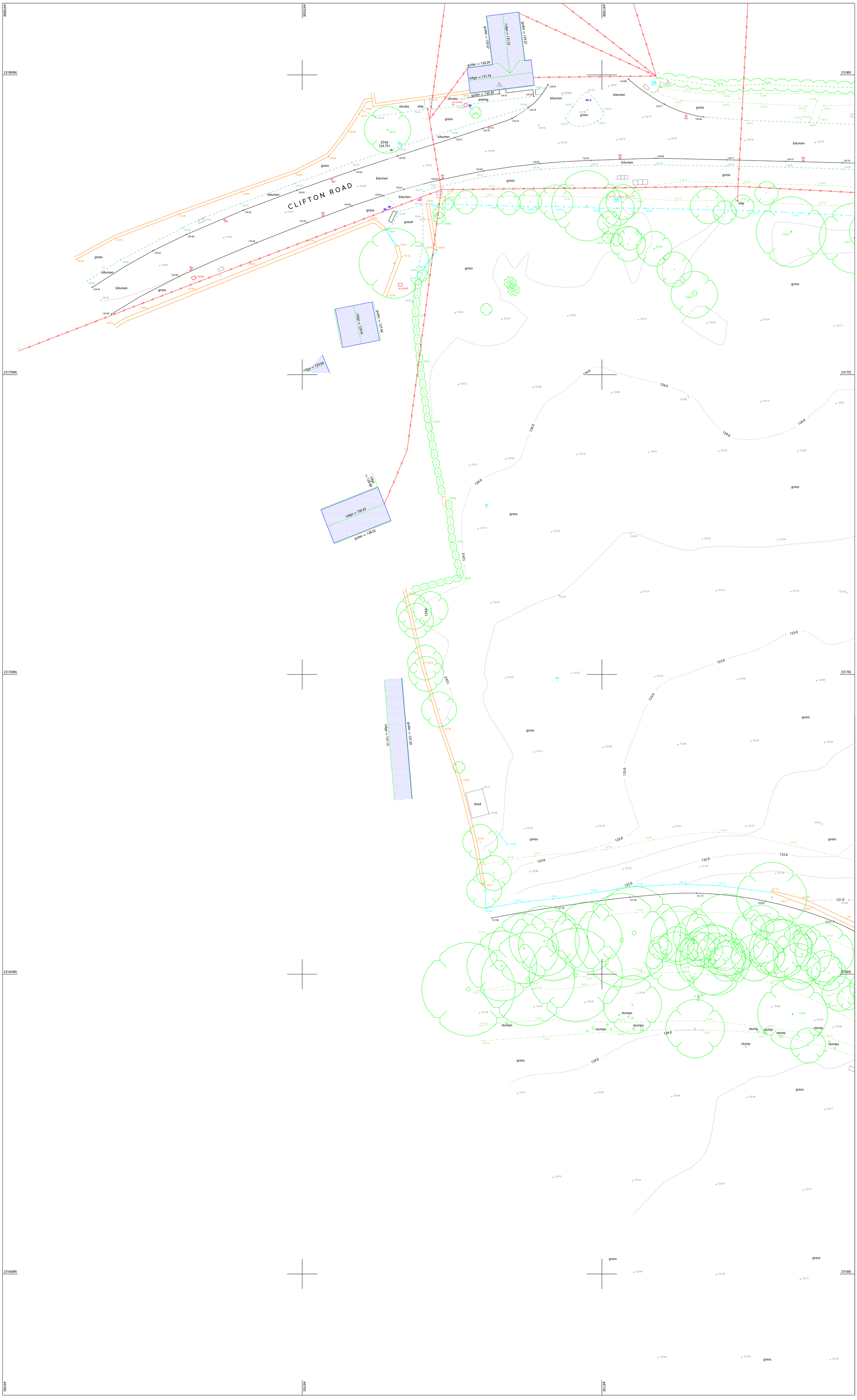
Other Water Pipes (Not Operated or Maintained by Thames Water)

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.

APPENDIX II – FIGURES & DRAWINGS

- 130149 Interlock Surveys Topographical Survey
- PL/060114/02 Proposed Site Layout
- 13166/DS1 Drainage Strategy Plan



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
AK	RW	08/04/13	SIH	08/04/13	RGT	08/04/13

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Title.

TOPOGRAPHICAL SURVEY

CLIFTON ROAD
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OXFORDSHIRE
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Dwg No. **130149** Sheet **1 of 2**

Scale 1:200 A0 Sheet Rev. -