

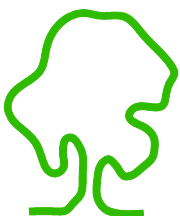
BROOKFIELD FARM



OLD WOKINGHAM ROAD, CROWTHORNE, WOKINGHAM,
BERKSHIRE, RG40 3BU

Flood Risk Assessment and Drainage Design

January 2026



eas ltd

Environmental Assessment Services Ltd

REPORT DATA SHEET

Requirement	Data
Report Reference	874/ProwePlanning/BrookfieldFarm/FRA&DS
Date	January 2026
Client	Phil Rowe
Report type	Flood Risk Assessment and Drainage Strategy
Purpose	Planning
Revisions	-
Prepared by	Xanthe Lyford BSc (Hons) Signed 
Approved by	Eur Ing Malcolm McKemey BSc (Hons), CEng, Cenv, MICE, MCIWEM, MIEnvSc Signed 

PROWE PLANNING

**BROOKFIELD FARM, OLD WOKINGHAM ROAD, CROWTHORNE,
WOKINGHAM, BERKSHIRE, RG40 3BU**

Flood Risk Assessment and Drainage Strategy

January 2026

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1. BACKGROUND, EXISTING SITE & PROPOSED DEVELOPMENT
 - 1.1 The site largely comprises an area of unused agricultural land, with a storage building and office building, a tarmacked access track and parking area to the southeast with vehicles and shipping containers stored adjacent. The buildings are to remain post development (see Figures 1, 2, 3 in Appendix A for the proposed development). The site is located in a rural location to the southwest of Bracknell, Berkshire. The north, south and eastern boundaries are treelined and the western boundary comprises a post and rail fence. The site is bordered to the north by Easthampsted Road, public highway with agricultural fields on the opposite side, to the east by Old Wokingham Road public highway, with residential properties on the opposite side, to the south by an unnamed private track with a car parking area and workshops on the opposite side and to the west by agricultural fields laid to pasture for grazing. There is a watercourse running adjacent to the southern boundary, the Emm Brook. The site is currently accessed from Old Wokingham Road by an entrance track leading to a parking area adjacent to Brookfield Farm residence. The site area (redline boundary) is approximately 4.6 ha. The Ordnance Survey map reference for the centre of the site is SU 83850 66564. The site elevation for the centre of the site is approximately +68 m AOD. See Appendix A Figure 1 for the site location plan and Figure 2 for the existing site layout.
 - 1.2 It is proposed to redevelop the existing field into a natural burial ground. This includes the construction of a Pavillion Building to the north of the site with an adjacent visitor car park and a viewing platform overlooking a new natural lake surrounded by raised mounds to the east, west and south. There are to be new pathways through the burial ground linking the pavilion and lake with three ceremonial gardens, on the northern, southern and western sections of the site (all of which is to be constructed of permeable surfacing). Access to the site is to be via a currently disused and blocked gated entranceway from Easthampsted Road to the north. See Figure 3 in Appendix A for the proposed site layout.

2. GEOLOGY & HYDROGEOLOGICAL CONSIDERATIONS

- 2.1 According to the British Geological Survey website the site lies on Bagshot Formation-Sand. These sedimentary rocks are detrital, ranging from coarse- to fine-grained (locally with some carbonate content) forming interbedded sequences. The free draining soil type was seen at the time of our visit. See Appendix E for photographs of the soil at the site.
- 2.2 The Department for Environment, Food and Rural Affairs (Defra) online mapping (MAGIC) shows the site to be lying on a Secondary A bedrock aquifer and superficial drift. DEFRA classify the soil type as “*Freely draining lime-rich loamy soils*”. The site lies on an area of ‘high’ groundwater vulnerability and does not lie in a groundwater source protection zone (SPZ).

3. FLOOD RISK ASSESSMENT

3.1 Outline Flood Risk

- 3.1.1 The Environment Agency’s Flood Maps for Planning shows the site lies in Flood Zone 1 (low risk/>0.1% AEP). The Flood Maps for Planning long-term prediction (2036-2069) for the site shows that the site is predicted to remain in Flood Zone 1. See Appendix B for the flood zone maps for the site.
- 3.1.2 The majority of the site is not shown to be at risk of surface water flooding in the 1 in 30-year scenario, apart from a very small section on the northwestern corner and another in the northern section of the site at the approximate location of the proposed easternmost portion of the natural lake. These areas do not appear to have increased in size in the 1 in 100-year scenario. In the 1 in 1000-year scenario these areas have enlarged, and three additional small areas of surface water flood risk have appeared along the northern boundary and in the centre of the site. The Flood Maps for Planning site gives long term predicted flood risk for surface water. The 2040-2060 scenario shows the area of flood risk to be of low risk (> 0.1 % in any year). Flooding from groundwater or reservoirs is considered unlikely in this area. There does not appear to be any history of sewer flooding at the site. See Appendix B: for the Environment Agency’s flood risk maps.

3.2 Defences

- 3.2.1 Flood defences can help reduce the chance of flooding but cannot completely prevent it. They can fail, or water could spill over the top if it is deep enough. There is a watercourse to the south of the site, (a minor tributary of the Emm Brook – a tributary of the River Loddon) that flows westwards (flow direction could be seen at the time of our visit).

- 3.2.2 The section of the Emm Brook, at Riverside Park (downstream of the site) has been straightened in the past, using river training for use as a mill stream, which has increased the flood risk from the brook. It is proposed to add meanders to the Emm Brook to restore it to its original flow path, to help to safeguard/defend the surrounding land from flooding and increase the biodiversity within the brook. This occurs downstream of the site and may increase in flood risk due to the area of straightened watercourse which does not affect the site itself.
- 3.2.3 The Emm Brook is also defended downstream of the site by engineered and natural high ground, but the site itself is not directly protected by these flood defences. See Appendix B for a map of the Emm Brook to the south of the site.

4 ALTERNATIVE SOURCES OF FLOODING

An assessment of alternative sources of flooding potentially affecting the site has been made from a review of the EA online flood mapping, the EA's Product 4 information (applied for on 15 January 2026) and from Wokingham Borough Council Level 1 Strategic Flood Risk Assessment (SFRA May 2023). The SFRA addresses alternative sources of flooding including fluvial flooding, surface water flooding, groundwater flooding, flooding from sewers and flooding from reservoirs.

4.1 Surface Water Flooding

- 4.1.1 Surface water runoff (or 'pluvial' flooding) is most likely to be caused by intense downpours e.g. thunderstorms, exacerbated by blocked culverts and areas of nonpermeable surfacing.
- 4.1.2 The EA flood maps for planning show the site to be at risk of surface water flooding in the northwestern corner of the site and a small area to the north in the 1 in 30-year scenario. These areas do not increase in size in the 1 in 100-year scenario. In the 1 in 1000-year scenario these areas have increased in size along the northern boundary and three additional small areas to the centre and in the north of the site have appeared.

The SFRA (2023) states

"The mapping shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys and can pond in low-lying areas."

4.2 Sewer Flooding

- 4.2.1 Sewer maps for the site were ordered from Thames Water on 20 January 2026. There is no mains foul sewer at the site and none in the surrounding area. The only surface water and foul sewers are rising mains in Old Wokingham Road to the far south of the site. See Appendix F for the Thames Water Sewer maps for the area. No records of sewer flooding at the site have been found.

4.3 Groundwater Flooding

- 4.3.1 Groundwater flooding occurs when the water table rises above the surface of the ground, normally as a result of persistent rainfall over a prolonged period. Increased levels of development in an area can increase the risk of groundwater flooding. The flood maps for planning classifies the site as unlikely to be at risk from groundwater flooding.

4.4 Reservoir Flooding

- 4.4.1 There are no large artificial water storage facilities within the vicinity of the site. The EA's Flood Maps for planning site state that flooding from reservoirs is unlikely at the site.

5 HISTORY OF FLOODING

- 5.1 According to the SFRA (2023), there are several recorded incidents of flooding within the Wokingham LLFA area. Most notably 1993, 2000, 2003, 2007 and 2013/14. The cause was predominantly fluvial and surface water flooding following a period of unprecedented rainfall. No records of historic flood events directly affecting the site, or its immediate surroundings, have been found.
- 5.2 The Environment Agency's flood risk data (Product 4) for the site was ordered from the EA on 15 January 2026. See Appendix G for the EA's Product 4 data. Due to the flood risk at the site being only from surface water the EA have no Product 4 flood data for the site.

6 PLANNING STATUS WITH RESPECT TO FLOODING

- 6.1 The site is shown to be in Flood Zone 1 (>0.1% probability of flooding in any year). The majority of the site is shown not to be at risk of surface water flooding, with a small section on the northwest corner and towards the north of the site to be at risk in the 1 in 30-year and 1 in 100-year scenarios; increasing in size in the 1 in 1000-year scenario, with two additional areas of surface water flood risk appearing towards the north and in the centre of the site. However, the areas of the site that are affected by the surface water flood risk are to be in areas of natural ground and in the location of the proposed natural lake, and as such will not impact the development of the site. The area where the Pavillion, car park and burial sites are to be located are not shown to be at risk of surface water flooding in any of the scenarios and are in Flood Zone 1 and expected to remain so for the lifetime of the proposed building. See Appendix B for the Environment Agency Flood Zone and surface water maps.
- 6.2 The Sequential Test is intended to steer vulnerable development to land in Flood Zone 1. As the area of the site that is to be developed is in Flood Zone 1 it can be considered that the Sequential Test is satisfied. There will be no need to apply the Exception Test.

7 RISK TO PROPERTY

- 7.1 The area of the site to be developed lies in Flood Zone 1 and is at low risk of flooding from surface water flooding. The buildings on the site are not considered likely to be at risk from flooding in any form.

8 RISK TO USERS OF THE PROPOSED DEVELOPMENT

- 8.1 The developed area of the site lies in Flood Zone 1 and is at low risk of surface water flooding. There should be no significant flood related risk to the proposed site users whilst they are on the burial ground area of the site or in the pavilion building. The areas where surface water flood risk is shown are in the northwest corner of the site, which is to be left as natural ground, and in the area of the easternmost section of the lake.

9 LIKELY IMPACT ON FLOOD RISK ELSEWHERE

- 9.1 The site, as existing, is largely of permeable surfacing (field), apart from the storage buildings, office building and tarmac track to the southeast (to remain). It is proposed that the parking area, paths and ceremony gardens be of permeable surfacing, as such, the proposed development will only slightly increase the impermeable area and therefore the surface water runoff from the site. The increase in area is calculated from the area of the roof of the Pavillion Building (approximately 173 m²). The increase in flood risk has been mitigated by the use of permeable surfacing in the parking area, ceremony gardens and paths. It is also proposed to construct a lake to the north of the site, with an outdoor viewing space and bridge giving access to the main burial site. This will slow the runoff from the wider site and make it more sustainable in line with the SuDS hierarchy.

10 EXISTING SITE DRAINAGE

- 10.1 The site was visited on Thursday 22 January 2026.
- 10.2 There appears to be no formal surface water drainage at the site and it can be assumed that the site drains as greenfield in a southerly direction following the topography of the land before draining into the Emm Brook, a tributary of the River Loddon (located to the south of the site, flowing west). There was an established ditch present along the northern boundary with Easthamsted Road, this was seen to be wet with a flow in a westerly direction parallel with the Emm Brook on the opposite side of the site. See Appendix E for photographs of the ditch and Emm Brook.
- 10.3 There is no foul water drainage at the site as existing and no public mains foul sewer in the area surrounding the site. See Appendix F for the Thames Water sewer map for the site.

11 SURFACE WATER DRAINAGE OPTIONS

- 11.1 There is a general requirement that new drainage systems should be sustainable (SuDS) and that flow leaving the site should not exceed the Greenfield flow rate, including both surface water and sewage effluent.
- 11.2 The area of impermeable surface will be increased by the proposed redevelopment as the site is currently largely permeable, consisting of a field with an impermeable access track (tarmac) and a storage building and office building to the southeast, which are to remain as existing (so not impacting the increase in surface runoff).
- 11.3 The proposed development will have an increase in impermeable surface area of approximately 173 m² comprising the roof areas of the Pavillion Building. The use of permeable paving in the car park area, ceremony gardens and paths will reduce the surface water runoff and make the development more sustainable.
- 11.4 The Greenfield runoff rate for the site has been calculated using the UK SuDS tools, the results are shown in See Appendix C and summarised in Table 11.1 below:

TABLE 11.1
GREENFIELD RUNOFF RATES

Return period	Flow rates (l/s)
Qbar	21.3
1 in 1 year	18.1
1 in 2 year	18.8
1 in 10 year	34.6
1 in 30 year	49.1
1 in 100 year	68.1
1 in 200 year	79.8

- 11.5 The current non-statutory guidance indicates that the maximum discharge permitted to leave the site from the drained area post development should not exceed the 1 in 1 year return period flow rate (18.1 l/s), or as near as practicable. Flow control vortex valves can reduce the flow rate to as little as 2 l/s to reduce the impact of the runoff. See Appendix C for the HR Greenfield Flow Rate tool data.

11.6 According to the SuDS manual, UK runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- *priority 1: collected for non-potable use*
- *priority 2: infiltrated to ground*
- *priority 3: discharged to an above ground surface water body*
- *priority 4: discharged to a surface water sewer, or another piped surface water drainage system*
- *priority 5: discharged to a combined sewer*

(Priority 1 is the highest priority and priority 5 is the lowest.)

11.7 Rainwater harvesting for garden irrigation should be considered where practicable.

11.8 Discharge to soakaway requires suitably permeable ground. The soil at the site is Bagshot Sand Formation (variable-good permeability). At the time of our visit the surface of the exposed soil could be seen to be sandy and porous, there had been heavy rain leading up to the time of the site visit and the areas of exposed soil did not show pooling. See Appendix E for pictures of the soil at the site. It is proposed to drain the surface water from the roof of the Pavilion Building to a soakaway located under the adjacent permeable surface of the car park. This would require percolation testing to confirm the soil suitability and gain an accurate percolation coefficient, prior to construction commencing. For the purpose of this drainage design we have assumed a percolation coefficient of 5×10^{-5} l/s. Drainage to soakaway is the preferred method of disposal of surface water from the developed site.

11.9 The alternative to drainage to soakaway is drainage to attenuation storage where excess surface water is stored on site, either in a pond, gully, swale or underground attenuation storage unit. The surface water is allowed to discharge at a maximum of the Greenfield flow rate via a flow-control vortex valve or orifice plate into a nearby watercourse. As infiltration drainage to a soakaway is the preferred method for the disposal of surface water in the SuDS hierarchy and the soil type at the site allows for this method, attenuation has not been considered further.

- 11.10 The NPPF states: *“Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control the flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible facilitating improvements in water quality and biodiversity.”*

The use of permeable paving in the parking area, ceremony gardens and paths, has reduced the surface water runoff rate and made the development more sustainable. A lake has been created to the north of the site, to help to intercept and slow the flow of surface water across the ground towards the Emm Brook which also helps to make the development more sustainable and increases biodiversity. Additional SuDS measures to mitigate the impact of the development by decreasing the runoff flow rates and increasing sustainability could include water butts on the drainpipe downpipes for use in garden watering.

- 11.11 A suitable sized soakaway would be 3.2 m x 3.2 m x 0.8 m deep as calculated by the MasterDrain drainage network model using a percolation coefficient of 5×10^{-5} . The soakaway will be located under the adjacent car park and surface water runoff from the pavilion roof will be drained to this for infiltration to the surrounding soil. The proposed drainage layout is shown in Figure 4. Please note that, in the absence of a topographical survey for the site, the levels given in the outline design are provisional. Output from the drainage design model can be seen in Appendix D.

11.12 Design Storm

The surface water drainage system has been designed for the 30-year return period event plus a 35% allowance for climate change and tested for surcharge for the 1 in 100-year return period event (1% Annual Exceedance Probability) plus a 45% allowance for climate change. See Appendix A, Figure 4 for the proposed drainage design, Figure 5 for an example of a crate soakaway design and Appendix D for pipe and chamber layout and sizing of the soakaway from the MasterDrain model.

11.13 Drainage Design Model

The soakaway should be located not less than 5 m from the edge of the nearest building and 2.5 m from the nearest boundary. The chosen location, in the car park, is greater than 5 m from any building and 2.5 m from any boundary. See Figure 4 in Appendix A for the suggested drainage arrangement.

The soakaway consists of an underground system made of high-strength plastic that temporarily stores excess surface water and allows it to slowly soak into the surrounding soil, preventing flooding and reducing the strain on public drainage systems. The soakaway has been sized at 3.2 m x 3.2 m x 0.8 m deep. See Figure 5 in Appendix A for an example of soakaway design.

The drainage arrangement has been designed using the MasterDrain network drainage model.

11.16 Hydrological Data

Hydrological data for the site as used in the MasterDrain model is given in Appendix D.

11.17 Extreme Event

An extreme event, which overwhelmed the drainage system, would likely result in water following the existing course and flowing south across the surface of the ground towards Emm Brook watercourse (tributary of the River Loddon) as per the existing arrangement. The Emm Brook was seen at the time of our visit with a high water level and a strong flow in a westward direction. See Appendix E for photographs of the Emm Brook.

12 PROPOSED FOUL DRAINAGE

12.1 Due to the absence of a public foul sewer in the vicinity of the site it is proposed to drain the foul sewage from the Pavilion Building to an onsite sewage treatment plant. A suitable location for the treatment plant would be in the mound to the east of the parking area (2.5 m from the nearest boundary and 5m from the nearest building). The treated effluent from the plant is to discharge to a drainage field or the neighbouring watercourse, a ditch running adjacent to Easthampsted Road along the northern boundary of the site; this then flows westwards to join the Emm Brook further downstream (tributary of the River Loddon). The ditch was seen at the time of our visit with a water level of approximate depth of 0.15 m. See Appendix E for photographs of the ditch at the site.

12.2 See Appendix F for the Thames Water Sewer Plans for the site and Figure 4 in Appendix A for the suggested drainage layout.

13. DRAINAGE DESIGN SUMMARY

13.1 The surface water chamber sizes, invert levels and pipe sizes from the MasterDrain model are summarised in Table 13.1 below:

TABLE 13.1
SURFACE WATER CHAMBERS

No.	Dia (mm)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
SW1	450	65.86	65.36	100	100
Soakaway	N/A	65.82	64.86	100	-

13.2 The foul sewage chamber sizes, invert levels and pipe sizes are given in Table 13.2 below:

TABLE 13.2
 FOUL SEWAGE CHAMBERS

No.	Dia (mm)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
FW 1	450	66.01	65.51	100	100
Sewage Treatment Plant	N/A	66.04	65.32	100	100
Ditch	N/A	66.00	65.22	100	-

14 OPERATION AND MAINTENANCE OF THE SYSTEM

14.1 The drainage system will generally require minimal operational input once construction has been completed. However, it will require some regular maintenance.

14.2 Items requiring maintenance will include:

- Chambers, this will require regular removal of any debris likely to obstruct. Maintenance should be carried out at the time of year after most leaf fall has occurred.
- Any gullies, pipes and channels will need occasional removal of accumulated debris and silt.
- The sewage treatment plant will require annual maintenance from a specialist contractor.

15 SUMMARY OF CONCLUSIONS

15.1 The site comprises an area of unused agricultural land with a tarmac track and parking area leading to a storage building and office building to the southeast of the site which are to remain as existing. It is located in a rural location to the southwest of Bracknell, Berkshire. See Figure 1 in Appendix A for the site location.

- 15.2 It is proposed to redevelop the existing field into a natural burial ground. This includes the construction of a Pavillion Building to the north of the site with an adjacent visitor car park (permeable surfacing) and a viewing platform overlooking a new natural lake surrounded by raised mounds to the east, west and south. There are to be new pathways through the burial ground linking the pavilion and lake with three ceremony gardens, on the northern, southern and western sections of the site, these are also to be of a permeable design to minimise runoff from the development. See Figure 2 in Appendix A for the site as existing and Figure 3 for the proposed development.
- 15.3 The underlying geology is Bagshot Sand Formation – Sandstone over sedimentary bedrock. The Department for Environment, Food and Rural Affaires (Defra) online mapping (MAGIC) shows the site to be lying on a Secondary A bedrock aquifer and superficial drift. DEFRA classify the soil type as “*Freely draining lime-rich loamy soils*”. The site lies on an area of ‘high’ groundwater vulnerability but does not lie in a groundwater source protection zone (SPZ).
- 15.4 The Environment Agency’s Flood Map for Planning shows the site lies in Flood Zone 1 (low risk/ $>0.1\%$ AEP). The majority of the site is not shown to be at risk of surface water flooding, apart from a small area in the northwestern corner of the site and a small area to the north in the 1 in 30-year and 1 in 100-year scenarios. These areas increase in size in the 1 in 1000-year scenario and also include three additional small areas to the north and in the centre of the site. Flooding from groundwater or reservoirs is considered unlikely in this area. There does not appear to be any history of sewer flooding at the site. See Appendix B for the flood maps for planning.
- 15.5 The development portion of the site is in an area that is in Flood Zone 1 and at low risk of flooding from surface water. As such, the development and future site users are not at risk from flooding. The areas of the site that are shown to be at risk of surface water flooding are under the proposed natural lake to the north of the site or in the far northwest corner of the site, in an area that is to be left as natural ground. The proposed development includes permeable paving in the paths, ceremony gardens and parking area, this makes the development more sustainable and reduces the surface water runoff from the site. The lake has further added to the sustainability of the site as a whole, slowing and attenuating the flow of surface water runoff from the site and increasing the biodiversity of the area. These measures have helped keep the impact of the development on flood risk elsewhere to a minimum, making the development more sustainable in line with the SuDS hierarchy.
- 15.6 The preferred sustainable drainage method is drainage to a soakaway located under the permeable car park adjacent to the Pavilion Building to the northwest of the site. This location is greater than 5 m from any building and 2.5 m from any boundary as required. A suitable sized soakaway would be 3.2 m x 3.2 m x 0.8 m deep. See Figure 4 in Appendix A for the drainage design and Figure 5 for the soakaway design.

- 15.7 The use of permeable paving for the areas of hardstanding in the proposed car park, ceremony gardens and paths in the design has reduced the non-permeable area in the development and increased its sustainability.
- 15.8 The construction of a lake to the north of the site has also added sustainability by reducing surface runoff from the wider site and increasing biodiversity. Measures to further reduce the runoff from the site include water butts from drainpipe downpipes for use in garden watering.
- 15.9 An extreme event overtopping the system would likely follow the existing flow pattern, draining southwards across the surface of the ground to the Emm Brook (a tributary of the River Loddon). See Appendix E for photographs of the Emm Brook.
- 15.10 Due to the absence of a mains foul sewer in the vicinity, the foul sewage from the public lavatories in the Pavilion Building will discharge into a sewage treatment plant located in the mound to the east of the parking area. The treated effluent from this will discharge into the drainage ditch located along the northern boundary of the site along Easthampsted Road and flowing in a westerly direction to join the Emm Brook (a tributary of the River Loddon). See photographs in Appendix E for photographs of the drainage ditch.



APPENDIX A:

- Figure 1: Site Location
- Figure 2: Site as Existing
- Figure 3: Proposed Development
- Figure 4: Suggested Drainage Arrangement
- Figure 5: Soakaway Design
- Figure 6: Sewage Treatment Plant Example



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Figure 1: Site Location Plan

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Figure 2: Site as Existing

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Figure 3: Proposed Development

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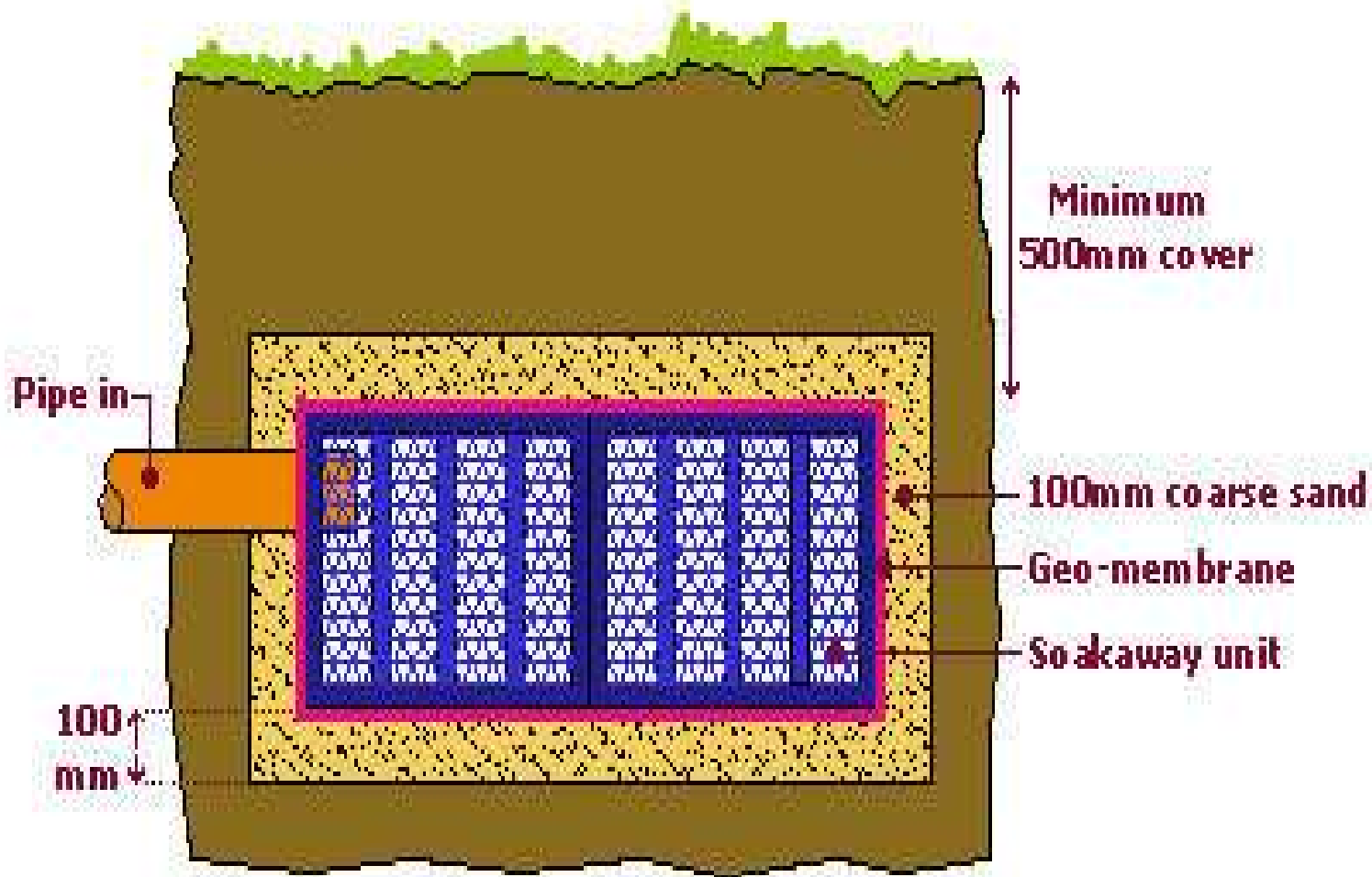
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Figure 4: Suggested Drainage Arrangement

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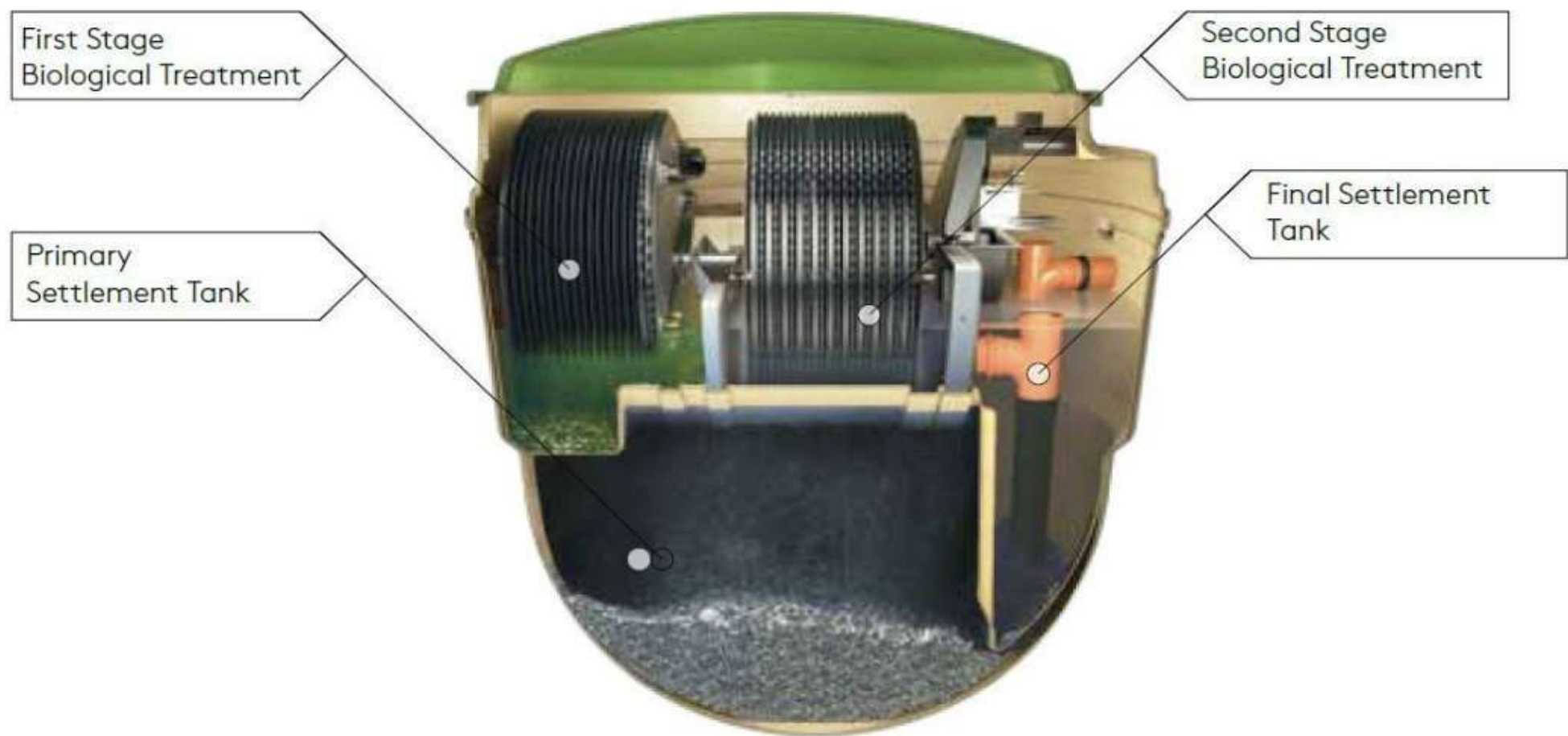
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Not to scale

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Figure 5: Soakaway Design

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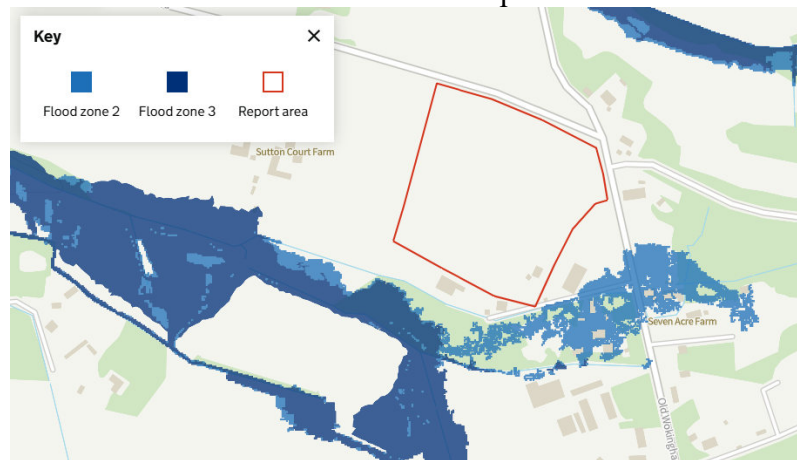
Figure 6: Example Sewage Treatment Plant

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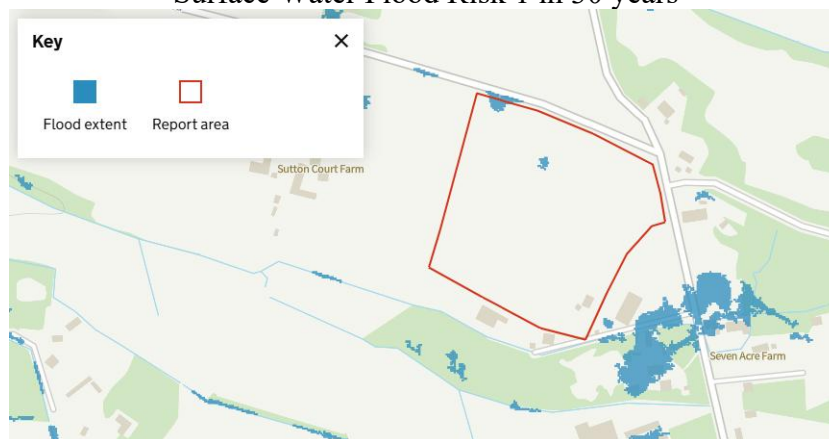
APPENDIX B:

ENVIRONMENT AGENCY FLOOD MAPS FOR PLANNING

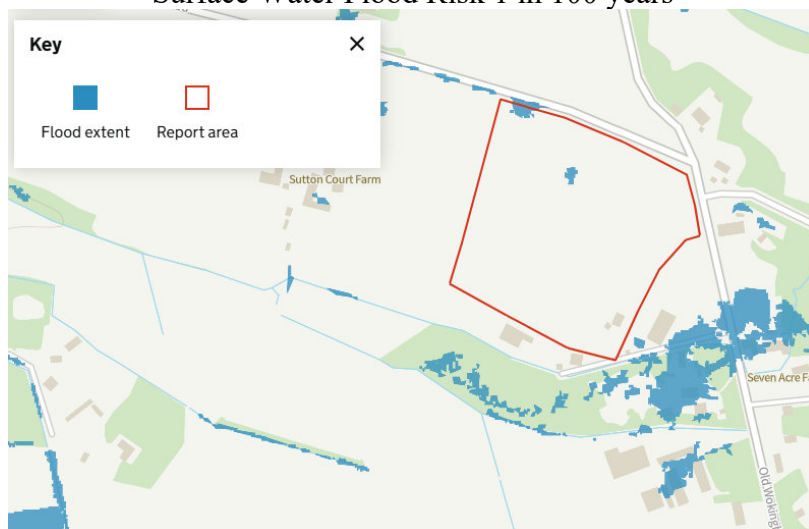
Flood Zone Map



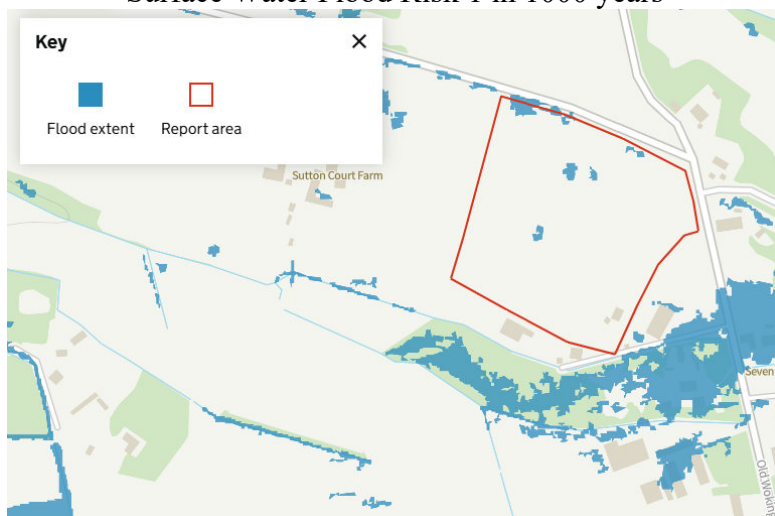
Surface Water Flood Risk 1 in 30 years



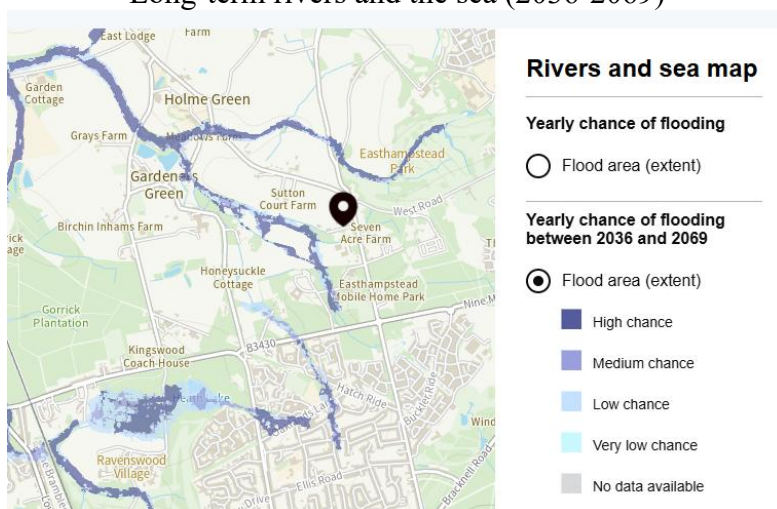
Surface Water Flood Risk 1 in 100 years



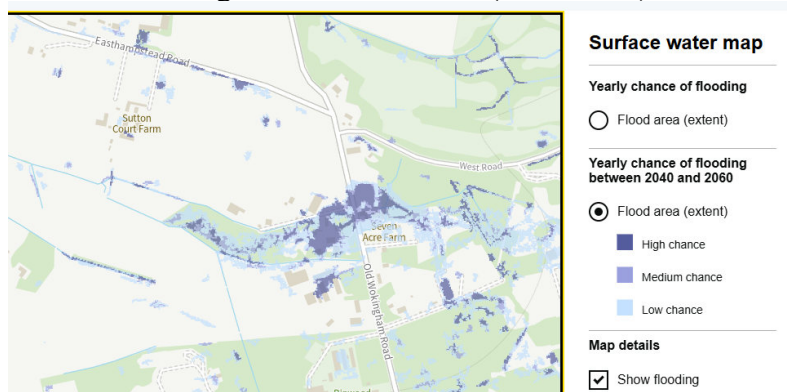
Surface Water Flood Risk 1 in 1000 years



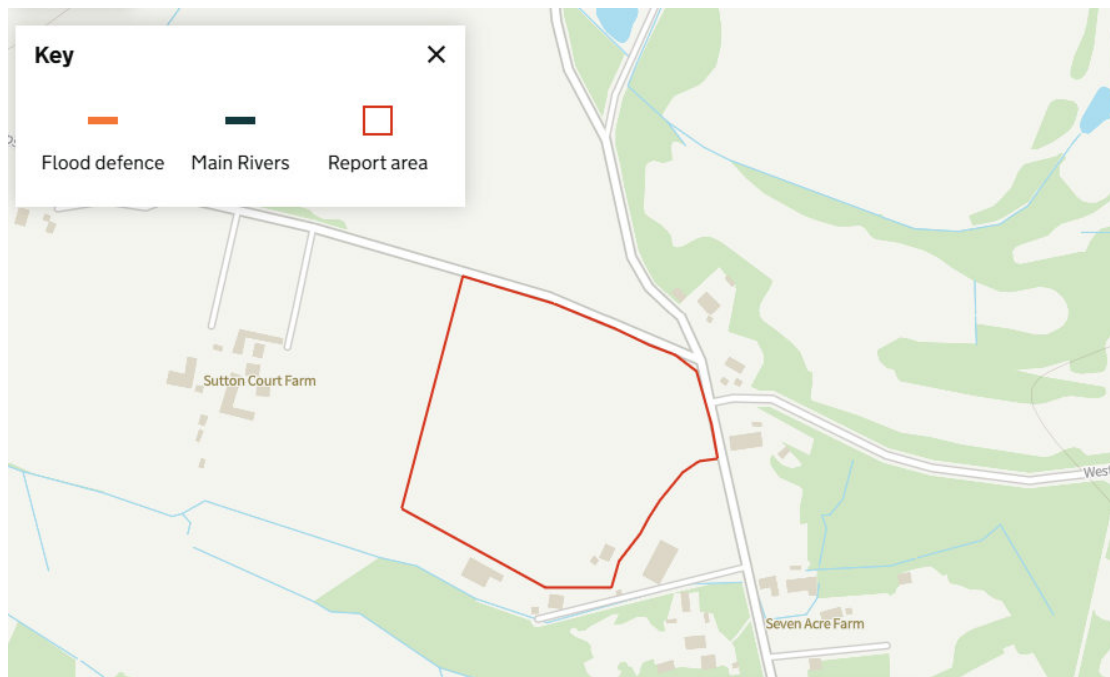
Long-term rivers and the sea (2036-2069)



Long-term surface water (2040-2060)



Map showing Emm Brook Watercourse to the south of the site (Emm Brook)



APPENDIX C:
HR WALLINGFORD GREENFIELD FLOW RATES

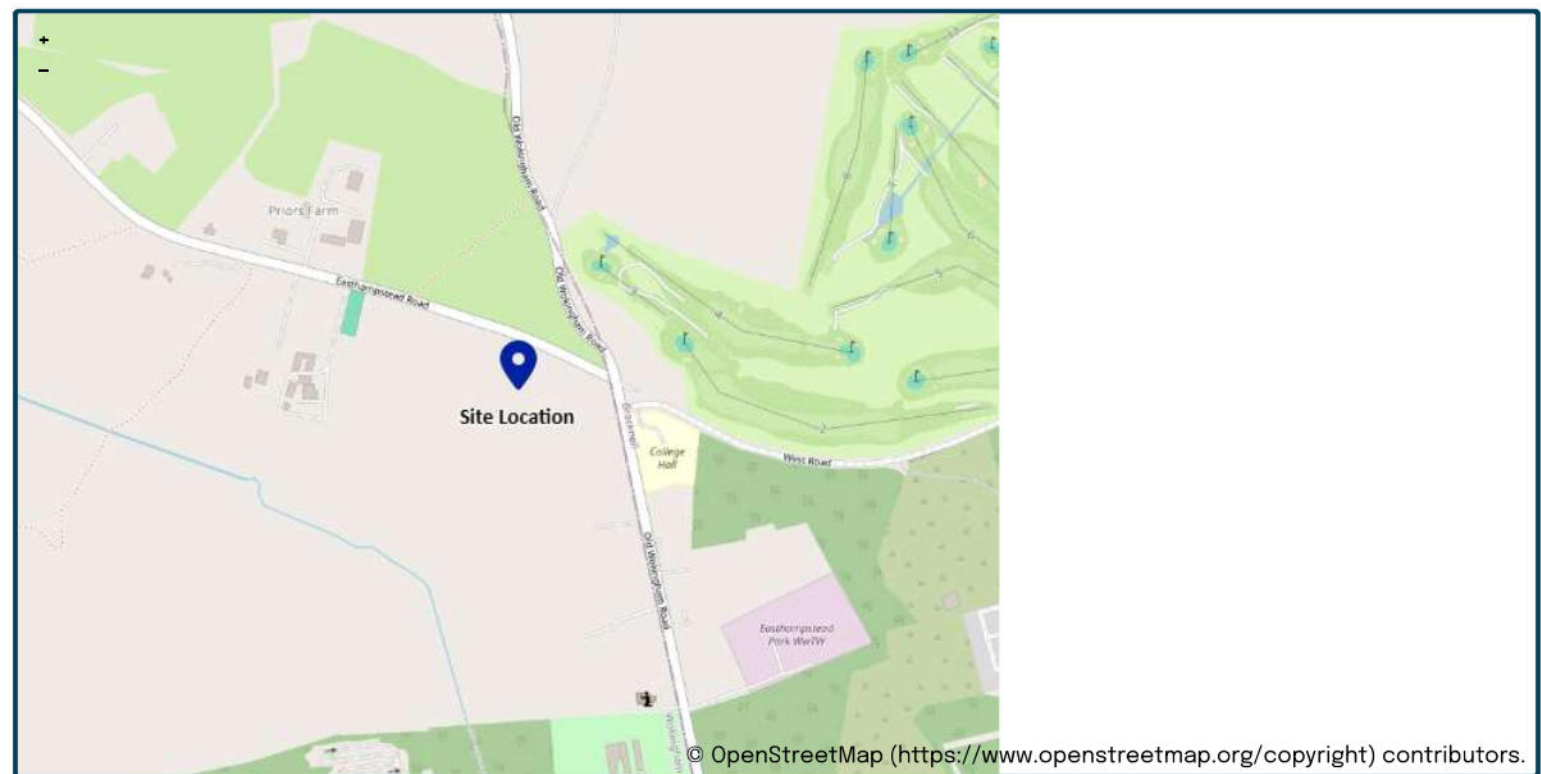
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	21/01/2026
Calculated by	XL
Reference	874
Model version	2.2.2

Location

Site name	Brookfield Farm
Site location	



Site easting (British National Grid)	483757
Site northing (British National Grid)	166564

Site details

Total site area (ha)	4.66	ha
----------------------	-----------------------------------	----

Greenfield runoff

Method

Method	IH124
--------	-------

IH124

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	669	mm	669
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	21.3	l/s	

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	6		6
1 year growth factor	0.85		
2 year growth factor	0.88		
10 year growth factor	1.62		
30 year growth factor	2.3		
100 year growth factor	3.19		
200 year growth factor	3.74		

Results

Method	IH124	
Flow rate 1 year (l/s)	18.1	l/s
Flow rate 2 year (l/s)	18.8	l/s
Flow rate 10 years (l/s)	34.6	l/s
Flow rate 30 years (l/s)	49.1	l/s
Flow rate 100 years (l/s)	68.1	l/s
Flow rate 200 years (l/s)	79.8	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (<https://www.uknuts.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uknuts.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

APPENDIX D:

OUTPUT FROM DRAINAGE DESIGN SOFTWARE AND
DRAINAGE FIELD INFILTRATION CALCULATIONS



MasterDrain
SW 16.56

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<http://www.easitd.co.uk>

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Haywards Heath,
West Sussex, RH17 5LZ
Tel: 01444 882552
email: info@easitd.co.uk

Job No. 874		
Sheet no. 1		
Date 23/01/26		
By	Checked	Reviewed

Project	Brookfield Farm
Title	Filled pit soakaway calculations for WOKINGHAM

Data:-

Location hydrological data (FSR):-

Location	= WOKINGHAM	Grid reference	= SU8068
M5-60 (mm)	= 18.6	r	= 0.41
Soil index	= 0.45	SAAR (mm/yr)	= 650
WRAP	= 4	Area	= England and Wales

Soil classification for WRAP type 4
Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Design data:-

Safety factor = 1.5 - No damage or inconvenience (SF=1.5)
Fill porosity = 0.95 - Plastic cells (porosity = 0.95)

Equivalent porosity (n1) = 0.95

Pit dimensions= 3.2 x 3.2 metres

Area drained = 173 m²

Infiltration coefficient = 0.180 m/hr
Effective inf.coeff (q) = 0.120

Return period = 100 yrs

Climate change factor = 45%

Calculations :-

Filled Excavation:-

Perimeter of pit = (2 x Excavation Width)+(2 x Excavation Length)
Area of base = Excavation Width x Excavation Length
Infiltration area = (Area of base)+(Perimeter of pit x Hmax)
Temporary constant 'a'
= (Area of base / perimeter)-((AreaDrained x Rainfall depth /1000)/(Perimeter/Inf. coeff))
Temporary constant 'b' = (Perimeter/Inf. coeff) / (Area of base x porosity)
Hmax = a*((EXP(-1 x b x Duration of storm))-1)

Note: The Hmax calculation is iterated to a maximum value of Hmax.

Note: Duration of storm in hours, Rainfall depth in mm/hr x Climate Change factor.

Results :-

Emptying time to 50% volume = 1:49 (hr:min)

hMax (Depth) = 0.8 metres

Time to maximum = 0:02 hr:min

Rainfall at maximum = 40.38mm/hr

Width (m) = 3.2

Length (m) = 3.2

Total Infiltration area = 20.5m² (base area + sidewall area).

Total available volume = 7.77m³

N.B. The rainfall rates are calculated using the location specific values above in accordance with the Wallingford procedure.
Formulae and methods from CIRIA 156.



MasterDrain
SW 16.56

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Job No.

874

Sheet no.

2

Date

23/01/26

Project

Brookfield Farm

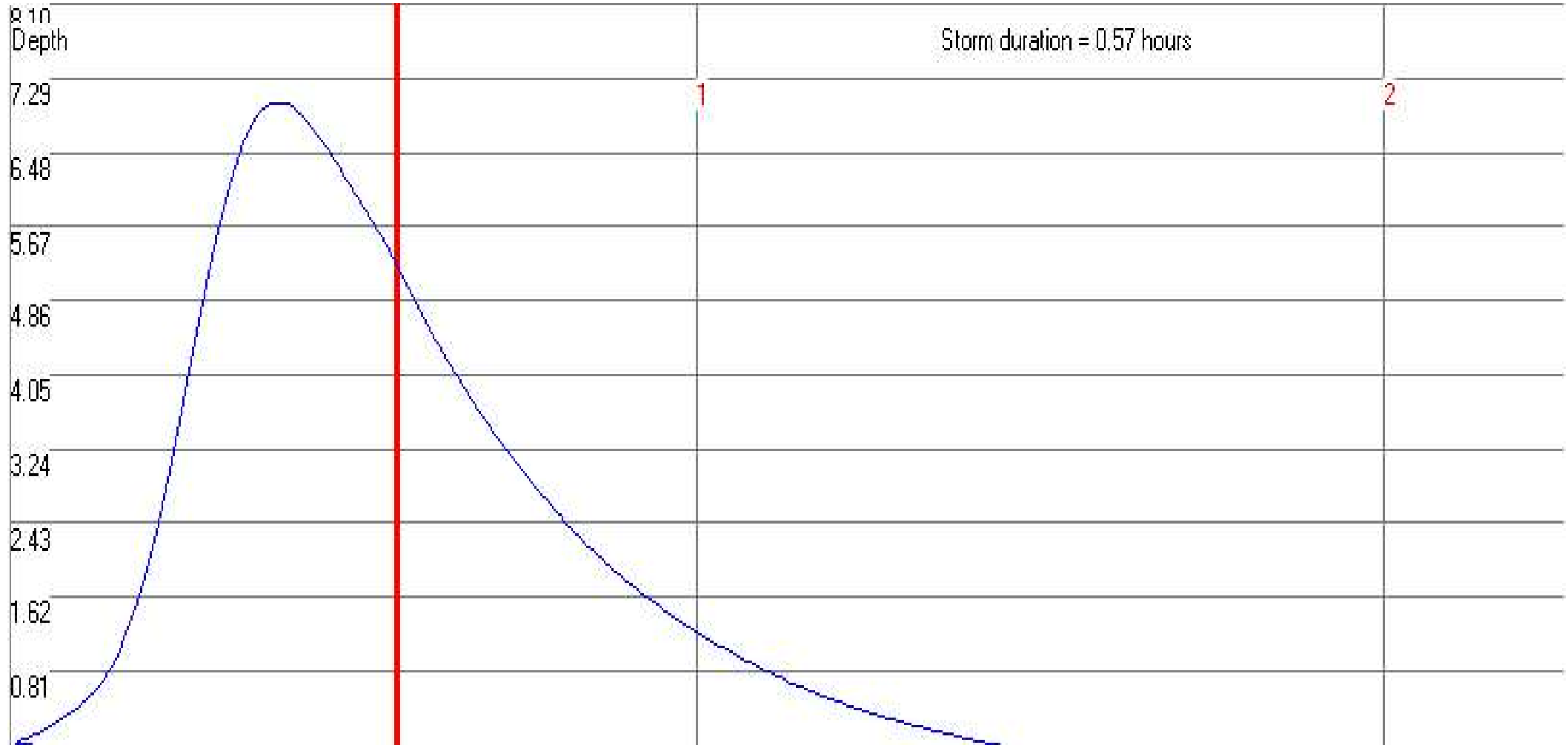
Title

Worst case soakaway times to empty.

By

Checked

Reviewed

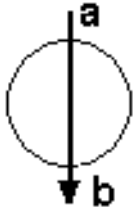


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	Sheet no. 1				
	Date 23/01/26 13:03				
Project Brookfield Farm		By	Checked	Reviewed	
Title Manhole printout for BROOKFIELD FARM.SW					

Manhole ref.	X ref	Y ref	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Exit Diam	Exit Crown	Exit Invert	Chamb const	Slab level	Cover Level	Dwnstr MH
SW1	17.55	28.49	circ	450	N/A	0.50		0.08	100	65.485	65.360	N/A	65.310	65.860	Soakaway

All manholes to be as per 'Sewers for Adoption'

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				Sheet no. 2		
				Date 23/01/26 13:03		
Project Brookfield Farm				By	Checked	Reviewed
Title Manhole printout for BROOKFIELD FARM.SW						



MH = SW1
a=head
b = 100

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	Sheet no. 3		
	Date 23/01/26 13:03		
Project Brookfield Farm	By	Checked	Reviewed
Title Manhole printout for BROOKFIELD FARM.SW			

These explanatory notes should be read in conjunction with the Manhole printout

- 1) Manhole ref - the reference for the manhole in question
- 2) Form - either circular or rectangular
- 3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
- 4) Rectangular width - if form is rectangular, this gives the width of the chamber
- 5) Chamber height - height of chamber from invert
- 6) Shaft height - height of access shaft if applicable, from top of chamber to ground level
- 7) Manhole volume - cubic capacity of manhole chamber
- 8) Exit diameter - diameter of pipe leaving this manhole
- 9) Exit crown - crown level of pipe leaving this manhole
- 10) Exit invert - invert level of pipe leaving this manhole
- 11) Chamb const - manhole construction :-
 - N/A - not specified
 - Conc - concrete rings
 - Poly - polypropylene rings surrounded by selected fill
 - Poly/conc - polypropylene rings surrounded by concrete
 - Brick - brick built with waterproof render
 - In situ - concrete cast in situ
- 12) Slab level - surface level of base slab (if no sump, this is placed at 50mm below exit invert to allow levels manipulation).
- 13) Manhole diameters of 9999 have exceeded the sizes available in SfA
- 14) Manhole diameters may have to be modified due to the number of branches



MasterDrain
SW

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Sheet no. 1		
Date 23/01/26		
By	Checked	Reviewed

Project Brookfield Farm	By	Checked	Reviewed
Title Surcharge calcs (Sized at 30 yrs storm) for BROOKFIELD FARM.SW CCF = 45%			

Free flowing outlet
Return period = 100 yrs
Climate change factor = 45

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 133.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 521.36 mm/hr
Sample period = 7.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS	
1	I	1.01	SW1	20.3	10.2	100	450	65.36	65.41	65.86	0.50	0.05	0.00	0.000	164	OK



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SW

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Date 23/01/26		
By	Checked	Reviewed

Project	Brookfield Farm
Title	Surcharge calcs (Sized at 30 yrs storm) for BROOKFIELD FARM.SW CCF = 45%

Notes

Printout headings

- | | | |
|---|---|--|
| 1) Entry no - position in file | 2) Section no - pipe identifier | 3) Manhole ref - Manhole identifier |
| 4) Pipe cap - full bore capacity of that pipe | 5) Rate of flow - calculated flow rate (l/s) ± = flow restrictor. | 6) Pipe diam - outlet pipe diameter (mm) |
| 7) Chamber diam - chamber diam. at base of MH | 8) Invert level - invert level of manhole | 9) Water level - calculated peak water level. |
| 10) Grnd level - ground / cover level | 11) Surch. fract - calc.flow/pipe capacity | 12) Surch. depth - surcharge level above soffit |
| 13) Overflow - surcharged flow rate (l/s) | 14) Flooded vol - volume of water above cover | 15) Upstrm Vol - upstream pipe vol to previous manhole(s) |
| 16) Status - OK - outlet not surcharged | 17) Status - Surcharged - outlet surcharged | 18) Status - Warning - water level within 299mm of cover level |
| 19) Status - Flooded - cover over-topped | 20) § against diameter indicates throttle pipe used. | |

Title box

Hydrograph data

- | | | |
|---|--------------------------------------|--|
| 1) Ret. period - that used to calculate profile | 2) Duration - length of storm (mins) | 3) Profile - either Winter (75%) or Summer (50%) |
|---|--------------------------------------|--|



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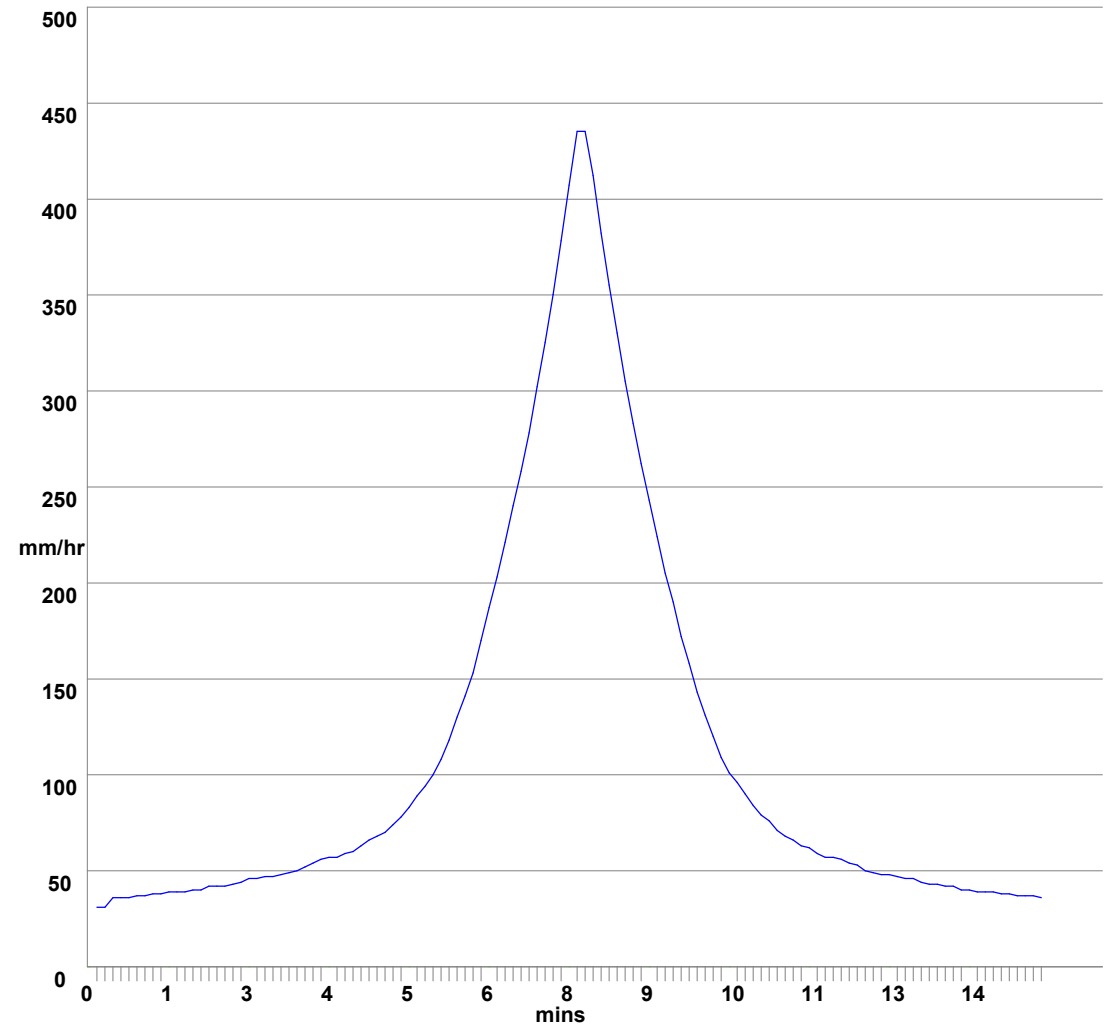
MasterDrain
SW

Project Brookfield Farm
Title Surcharge calcs (Sized at 30 yrs storm) for BROOKFIELD FARM.SW CCF = 45%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	31.10	5:08	88.86	10:08	95.52
0:15	31.10	5:15	94.41	10:15	89.97
0:22	35.54	5:22	99.96	10:22	84.41
0:30	35.54	5:30	107.74	10:30	78.86
0:38	35.54	5:38	117.74	10:38	75.53
0:45	36.65	5:45	129.95	10:45	71.09
0:52	36.65	5:52	141.06	10:52	67.75
1:00	37.76	6:00	153.28	11:00	65.53
1:08	37.76	6:08	169.94	11:08	63.31
1:15	38.88	6:15	186.60	11:15	62.20
1:22	38.88	6:22	203.26	11:22	58.87
1:30	38.88	6:30	221.03	11:30	56.65
1:38	39.99	6:38	239.92	11:38	56.65
1:45	39.99	6:45	257.69	11:45	55.54
1:52	42.21	6:52	277.68	11:52	54.43
2:00	42.21	7:00	302.12	12:00	53.31
2:08	42.21	7:08	325.44	12:08	49.98
2:15	43.32	7:15	349.88	12:15	48.87
2:22	44.43	7:22	377.65	12:22	47.76
2:30	45.54	7:30	406.52	12:30	47.76
2:38	45.54	7:38	435.40	12:38	46.65
2:45	46.65	7:45	435.40	12:45	45.54
2:52	46.65	7:52	412.08	12:52	45.54
3:00	47.76	8:00	382.09	13:00	44.43
3:08	48.87	8:08	355.43	13:08	43.32
3:15	49.98	8:15	329.88	13:15	43.32
3:22	52.20	8:22	305.45	13:22	42.21
3:30	54.43	8:30	283.23	13:30	42.21
3:38	55.54	8:38	262.13	13:38	39.99
3:45	56.65	8:45	243.25	13:45	39.99
3:52	56.65	8:52	224.37	13:52	38.88
4:00	58.87	9:00	205.48	14:00	38.88
4:08	59.98	9:08	189.93	14:08	38.88
4:15	63.31	9:15	172.16	14:15	37.76
4:22	65.53	9:22	157.72	14:22	37.76
4:30	67.75	9:30	143.28	14:30	36.65
4:38	69.98	9:38	131.07	14:38	36.65
4:45	74.42	9:45	119.96	14:45	36.65
4:52	77.75	9:52	108.85	14:52	35.54
5:00	83.30	10:00	101.08	15:00	35.54

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 15 mins Profile - summer





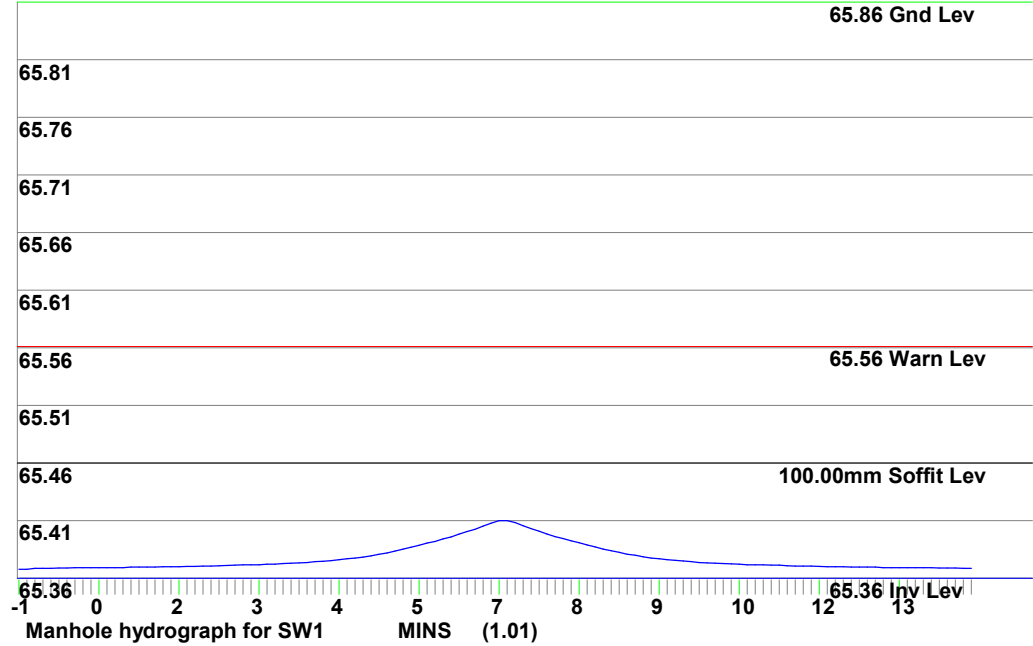
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SW

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Project	Brookfield Farm
Title	Surcharge calcs (Sized at 30 yrs storm) for BROOKFIELD FARM.SW CCF = 45%





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SW

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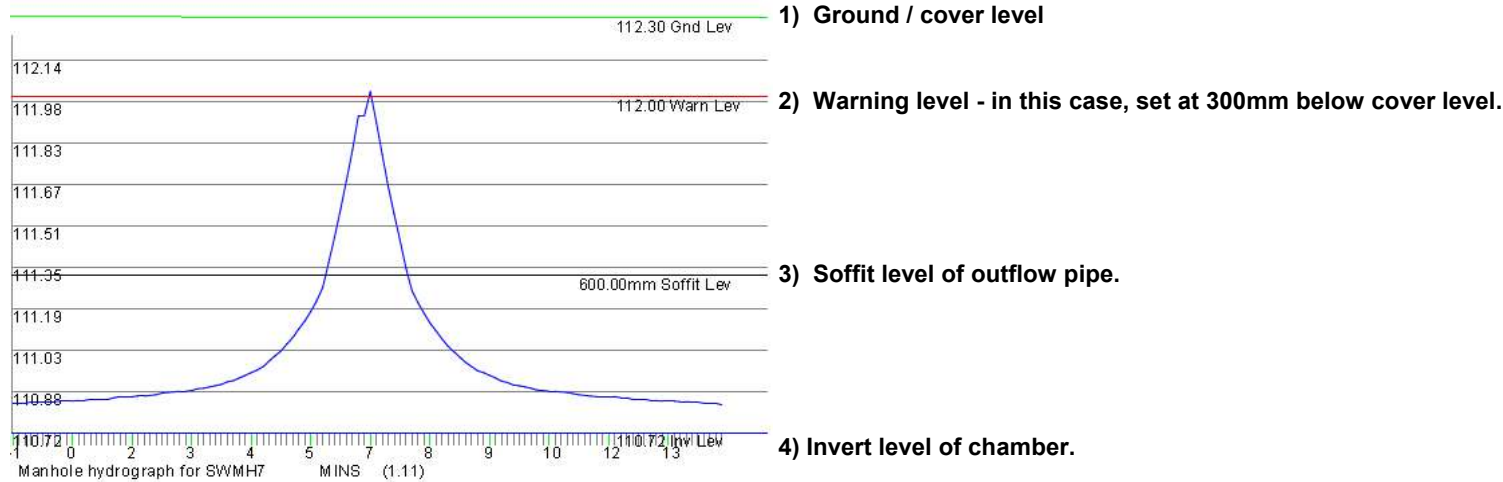
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Sheet no. 5		
Date 23/01/26		
By	Checked	Reviewed

Project
Brookfield Farm

Title
Surcharge calcs (Sized at 30 yrs storm) for BROOKFIELD FARM.SW CCF = 45%



Notes

- Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.
- Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.
- The top of the graph clips the warning level and would be marked thus on the printout.
- In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.
- The diagram above is a general one and is not part of the current calculation.



MasterDrain
Foul 11.5

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				Sheet no. 0		
				Date 23/01/26		
Project Brookfield Farm				By	Checked	Reviewed
Title Manhole printout for BROOKFIELD FARM.FL						

Manhole ref.	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Ent. Diam	Ent. Crown	Ent. Invert	Exit Diam	Exit Crown	Exit Invert	Chamb const	Cover Level	Dwnstr MH
FW1	circ	450	N/A	0.50		0.08	Head	----	----	100	65.635	65.510	N/A	66.010	STP
STP	circ	450	N/A	0.72		0.11	100	0.000	0.000	100	65.445	65.320	N/A	66.040	Ditch

All manholes to be as per 'Sewers for Adoption'

Levels calculated for level inverts



MasterDrain
Foul 11.5

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Job No. 874		
Sheet no. 0		
Date 23/01/26		
By	Checked	Reviewed

Project Brookfield Farm	By	Checked	Reviewed
Title Manhole printout for BROOKFIELD FARM.FL			

These explanatory notes should be read in conjunction with the Manhole printout

- 1) Manhole ref - the reference for the manhole in question
- 2) Form - either circular or rectangular
- 3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
- 4) Rectangular width - if form is rectangular, this gives the width of the chamber
- 5) Chamber height - height of chamber from invert
- 6) Shaft height - height of access shaft if applicable, from top of chamber to ground level
- 7) Manhole volume - cubic capacity of manhole chamber
- 8) Exit diameter - diameter of pipe leaving this manhole
- 9) Exit crown - crown level of pipe leaving this manhole
- 10) Exit invert - invert level of pipe leaving this manhole
- 11) Manhole diameters of 9999 have exceeded the sizes available in Sfa
- 12) Manhole diameters may have to be modified due to the number of branches

APPENDIX E: PHOTOGRAPHS

The site facing south



The site facing north



The site facing east



Exposed soil at the site



Boundary fence and treeline with Easthampsted Road (north)



Ditch to the north, along Easthampsted Road



Entrance Gateway to be reinstated



Access track (southeast)



Storage Building (to remain)



Office Building (to remain)



Emm Brook (to the south of the site flowing west)



APPENDIX F

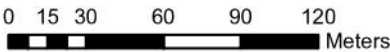
THAMES WATER SEWER PLANS



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 483755,166538

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.

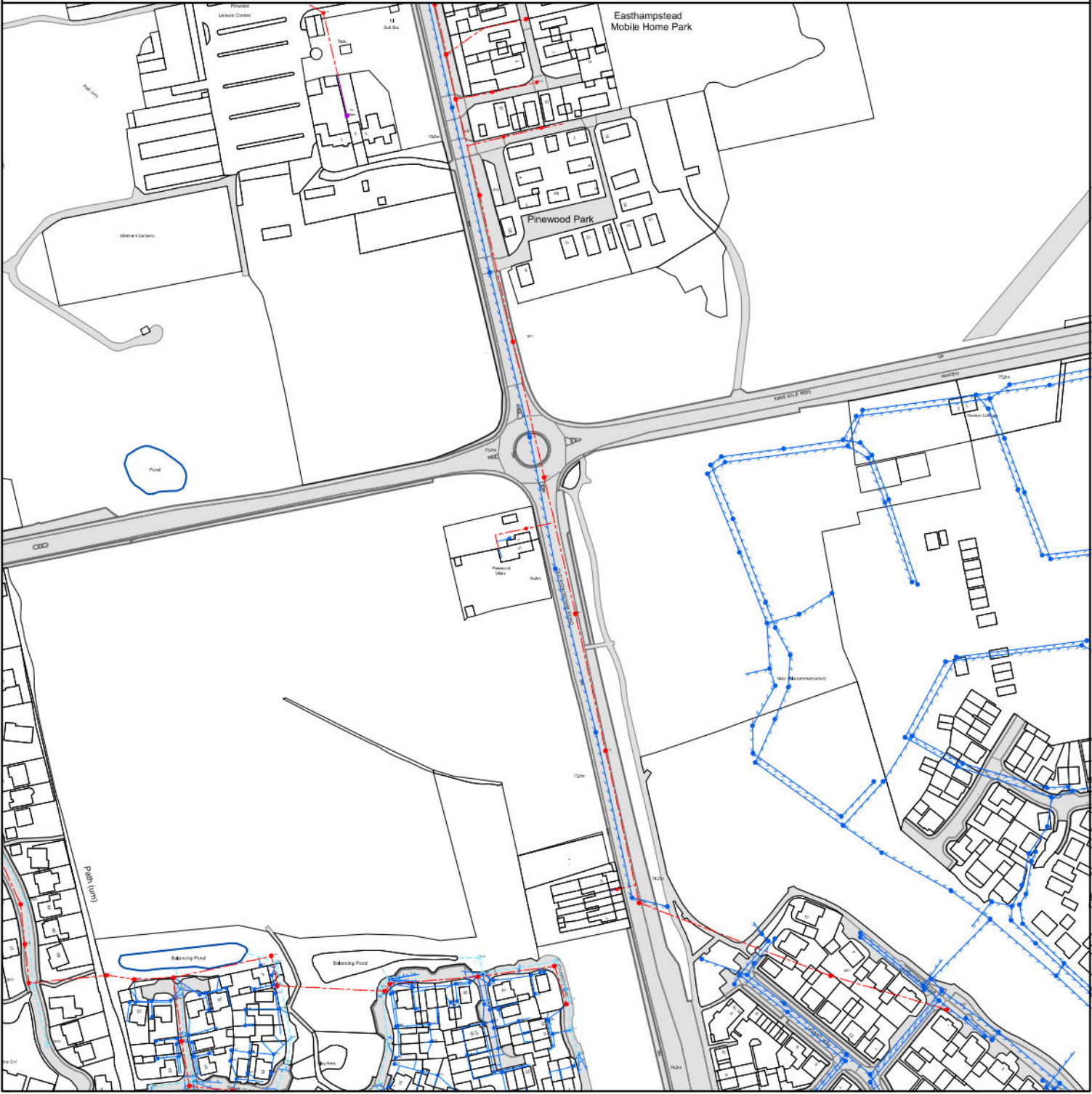
Based on the Ordnance Survey Map (2024) with the Sanction of the controller of H.M. Stationery Office, License no. AC0000849556 Crown Copyright Reserved.



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Scale: 1:2928
Width: 580m
Printed By: tllove
Print Date: 21/01/2026
Map Centre: 484033,166189
Grid Reference: SU8466SW

Comments:



0 15 30 60 90 120
Meters

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Scale: 1:2928
Width: 580m
Printed By: tlove
Print Date: 21/01/2026
Map Centre: 484093,165702
Grid Reference: SU8465NW

Comments:

ALS/ALS Standard/2026_5276498

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

REFERENCE	COVER LEVEL	INVERT LEVEL
8502		
8403	74.65	72.68
3401	78.13	73.79
8401		
1501	74.98	72.48
0801	72.12	69.85
0902	70.68	68.69
0901	70.87	68.9
071A		
091C		
0701	74.03	
091G		
991A		
141A	77	75.34
841B	75.43	73.13
941J	75.644	74.288
941G	75.667	74.416
941A	75.68	73.65
041K	75.897	74.397
041J	75.95	74.448
041I	76.206	74.655
941K	75.534	74.235
841D	75.43	73.5
941E	75.33	73.64
941H	75.438	74.285
841A	75.42	73.27
141D	76.89	75.72
941R		
942M		
942D		
942J		
042M		
043M		
841G		
841J		
941U		
141E		
042K		
041U		
042A		
042I		
841N		
041T		
042T		
043H		
942N		
942L		
042Q		
942G		
041Z		
841I		

REFERENCE	COVER LEVEL	INVERT LEVEL
8501	72.8	71.23
2401	78.2	73.32
0802	71.37	69.25
1601	75.25	71.13
151A		
8402	72.65	70.95
091E		
071B		
091B		
091D		
151B		
091F		
991B		
041C	76.62	75.08
041E	75.89	74.16
941B	75.61	73.79
141C	77.162	75.801
041F	75.93	74.11
941D	75.22	73.73
941L	75.3	74.075
141B	77.466	76.041
041D	76.12	74.49
041M	76.107	74.862
841E	75.736	74.539
841F	75.3	74.06
041L	76.6	75.432
841C	75.1	73.04
043I		
942P		
042Z		
042Y		
942B		
041V		
942K		
043J		
042R		
041X		
043C		
942S		
042H		
041Y		
841P		
841K		
043G		
941X		
942O		
043D		
942T		
041Q		
841O		
043E		

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 before any works are undertaken. Crown copyright Reserved

ALS/ALS Standard/2026_5276498

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

REFERENCE	COVER LEVEL	INVERT LEVEL
942H		
042B		
043A		
042V		
042E		
942E		
041W		
841M		
042U		
841L		
841H		
042C		
841S	74.36	72.56

REFERENCE	COVER LEVEL	INVERT LEVEL
942R		
042P		
942C		
041R		
042D		
941T		
942Q		
042L		
941V		
942I		
042N		
042S		
043P	76.107	74.862

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REFERENCE	COVER LEVEL	INVERT LEVEL
9101	68.43	67.51
1201		
1207		
1202	67.86	
2201	68.76	
1205	68.44	
0902	70.68	68.69
0901	70.87	68.9
091C		
091D		
1203	67.34	66.76
091F		
121A		
991B		
991D		

REFERENCE	COVER LEVEL	INVERT LEVEL
0101	67.84	66.93
0001	69.69	67.91
2202	69.33	
2204	68.79	
2203	69.23	
3201		
091E		
091B		
001A		
1204	67.19	64.38
091G		
911B		
991A		
991C		

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Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

	Sewer		Culverted Watercourse
	Proposed		Decommissioned Sewer
	Content of this drainage network is currently unknown		Ownership of this drainage network is currently unknown

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

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		Meter
	Dam Chase		Vent
	Fitting		

Operational Controls

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

	Ancillary		Drop Pipe
	Control Valve		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.

	Inlet		Outfall
	Undefined End		

Other Symbols

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

	Change of Characteristic Indicator		Public / Private Pumping Station
	Invert Level		Summit

Areas

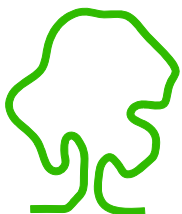
Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Casement	Ducts may contain high voltage cables. Please check with Thames Water.
	Conduit Bridge	
	Subway	
	Tunnel	

- 5) 'na' or '0' on a manhole indicates that data is unavailable.
- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. 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, please contact Property Searches on 0800 009 4540.



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