

Turing House School

Flood Risk Assessment and Drainage Strategy

Curtins Ref: FS0316-CUR-00-XX-RP-D-001

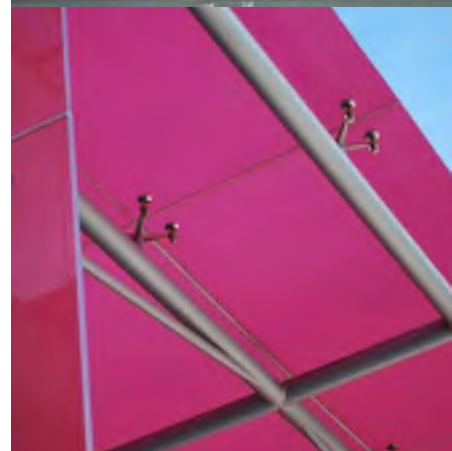
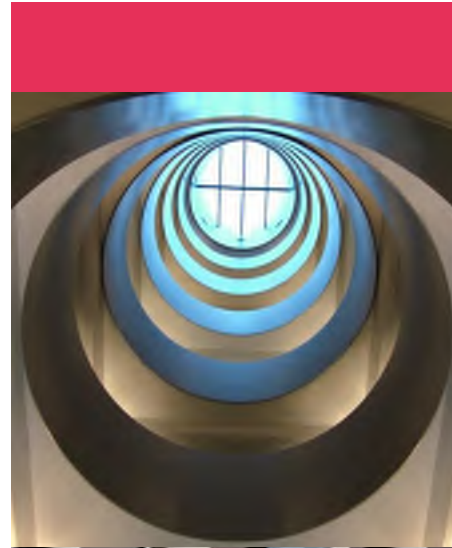
Revision: V02

Issue Date: 10 August 2018

Client Name: Bowmer and Kirkland Ltd

Client Address: High Edge Court, Heage, Belper, Derbyshire, DE56 2BW

Site Address: Hospital Bridge Road, Twickenham, TW2 6LH



Rev	Description	Issued by	Checked	Date
V01	First Issue	RJ	AW	01.08.18
V02	Updated following comments	RJ	AW	10.08.18

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Consulting Limited with respect to the information contained in the report will not extend to any third party.

Author	Signature	Date
Rowan Jobling Project Engineer		01.08.18

Reviewed	Signature	Date
Chloe Grimsley Principal Engineer		01.08.18

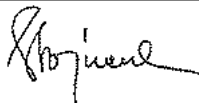
Authorised	Signature	Date
Ania Wojnowska BEng (Hons) Principal Engineer		01.08.18

Table of contents

1.0	Introduction.....	1
2.0	Existing Site Details.....	3
3.0	Development Policy.....	6
4.0	Flood Risk.....	12
5.0	Managing Residual Risk.....	19
6.0	Drainage Strategy.....	20
7.0	Conclusions and Recommendations.....	26
8.0	Appendices.....	28

Figures

Figure 2.1-1	Site Location (source OS Open Data)	3
Figure 4.2-1	Flood Map for Planning (Rivers and Sea). © Environment Agency.....	12
Figure 4.3-1	Flood Risk from Surface Water Map © Environment Agency.....	14
Figure 4.6-1	Flood Risk from Reservoirs Map © Environment Agency.....	17
Figure 6.8-1:	Pollution Hazard indices for land use classification (Table 26.2 the CIRIA SuDS Manual 2015) 23	
Figure 6.8-2	Indicative SuDS Mitigation Indices (Table 26.3 the CIRIA SuDS Manual 2015)	24

Tables

Table 3-1	NPPF Flood Zones.....	6
Table 3-2	NPPF development flood risk vulnerability classifications.	7
Table 3-3	NPPF guidance on Flood Zone and flood risk vulnerability compatibility.	9
Table 3-4	Environment Agency guidance for peak rainfall intensity allowance in small & urban catchments..	11

1.0 Introduction

1.1 Project Background

1.1.1 Curtins has been appointed by Bowmer & Kirkland (B&K) to provide a Flood Risk Assessment and Drainage Strategy for the proposed development of Turing House School, Hospital Bridge Road, Twickenham, TW2 6LH. This will be used in support of a planning application for the re-development of the site. The Flood Risk Assessment provides information on the nature of flood risk at the site and follows government guidance with regards to development and flood risk.

1.1.2 The Planning Practice Guide (PPG) states that a flood risk assessment is required where the following applies:

- At least partly in Flood Zone 2 or 3.
- In an area that has historically experienced flooding from any other source.
- Greater than 1 ha in total area, to provide an assessment of drainage.
- The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water runoff.

1.1.3 The report is based on currently available information and preliminary discussions.

1.1.4 Proposals contained in, or forming part of, this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.1.5 Where the proposed works to which this report refers to are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further considerations at no cost to Curtins.

1.2 Scope of Flood Risk Assessment

1.2.1 The assessment has been undertaken in accordance with the standing advice and requirements of the Environment Agency for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Practice Guidance (PPG) to the National Planning Policy Framework (NPPF).

1.2.2 The assessment will:

- Investigate all potential risks of flooding to the site;
- Consider the impact the development may have elsewhere with regards to flooding;
- Consider design proposals to mitigate any potential risk of flooding determined to be present; and,
- Consider foul and surface water drainage proposals.

1.2.3 The Flood Risk Assessment reviews the following information:

- The Environment Agency flood maps for river, coastal, surface water and other sources of flooding;
- National Planning Policy Framework (NPPF);
- Practical Guidance to the NPPF;
- London Borough of Richmond upon Thames, Strategic Flood Risk Assessment, (SFRA1), dated March 2016;
- Turing House Free School, Flood Risk Assessment Scoping Study (FRASS) by Campbell Reith, dated March 2017;
- Geo-Environmental Report by Delta Simons Ltd. dated April 2018; and,
- Thames Water Sewer Records, dated January 2017.

1.3 Proposed Development

1.3.1 It is understood that the proposal includes the construction of new buildings, associated landscaping, car park and sports pitches.

1.3.2 The net impermeable area that will be accommodated within a new surface water drainage system is estimated to be 1.43 ha.

1.3.3 The proposed site layout is included in **Appendix A** of this report.

2.0 Existing Site Details

2.1 History and Current Use

- 2.1.1 The site is located in Twickenham, south west London off Hospital Bridge Road. A site location plan is provided in *Figure 2.1-1*. The site currently comprises of a large open field a small area which is thought to be used for storage by the adjacent garden centre.
- 2.1.2 The approximate Ordnance Survey (OS) grid reference is 513521, 173666 (TQ1352173666).
- 2.1.3 A topographical survey was completed in June 2017, the topographical survey confirms that the site is relatively flat with levels ranging between approximately 20m AOD - 18.7m AOD falling towards the north east boundary. There is an artificial bund along the eastern boundary with a maximum level of approximately 22.7m AOD.
- 2.1.4 A copy of the topographical survey is included in **Appendix E**.
- 2.1.5 The total area of the site is estimated to be approximately 6.5ha, with a developable area of approximately 4.4ha.



Figure 2.1-1 Site Location (source OS Open Data)

2.2 Existing Watercourses and Water Bodies

- 2.2.1 OS mapping shows an ordinary watercourse running along the majority of the northern boundary of the site, however, the topographical survey identifies this is a small ditch only (400mm maximum depth and 54m long) which, according to the topographical survey, has no outfall. This has been supported further from subsequent visual inspections during site walkovers. Therefore, the nearest ordinary watercourse is located east of Hospital Bridge Road, running adjacent to the railway.
- 2.2.2 Environment Agency mapping indicates that the closest Main River to the site is the River Crane, located approximately 800m south of the site.

2.3 Geological and Hydrogeological Context

- 2.3.1 The site lies within Flood Zone 1. Land having a less than 1 in 1,000 annual probability of river or sea flooding.
- 2.3.2 A ground investigation has been undertaken by Delta-Simons Environmental Consultants Limited in April 2018. The findings from this ground investigation are summarised below.
- 2.3.3 Made ground or topsoil was encountered from the surface generally to depths of between 0.2m and 0.7m bgl. The made ground / topsoil comprised brown clayey sandy gravel of flint. The underlying soils consisted of brown sand and gravel of the Taplow Gravel Member, to a maximum depth of 5.4m bgl. Soft to stiff brown clay (London Clay), was encountered to a proven depth of 10m bgl. There were no visual or olfactory indications of significant contamination in the topsoil or the natural soil.
- 2.3.4 Groundwater was encountered in 3 no. boreholes at approximately 3.5m bgl. and rose to approximately 2.4-2.6m bgl after 20 minutes.
- 2.3.5 The natural soil was considered to be generally representative of the published superficial geology for the site and not significantly affected by mineral extraction.
- 2.3.6 The superficial drift deposits are classified by the Environment Agency as a Principal aquifer.

2.4 Sewers

- 2.4.1 Thames Water sewer records are available within **Appendix B** of this report.
- 2.4.2 The sewer records indicate that there are no public sewers within the site boundary. There are public foul and surface water sewers shown in the Redfern Avenue to the north. The public records indicate that there are 225mm foul and surface water public sewers within Hospital Bridge Road approximately 35m to the south east of the proposed site access.

2.5 Highway Drainage

2.5.1 There is no known highway drainage present within the site boundary.

2.6 Private Drainage

2.6.1 There are no above ground drainage features indicated on the topographical survey within the application boundary. Due to the former greenfield use of the site it is deemed unlikely that there will be private drainage within the site boundary.

3.0 Development Policy

3.1 National Planning Policy Framework (NPPF)

- 3.1.1 The National Planning Policy Framework was published in March 2012 and describes the Government's planning policies for England, with expectations on how they should be applied. The framework supersedes Planning Policy Statement 25 but retains key elements from it. The framework consolidates the previously issued Planning Policy Statements and Planning Policy Guidance Notes.
- 3.1.2 At the time of publishing, the NPPF was accompanied by a supplementary document: 'Technical Guidance to the National Planning Policy Framework'. This document provides guidance in applying the NPPF to development plans. It is used in the design of new developments, as well as in the assessment of planning applications.
- 3.1.3 The 'Technical Guidance to the National Planning Policy Framework' document is no longer updated, however, with updates now being made to an equivalent, online guidance, titled 'Planning Practice Guidance'. This online resource provides advice on applying the NPPF to new developments, in much the same way as the previous technical guidance document.
- 3.1.4 The technical guidance document, although no longer officially supported, is still relevant in the planning process and contains useful guidance for assessing flood risk. The technical guidance document may be referred to in this report, except in specific instances where the online planning guidance may have superseded it.

3.2 Flood Zones

- 3.2.1 NPPF guidance provides definitions for Flood Zones. These are areas primarily categorised by their risk of flooding from rivers and the sea. The Flood Zone categories are described in Table 3-1.

Table 3-1 NPPF Flood Zones.

Flood Zone	Definition
Zone 1 (Low Probability)	Land having a less than 1 in 1,000 (< 0.1%) annual probability of river or sea flooding.
Zone 2 (Medium Probability)	Land having between a 1 in 100 and 1 in 1,000 (0.1-1%) annual probability of river flooding, or land having between a 1 in 200 and 1 in 1,000 (0.1-0.5%) annual probability of sea flooding.

<p>Zone 3a (High Probability)</p>	<p>Land having a greater than 1 in 100 (> 1%) annual probability of river flooding, or land having a greater than 1 in 200 (> 0.5%) annual probability of sea flooding.</p>
<p>Zone 3b (The Functional Floodplain)</p>	<p>This zone comprises land where water has to flow or be stored in times of flood. It is typically identified by local planning authorities in their Strategic Flood Risk Assessments, in agreement with the Environment Agency.</p>

3.2.2 One of the aims of the NPPF is to avoid inappropriate development by directing development away from areas of high flood risk. Where development in risk areas is necessary, it must be made safe without increasing flood risk elsewhere.

3.2.3 Areas at risk of flooding, under the NPPF guidance, refer to land within Flood Zones 2 and 3, or land within Flood Zone 1 that has been identified as having critical drainage issues and been notified to the local planning authority by the Environment Agency.

3.2.4 Flood risk, as defined by the NPPF guidance, means risk from all sources of flooding, including: rivers and sea, directly from rainfall on the ground, rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals, lakes and other artificial sources.

3.2.5 As the site lies within Flood Zone 1, sequential (or exception testing) is not necessary.

3.3 Flood Vulnerability

3.3.1 The NPPF guidance categorises developments for their vulnerability to flood risk. Basement dwellings and mobile homes, for example, are considered more vulnerable to flooding than agricultural land or general industrial buildings. Table 3-2 describes the vulnerability classifications given in the NPPF guidance.

Table 3-2 NPPF development flood risk vulnerability classifications.

<p>Essential Infrastructure</p> <ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.

<p>Highly Vulnerable</p> <ul style="list-style-type: none"> • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
<p>More Vulnerable</p> <ul style="list-style-type: none"> • Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
<p>Less Vulnerable</p> <ul style="list-style-type: none"> • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
<p>Water-Compatible Development</p> <ul style="list-style-type: none"> • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations.

- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

3.4 Flood Risk Vulnerability and Flood Zone Compatibility

3.4.1 By defining Flood Zones and flood risk vulnerability, it is possible to compile a matrix of compatibility between the two. NPPF guidance provides a table that summarises which Flood Zones are suitable for which levels of vulnerability. This is included in this report as Table 3 3.

Table 3-3 NPPF guidance on Flood Zone and flood risk vulnerability compatibility.

Flood Zone	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	✓**

Table Legend:

- ✓ Development is appropriate.
- x Development is unsuitable and should not be permitted.
- * Within Flood Zone 3a, essential infrastructure should be designed and constructed to ensure it remains operational and safe during flood events.
- ** Within Flood Zone 3b, essential infrastructure should be designed and constructed with the same objective in mind as Flood Zone 3a, with the additional aim that it must also cause no net losses in floodplain storage and must not interfere with water flow or aggravate flood risk elsewhere in the catchment.

3.4.2 The site is classified as more vulnerable, which is acceptable development for Flood Zone 1, with no requirement for Exception Testing.

3.5 Development Plan Policy

3.5.1 The following key documents are pertinent to this report:

- The London Plan, March 2016;
- London Borough of Richmond upon Thames Strategic Flood Risk Assessment, March 2016;
- London Borough of Richmond upon Thames Surface Water Management Plan, September 2011;
- London Borough of Richmond upon Thames Preliminary Flood Risk Assessment, May 2011;
- Thames Water Pre-Development Enquiry response; dated April 2018 (included in **Appendix C**)

3.6 Climate Change

- 3.6.1 The NPPF requires an allowance for climate change be included in flood risk assessments to help minimise vulnerability and provide resilience to flooding and coastal change in the future. The climate change allowances cover the anticipated change for peak river flow, peak rainfall intensity, sea level rise, offshore wind speed and extreme wave height. The allowances were produced by the EA, based on climate change predictions and scenarios of carbon dioxide (CO₂) emissions.
- 3.6.2 There are different allowances for different periods of time over the next century, as well as for different river basins. This approach has moved towards a more site-specific assessment, and away from the flat 20% increase used in the past.
- 3.6.3 The Environment Agency also provides guidance on peak rainfall intensity allowances and recommends assessment of both in the form of sensitivity tests. This is shown in Table 3-5.

Table 3-4 Environment Agency guidance for peak rainfall intensity allowance in small & urban catchments

	Total potential change anticipated for '2020s' (2015 to 2039)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

- 3.6.4 For a development with a lifetime beyond 2070, the allowances are 20% and 40% respectively.
- 3.6.5 For the purposes of this FRA and drainage strategy a conservative value of 40% will be applied when assessing the drainage network and attenuation requirements for the site.

3.7 Development Lifetime

- 3.7.1 It is assumed for this report that the design life of the proposed development will be up to 100 years.

4.0 Flood Risk

4.1 Flooding History

4.1.1 Figure 1 of the SFRA shows no historical flooding events in the immediate vicinity of the site. This map is contained within **Appendix D** of this report.

4.1.2 Figure I of the SFRA shows the site to be in a postcode area that has had between 1 and 5 sewer flooding incidents. This map is contained within **Appendix D** of this report.

4.2 Fluvial Flooding (Rivers and Sea)

4.2.1 The Environment Agency's 'Flood Map for Planning (Rivers and Sea)', available online, provides information on flood risks/zones across England. The map was consulted for the proposed site and is shown in Figure 4.2-1.

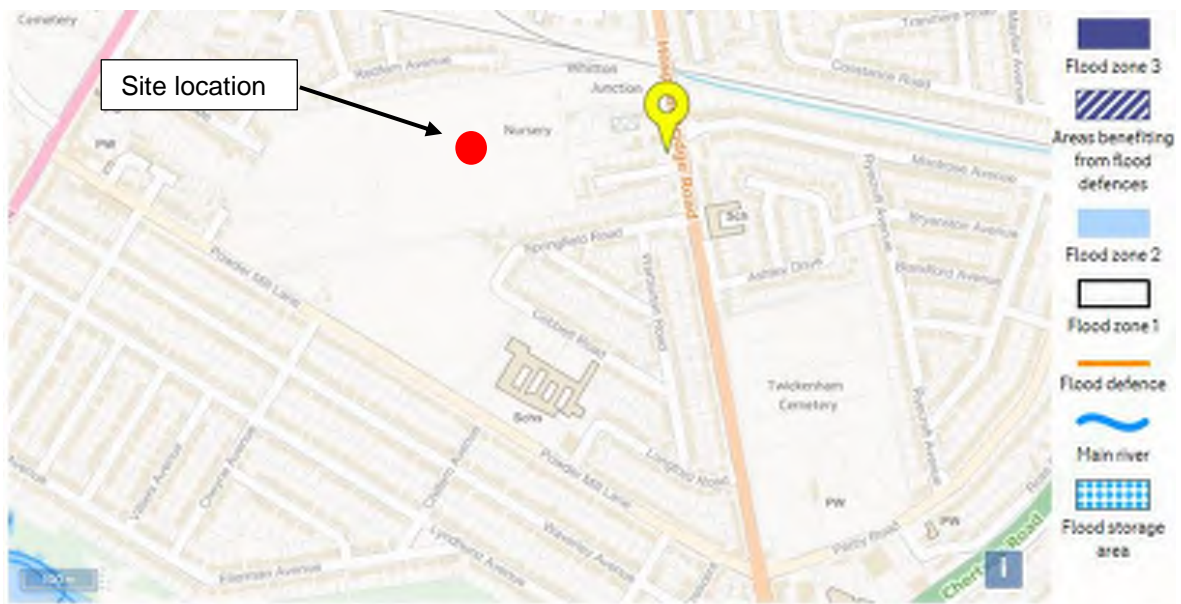


Figure 4.2-1 Flood Map for Planning (Rivers and Sea). © Environment Agency

4.2.2 The site is shown to be within Flood Zone 1, at low risk of flooding from rivers or the sea (land with less than 1 in 1,000 annual probability).

4.2.3 The risk of fluvial flooding for the site is considered low.

4.3 Surface Water Flooding to the site

4.3.1 Surface water flooding can occur when rainwater during extreme rainfall events does not drain away through the normal drainage system or permeate into the ground. Surcharging sewers can result in overland flows. If such flows were to originate at a higher elevation to the development site this could pose a flood risk. In this instance the sewers within the proximity of the site are the head of the runs and therefore deemed to pose minimal risk to the development.

4.3.2 The UK Government's Flood Risk from Surface Water (extent of flooding) map illustrates the following;

- Where a site is located in a dark blue shaded zone, this indicates that the site is at high risk of flooding, where flooding occurs as a result of rainfall with a greater than 1 in 30 (3.3%) chance in any given year.
- Where a site is located in a mid-blue shaded zone, this indicates that the site is at medium risk of flooding, where flooding occurs as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
- Where a site is located in a light blue shaded zone, this indicates that the site is at low risk of flooding, where flooding occurs as a result of rainfall of between 1 in 1000 (0.1%) and 1 in 100 (1%) chance in any given year.
- Where a site is located in a clear (unshaded) area; this indicates that the site is at very low risk of flooding, where flooding occurs as a result of rainfall with less than 1 in 1000 (0.1%) chance in any given year.

4.3.3 The Environment Agency’s surface water flood risk map, available online, is included in Figure 4.3-1

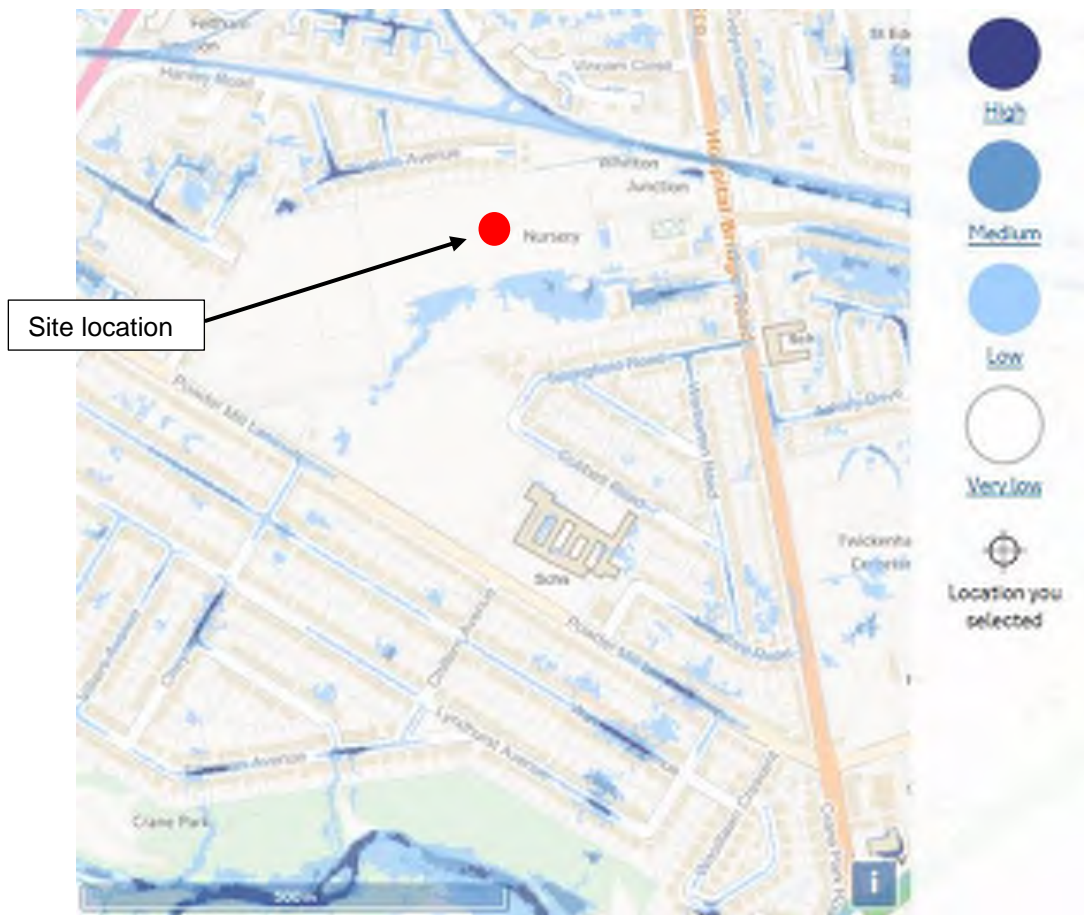


Figure 4.3-1 Flood Risk from Surface Water Map © Environment Agency

4.3.4 The map indicates some areas of low risk (between 1 in 100 year and 1 in 1000 year probability) surface water flooding. The estimated maximum flooding depth is below 300mm. There is also an area indicated as having low, medium and high risk of surface water flooding in the north east corner of the site. During each of the scenarios the flood depths are shown to be below 300mm.

4.3.5 The majority of the surface water flooding is shown within the area of the proposed sports pitches or in areas where there are no development proposals. The levels in this area will largely be the same, post development, and therefore overland flow paths will be unaltered following the development of the site. The indicated surface water flooding in this area is not considered to pose a significant risk to the development.

4.3.6 The area to the north east at risk of surface water flooding is shown in the area of the proposed car park. It is thought that the introduction of a positive drainage system will partly eliminate any surface water flooding. If the car park is designed with full upstand kerbs it is anticipated that any excess

overland flows will be accommodated within the curtilage of the car park. Careful consideration should be given to the external levels in this area, levels should be designed to fall away from the proposed building towards the car park area.

- 4.3.7 The Drainage Strategy for the scheme will need to take account of the risks of the surface water flooding identified and produce a solution that designs this risk out and does not increase the flood risk outside the site.
- 4.3.8 Given that the overland flows are indicated to be less than 300mm with low velocities and in areas that can accommodate surface water (post development), it is considered that overland flooding does not pose a significant risk to the development. The introduction of a positive drainage system at the site will help further reduce the risk from surface water flooding. It is recommended that the proposed external ground levels are to be designed to fall away from the proposed buildings.

4.4 Surface Water Flooding from the Site

- 4.4.1 Developers are responsible for ensuring that new development does not increase flood risk elsewhere. The proposed surface water drainage network shall be designed to avoid flooding for the critical 1 in 30 year storm event. Flood water generated up to the critical 1 in 100 year plus climate change storm event shall be constrained within areas on site so as not to cause damage to buildings, essential services or adjoining developments and services.
- 4.4.2 The development has the potential to increase flood risk whereby any increase in impermeable areas such as roads, car parks and buildings, results in additional run-off into the drainage network. It is therefore encouraged to propose permeable areas, landscaped areas and incorporate sustainable drainage features utilising infiltration or attenuation measures where possible.
- 4.4.3 An assessment of the proposed surface water flows is carried out within the drainage strategy which is discussed further in Section 6 of this report. The supporting calculations and drainage strategy drawings are contained within Appendices G & H respectively. A conservative value of 40% has been used to accommodate the effects of climate change for the lifespan of the development.

4.5 Risk of Groundwater Flooding

- 4.5.1 Groundwater flooding is frequently difficult to identify as the only cause of flooding as it can often be associated with, and obscured by, other forms of flooding acting in combination. Specific events often occur over a longer timeframe when compared to other forms of flooding. Though it poses a very low risk to people, it can have a significant impact on buildings. Flooding incidents specifically attributable to rising groundwater are rare across most local authority areas.
- 4.5.2 The SFRA mapping records indicate no historical groundwater flooding in the area.
- 4.5.3 Given that the BGS mapping indicates that the site is underlain by London Clay, this would suggest that the risk from groundwater flooding would be low.

- 4.5.4 The site is on land designated as a Principal Aquifer for the superficial drift deposits.
- 4.5.5 During the intrusive ground investigation and subsequent monitoring, groundwater ranged between 2.4m and 2.62m bgl. Samples were taken between 14/03/2018 and 04/04/2018, as early spring is considered the time when the water table is generally at its highest point.
- 4.5.6 Figure E of the SFRA shows the site lies within an area identified as having the 'potential for groundwater flooding to occur at surface'. The Susceptibility to Groundwater Flooding map is provided within **Appendix D** of this report.
- 4.5.7 Finished floor levels of the building will be set in excess of 2m above the recorded groundwater level and external areas will be designed to fall away from the proposed buildings in order that in the unlikely event of groundwater flooding, the flood water is safely directed away from the buildings.
- 4.5.8 Based on the information obtained from the intrusive ground investigation and the proposed development levels, the site is considered at low risk from ground water flooding.

4.6 Risk of Flooding from Reservoirs

- 4.6.1 Reservoir flooding may occur in a situation where a large reservoir fails and releases some of the water it holds. The Environment Agency defines a large reservoir as one that holds over 25,000 cubic metres of water and states that such a failure is extremely unlikely.
- 4.6.2 The Environment Agency's flood map for risk of flooding from reservoirs is shown in Figure 4-6-1.

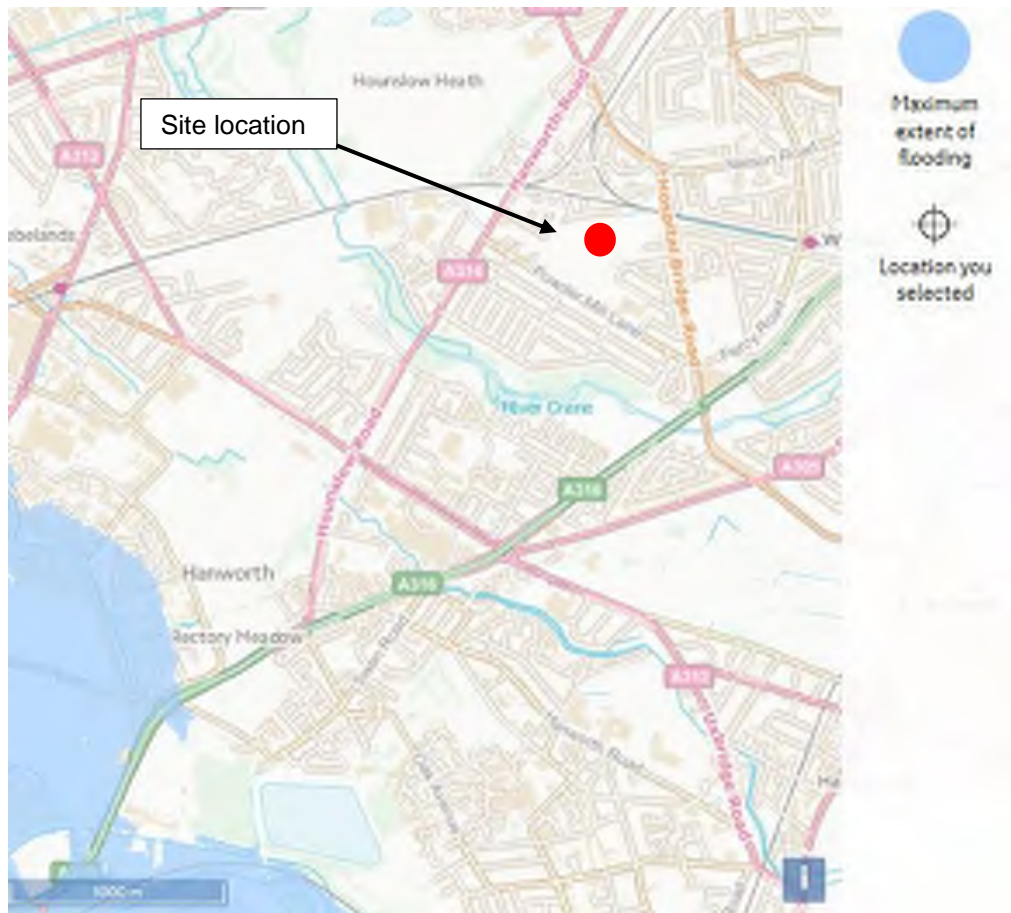


Figure 4.6-1 Flood Risk from Reservoirs Map © Environment Agency

4.6.3 The maximum flooding extent is indicated to be approximately 2.5km south west of the site. The risk of reservoir flooding affecting the development is considered low.

4.7 Risk of Flooding from Sewers

4.7.1 Figure I of the SFRA shows the site to be in a postcode area that has had between 1 and 5 sewer flooding incidents. This map is contained within **Appendix D** of this report.

4.7.2 The public sewers within the vicinity of the site are the head of the runs and flows are heading away from the site and are unlikely to present flood risk to the proposed development. Additionally, levels generally fall from west to east away from the site. There are no known public or private sewers within the site boundary.

4.7.3 A Developer Enquiry was made to Thames Water in April 2018. Their response stated that there was sufficient capacity in both the foul and surface water drainage networks. As there are no capacity constraints, this suggests the risk of sewer flooding is low in the area. The response from Thames Water is included within **Appendix C** of this report.

4.7.4 The new development site drainage will be designed in accordance with current best practice (discussed in Section 6 of this report) as to not exacerbate the risk of sewer flooding to the site or downstream.

4.7.5 Based on the available information, the risk of sewer flooding is considered low.

4.8 Other Sources of Flooding

4.8.1 There are no known artificial sources of potential flooding, such as canals, within the vicinity of the site.

4.9 Flood Defences

4.9.1 Not applicable.

4.10 Site Suitability

4.10.1 The Environment Agency's flood map for planning indicates that the site is within Flood Zone 1. Subject to an acceptable drainage strategy in line with SUDS principles, the site would be considered as appropriate (classified as 'more vulnerable' under NPPF).

5.0 Managing Residual Risk

- 5.1.1 The site layout has been designed to accommodate the NPPF criteria for the provision of sufficient surface water storage/attenuation to accommodate the 1 in 100 year + climate change rainfall event without increasing the runoff rate or volume off site, or increase the surface water flood risk to existing properties and infrastructure adjacent to the site (other buildings, sewers etc). The runoff from the 1 in 30 year event should be contained within the proposed drainage system and the 1 in 100 year plus climate change event should be contained within the development site.

6.0 Drainage Strategy

6.1 National Planning Policy Framework Requirements

6.1.1 The NPPF requires that the proposed development will not flood and will not increase flood risk elsewhere. This includes surface water runoff generated by the development. Runoff generated by the development must be naturally drained within the site if possible, or captured and attenuated by a suitable drainage system. This system will require sufficient storage capacity to prevent it surcharging during extreme rainfall events, potentially flooding adjacent areas.

6.1.2 NPPF requires that sustainable drainage systems (SuDS) should be provided in new developments, unless it is demonstrated that they are inappropriate (for example, development related to mineral extraction). The Planning Practice Guidance notes that SuDS are designed to control surface water runoff close to source and mimic natural drainage as much as possible. SuDS provide opportunities to:

- Mitigate the causes and impacts of surface water flooding;
- Treat urban surface water runoff at source, by removing pollutants; and,
- Combine water management with additional benefits for amenity, recreation and biodiversity.

6.1.3 General national guidance for the design of the surface water drainage systems include the following:

- National Planning Policy Framework (NPPF)
- Non-Statutory Technical Standards for Sustainable Drainage Systems, DEFRA, March 2015
- Written Ministerial Statement regarding Sustainable Drainage (HCWS161)
- The SUDS Manual – C753, CIRIA Industry Best Practice Guidance
- Flood Risk Planning Practice Guidance
- Building Regulations Part H

6.2 Drainage Hierarchy

6.2.1 The NPPF stipulates the drainage hierarchy as follows:

- Discharge into the ground;
- Discharge to a surface water body;
- Discharge to a surface water sewer;
- Discharge to a combined sewer.

6.3 Discharge into the ground (Infiltration)

- 6.3.1 A Phase II GI has been undertaken including 3 no. infiltration tests. At two locations the infiltration rate was too poor to complete the tests. At the third location the test was completed, however the calculated infiltration rate was relatively poor (6.9×10^{-6} m/s).
- 6.3.2 Based on the above, soakaways are deemed unviable for the scheme. The test results are included in **Appendix J** of this report.

6.4 Discharge to a surface water body

- 6.4.1 The nearest watercourse to the site is an ordinary watercourse east of Hospital Bridge Road. The distance to the river and the fact that a connecting sewer would have to cross the public highway and 3rd party land mean that discharging to a watercourse is not viable.

6.5 Discharge into a surface water public sewer

- 6.5.1 The nearest public surface water sewer, shown on the Thames Water records, lie within Hospital Bridge Road. With the closest manhole (the head of the run) being approximately 35m south east of the proposed site access.
- 6.5.2 Based on the above, a connection to the public surface water sewer is deemed to be the most viable method of discharge.
- 6.5.3 Due to level differences it is likely that surface water flows will be pumped from the development into the public sewer. In the pre-development enquiry response from Thames Water they have confirmed that this approach is acceptable.
- 6.5.4 As the proposed connection is to the existing public sewer it will be subject to a Section 106 Agreement with Thames Water.

6.6 Discharge into a combined sewer

- 6.6.1 There are no public combined sewers in the immediate vicinity of the site.

6.7 Surface Water Drainage Calculations

- 6.7.1 The total area of the site is estimated to be approximately 6.5ha, with a developable area of approximately 4.4ha. The post development impermeable area will be approximately 1.43ha with the remaining area (~2.97ha) being permeable sports pitches which will not be positively drained.
- 6.7.2 As there will be large areas of greenfield land, the 1.43ha that will become impermeable has been used to assess the greenfield run-off for the development. The HR Wallingford method using the

www.uksuds.com website was utilised to estimate the equivalent greenfield run-off rate for the site, and the Q_{BAR} (annual average) rate was estimated as 2.18 l/s, the calculation sheet is included within **Appendix F** of this report. However, as the practical minimum limit on the discharge rate from a flow attenuation device to ensure an acceptable level of the risk of blockages is 5l/s, this figure has been proposed as the discharge rate from the system.

- 6.7.3 The total impermeable area of the site will be approximately 1.43ha. The MicroDrainage Network Module has been used to establish the overall attenuation volume required for the 100 years plus 40% climate change event. This has been calculated to be approximately 632m³ and is to be accommodated in an underground attenuation tank and permeable car park spaces.
- 6.7.4 A summary of the calculations for the 1 year, 30 years, and 100 years plus 40% climate change scenarios are included in **Appendix G** of this report.
- 6.7.5 An underground drainage system, with an attenuation tank, has been proposed, connecting (via a pump) to the existing public surface water sewer within Hospital Bridge Road. The design also incorporates subgrade attenuation beneath the parking area and filter drains which will provide additional attenuation and treatment to surface water runoff.
- 6.7.6 Separate systems for the foul water drainage and the surface water drainage are proposed. The strategy proposes to control the runoff to the above greenfield discharge rate via a vortex flow control chamber downstream of the underground tank.
- 6.7.7 The surface water drainage layout is included in **Appendix H** of this report.

6.8 Surface Water Management Train

- 6.8.1 The principles of the SuDS management train are to replicate the natural catchment drainage process as much as possible. This concept is core to the successful design and implementation of a SuDS scheme, where drainage techniques are used in series to incrementally reduce pollution, flow rates and volumes. The SuDS scheme should be integrated into the landscape proposals, to enhance amenity and biodiversity, whilst protecting and/or enhancing water quality.
- 6.8.2 SuDS features should be designed in accordance with CIRIA C753 SuDS Manual 2015'.
- 6.8.3 Source control should be the first recourse of any pollutant management, followed by conveyance measures and finally site control. Using the simple index approach contained within the SuDS Manual, Table 26.2, the car parking area would be classified as having a medium pollutant hazard level. The associated pollution hazard indices are Total Suspended Solids (TSS) of 0.7, Metals of 0.6 and Hydrocarbons of 0.7.
- 6.8.4 Runoff from the roofs would contain negligible levels of pollution, classified as a very low pollution hazard level. A gravity drainage system is envisaged for the new building.

- 6.8.5 Any new car parking area should have permeable paving and sub-base. Permeable paving would provide 0.7, 0.6 and 0.7 mitigation respectively, and so thus covering the main source of pollution, parked cars (see figures below – taken from the SuDS Manual). These ratings apply to both surface water and groundwater receptors and will offer a significant improvement to water quality of the runoff from these areas.
- 6.8.6 Runoff from the building perimeter footpath will be subject to pedestrian use, with very occasional maintenance vehicles, and as such contain negligible to low levels of pollution.
- 6.8.7 Catchpit manholes have been proposed upstream of the underground tank for silt collection.

Figure 6.8-1: Pollution Hazard indices for land use classification (Table 26.2 the CIRIA SuDS Manual 2015)

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Figure 6.8-2 Indicative SuDS Mitigation Indices (Table 26.3 the CIRIA SuDS Manual 2015)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ³	0.7 ⁴	0.7	0.5
Wetland	0.8 ⁴	0.8	0.6
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Notes

- 1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.
- 2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.
- 3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.
- 5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: <http://tinyurl.com/igt7yuj7>
- 6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

6.9 Maintenance

6.9.1 Appropriate maintenance regimes will need to be put in place to ensure SuDS features are kept free of blockages and build-up of debris and/or pollutants that may impede their performance, or otherwise lead to failure in the system. As many SuDS features are part of the site landscape, providing amenity and biodiversity benefits, adequate maintenance also ensures they continue to perform these functions and remain visually pleasing.

6.9.2 Maintenance in this context refers to:

- Inspections to identify any performance issues and to plan suitable maintenance needs;
- Operation and maintenance of the drainage system;

- Management of the overall site landscape; and,
- Waste management of contaminated silt and other materials produced as a result of maintenance.

6.9.3 Maintenance regimes will need to take into account the protection of habitats, associated ecology and should be regularly assessed (e.g. on an annual basis) to ensure they are still meeting the needs of the drainage system and landscape.

6.9.4 Those responsible for maintenance should understand the function of the surface water system, for all surface and below-ground components

6.9.5 A maintenance regime for the SuDS system will be decided during the detailed drainage design phase, once the components and layout have been finalised. It is likely to include regular inspections (for example, on a monthly basis in the first year) to ensure the system is performing as required. The frequency of inspections would then decrease, but will still be carried out to remove litter, debris and overhanging vegetation to manage sediment and trim/cut grass and vegetation as required.

6.10 Foul Water Drainage Layout

6.10.1 Similar to the surface water measures, the proposed foul water network will discharge to the public sewage system under Hospital Bridge Road.

6.10.2 Due to level differences, it is likely that foul water flows will be pumped from the development into the public sewer. Thames Water have confirmed that this approach is acceptable in their pre-development enquiry response.

6.10.3 As the proposed connection is to the existing public sewer, it will be subject to a Section 106 Agreement with Thames Water.

6.10.4 The foul water drainage layout is included in **Appendix I** of this report.

7.0 Conclusions and Recommendations

7.1 Conclusions

- 7.1.1 Curtins have been appointed by Bowmer & Kirkland to provide a Flood Risk Assessment and Drainage Strategy for the proposed development of Turing House School, Hospital Bridge Road, Twickenham, TW2 6LH.
- 1.3.4 It is understood that the proposal includes the construction of a new building, associated landscaping, car park and sports pitches.
- 7.1.2 It is understood that the proposal includes the construction of a new building, associated landscaping, car park and sports pitches.
- 7.1.3 A desk study was carried out of available information on flood risk factors that may affect the site. This included information on potential flooding from rivers and sea, surface water, groundwater, sewer and other artificial sources (e.g. reservoirs).
- 7.1.4 From the available information there is no significant evidence of any historical flooding within the vicinity of the site.
- 7.1.5 The Environment Agency's flood map for planning shows the site is in Flood Zone 1 (less than 1 in 1,000 annual probability of flooding), at low risk of fluvial flooding.
- 7.1.6 The Environment Agency mapping shows areas of the site as being at risk from surface water flooding, the potential flood depths are all indicated to be below 300mm. The risk of surface water flooding is largely limited to the playing fields and car park area. The areas of surface water flooding in the fields pose limited risk to the development. Surface water flooding in the car park area will partly be eliminated by the introduction of a positive drainage system. Any remaining surface water flooding will likely be retained within the kerbed area of the car park. The on-site drainage will be designed to ensure that the 100 year plus climate change event run-off from the site is attenuated.
- 7.1.7 The SFRA mapping indicates that the site is in an area as 'Potential for groundwater flooding to occur at surface'. However, during the intrusive ground investigation and subsequent monitoring, groundwater ranged between 2.4m and 2.62m bgl. The risk of groundwater flooding affecting the development is therefore considered low.
- 7.1.8 The risk of sewer flooding is considered low based on the available information. Thames Water have been consulted on this matter as part of a Pre-Development Enquiry.
- 7.1.9 The site has been identified as being at low risk of flooding from other sources.

- 7.1.10 Falling head tests were undertaken as part of the SI which proved that drainage by infiltration into ground is unviable.
- 7.1.11 There are no watercourses in the vicinity of the site to which the development runoff could outfall.
- 7.1.12 Separate foul and surface water connections will be made to the available public sewers within Hospital Bridge Road, this has been confirmed acceptable by Thames Water.
- 7.1.13 The current greenfield rate of run-off has been estimated as 2.18 l/s. However, as the practical minimum limit on the discharge rate from a flow control device to ensure an acceptable level of risk from blockages is 5 l/s, this figure has been proposed as the discharge rate from the surface water system.
- 7.1.14 For a 100 year plus 40% climate change event the attenuation required is approximately 632m³. The proposed location is under the proposed car park to the north east of the site.
- 7.1.15 Proposed foul water flows from the development will be pumped to the public foul water sewer within Hospital Bridge Road to the south east of the development. This approach has been confirmed acceptable with Thames Water via a Pre-Development Enquiry. A Section 106 connection application will be required prior to construction.
- 7.1.16 The overall flood risk as a result of the development of the site is deemed low and it is appropriate for development.

7.2 Recommendations

- 7.2.1 The attenuation for the site should be provided by below ground storage in the form of a geo-cellular tank and sub-base storage in the car park.
- 7.2.2 Careful consideration of the levels and drainage features to the north east of the site will be required to limit the impact of the surface water flooding indicated on Environment Agency mapping.
- 7.2.3 Drainage features placed at localised low points should have sufficient capacity to deal with excess runoff. External levels should be designed to convey overland flows away from buildings and pedestrian routes.
- 7.2.4 S106 applications for the new foul and surface water connections will ultimately need to be progressed with Thames Water.

8.0 Appendices

- Appendix A Proposed Site Layout**
- Appendix B Sewer Records**
- Appendix C Developer Enquiry Response**
- Appendix D SFRA Mapping**
- Appendix E Topographical Survey**
- Appendix F Greenfield Runoff Rate Calculations**
- Appendix G Drainage Network Calculations**
- Appendix H Surface Water Drainage Layout**
- Appendix I Foul Water Drainage Layout**
- Appendix J Falling Head Infiltration Test Results**



Appendix A Proposed Site Layout





Appendix B Sewer Records



TM Property Service Ltd.
743360 Swindon 31

Search address supplied	Land At, Hospital Bridge Road, Twickenham, TW2 6LE
Your reference	16124489
Our reference	CDWS/CDWS Standard/2016_3476785
Received date	19 December 2016
Search date	5 January 2017

Notification of Price Changes...

From 1 September 2016 Thames Water Property Searches will be increasing the prices of its CON29DW, CommercialDW Drainage & Water Enquiries and Asset Location Searches.

This will be the first price rise in three years and is in line with the RPI at 1.84%. The increase follows significant capital investment in improving our systems and infrastructure, including the recent updates to the content of the Law Society's CON29DW and the CommercialDW Enquiries.

Enquiries received with a higher payment prior to 1 September 2016 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk



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

CON29DW
DRAINAGE AND WATER ENQUIRY



Question	Summary Answer
----------	----------------

Maps, Wayleaves, Easements, Manhole Cover and Invert levels

1.1	Where relevant, please include a copy of an extract from the public sewer map.	Map Provided
1.2	Where relevant, please include a copy of an extract from the map of waterworks.	Map Provided
1.3	Is there a wayleave/easement agreement giving Thames Water the right to lay or maintain assets or right of access to pass through private land in order to reach the Company's assets?	No
1.4	On the copy extract from the public sewer map, please show manhole cover, depth and invert levels where the information is available.	See Details

Drainage

2.1	Does foul water from the property drain to a public sewer?	See Details
2.2	Does surface water from the property drain to a public sewer?	See Details
2.3	Is a surface water drainage charge payable?	See Details
2.4	Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?	No
2.4.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?	No
2.5	Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?	See Details
2.5.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the 50metres of any buildings within the property?	No
2.6	Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
2.7	Has a sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?	No
2.8	Is the building which is or forms part of the property, at risk of internal flooding due to overloaded public sewers?	Not At Risk
2.9	Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.	2.741 Kilometres

Water

3.1	Is the property connected to mains water supply?	See Details
3.2	Are there any water mains, resource mains or discharge pipes within the boundaries of the property?	No
3.3	Is any water main or service pipe serving or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
3.4	Is the property at risk of receiving low water pressure or flow?	See Details
3.5	What is the classification of the water supply for the property?	See Details
3.6	Please include details of the location of any water meter serving the property.	See Details

Question

Summary Answer

Charging

4.1.1	Who are the sewerage undertakers for the area?	Thames Water
4.1.2	Who are the water undertakers for the area?	Thames Water
4.2	Who bills the property for sewerage services?	Not Billed
4.3	Who bills the property for water services?	Not Billed
4.4	What is the current basis for charging for sewerage and/or water services at the property?	No Charge
4.5	Are there any trade effluent consents relating to this site/property for disposal of chemically enhanced waste?	No

Search address supplied: Land At, Hospital Bridge Road, Twickenham, TW2 6LE

Any new owner or occupier will need to contact Thames Water on 0800 316 9800 or log onto our website www.thameswater.co.uk and complete our online form to change the water and drainage services bills to their name.

The following records were searched in compiling this report: - the map of public sewers, the map of waterworks, water and sewer billing records, adoption of public sewer records, building over public sewer records, the register of properties subject to internal foul flooding, the register of properties subject to poor water pressure and the drinking water register. Thames Water Utilities Ltd (TWUL) holds all of these.

TWUL, trading as Property Searches, are responsible in respect of the following:-

- (i) any negligent or incorrect entry in the records searched
- (ii) any negligent or incorrect interpretation of the records searched
- (iii) any negligent or incorrect recording of that interpretation in the search report
- (iv) and compensation payments

Please refer to the attached [Terms & Conditions](#). Customers and clients are asked to note these terms, which govern the basis on which this Commercial Drainage and Water search is supplied.



Thames Water Property Searches is an Executive member of CoPSO (Council of Property Search Organisations).

Maps, Wayleaves, Easements, Manhole Cover and Invert levels

1.1 Where relevant, please include a copy of an extract from the public sewer map.

A copy of an extract of the public sewer map is included, showing the public sewers, disposal mains and lateral drains in the vicinity of the property.

1.2 Where relevant, please include a copy of an extract from the map of waterworks.

A copy of an extract of the map of waterworks is included, showing water mains, resource mains or discharge pipes in the vicinity of the property.

1.3 Wayleaves & Easements

Is there a wayleave/easement agreement giving Thames Water the right to lay or maintain assets or right of access to pass through private land in order to reach the Company's assets?

No.

1.4 Manhole

On the copy extract from the public sewer map, please show manhole cover, depth and invert levels where the information is available.

Details of any manhole cover and invert levels applicable to this site are enclosed.

Drainage

2.1 Does foul water from the property drain to a public sewer?

The enquiry appears to relate to a plot of land or a recently built property. It is recommended that drainage proposals are checked with the developer.

2.2 Does surface water from the property drain to a public sewer?

Records indicate that this enquiry relates to a plot of land or a recently built property. It is recommended that the drainage proposals are checked with the developer. If the property was constructed after 6th April 2015 the Surface Water drainage may be served by a Sustainable Drainage System (SuDS). Further information may be available from the Developer.

2.3 Is a surface water drainage charge payable?

This enquiry appears to relate to a plot of land or a recently built property. It is recommended that charging proposals are checked with the developer. If the property was constructed after 6th April 2015 the Surface Water drainage may be served by a Sustainable Drainage System (SuDS). Further information may be available from the Developer.

2.4 Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundary of the property?

The public sewer map indicates that there are no public sewers, disposal mains or lateral drains within the boundaries of the property. However, from the 1st October 2011 there may be lateral drains and/or public sewers which are not recorded on the public sewer map but which may prevent or restrict development of the property.

2.4.1 Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?

The public sewer map included indicates that there is no public pumping station within the boundaries of the property.

2.5 Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?

The public sewer map indicates that there are no public sewers within 30.48 metres (100 feet) of any buildings within the property.

However, from the 1st October 2011 many private sewers were transferred into public ownership and may not be recorded on the public sewer map and it is our professional opinion that if the property is connected to a foul sewer it is likely that there will be a public sewer within 30.48 metres (100 feet) of any buildings within the property.

2.5.1 Does the public sewer map indicate any public pumping station or any other ancillary apparatus within 50 metres of any buildings within the property?

The public sewer map included indicates that there is no public pumping station within 50 metres of any buildings within the property.

2.6 Are any sewers or lateral drains serving, or which are proposed to serve, the property the subject of an existing adoption agreement or an application for such an agreement?

Records confirm that Foul sewers serving the development, of which the property forms part are not the subject of an existing adoption agreement or an application for such an agreement.

The Surface Water sewer(s) and/or Surface Water lateral drain(s) are not the subject of an adoption agreement.

2.7 Has a sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?

There are no records in relation to any approval or consultation about plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain. However, the sewerage undertaker might not be aware of a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain.

2.8 Is the building which is or forms part of the property, at risk of internal flooding due to overloaded public sewers?

The property is not recorded as being at risk of internal flooding due to overloaded public sewers.

From the 1st October 2011 most private sewers, disposal mains and lateral drains were transferred into public ownership. It is therefore possible that a property may be at risk of internal flooding due to an overloaded public sewer which the sewerage undertaker is not aware of. For further information it is recommended that enquiries are made of the vendor.

2.9 Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.

The nearest sewage treatment works is Mogden STW which is 2.741 kilometres to the north east of the property.

Water

3.1 Is the property connected to mains water supply?

The enquiry appears to relate to a plot of land or a recently built property. It is recommended that the water proposals are checked with the developer.

3.2 Are there any water mains, resource mains or discharge pipes within the boundary of the property?

The map of waterworks does not indicate any water mains, resource mains or discharge pipes within the boundaries of the property.

3.3 Is any water main or service pipe serving, or which is proposed to serve, the property the subject of an existing adoption agreement or an application for such an agreement?

Records confirm that water mains or service pipes serving the property are not the subject of an existing adoption agreement or an application for such an agreement.

3.4 Is the property at risk of receiving low water pressure or flow?

Records confirm that the property is not recorded on a register kept by the water undertaker as being at risk of receiving low water pressure or flow.

3.5 What is the classification of the water supply for the property?

The water supplied to the property has an average water hardness of 99.8mg/l calcium which is defined as Hard by Thames Water.

3.6 Please include details of the location of any water meter serving the property.

This enquiry appears to relate to a plot of land or a recently built property. It is recommended that drainage proposals are checked with the developer.

Charging

4.1.1 – Who is responsible for providing the sewerage services for the property?

Thames Water Utilities Limited, Clearwater Court, Reading, RG1 8DB is the sewerage undertaker for the area.

4.1.2 – Who is responsible for providing the water services for the property?

Thames Water Utilities Limited, Clearwater Court, Reading, RG1 8DB is the water undertaker for the area.

4.2 Who bills the property for sewerage services?

The property is not billed for sewerage services.

4.3 Who bills the property for water services?

The property is not billed for water services.

4.4 What is the current basis for charging for sewerage and / or water services at the property?

This enquiry appears to relate to a plot of land or a recently built property.

4.5 Trade Effluent Consent

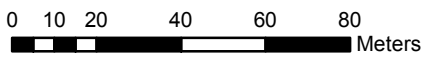
Are there any trade effluent consents relating to this site/property for disposal of chemically enhanced waste?

No.

Payment for this Search

A charge will be added to your suppliers account.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information.



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

Scale: 1:1790
Width: 500m
Printed By: Vkumar1
Print Date: 05/01/2017
Map Centre: 513354,173569
Grid Reference: TQ1373NW

Comments:

CDWS/CDWS Standard/2016_3476785

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

REFERENCE	COVER LEVEL	INVERT LEVEL
271H		
2602	19.04	17.3
271E		
261C		
271D		
271C		
261A		
3601	19.05	17.55
381F		
38ZX		
1603	18.96	16.88
161A		
161D		
161E		
17NM		
1702	19.06	17.23
1701	19.05	17.63
171C		
58XX		
57WV		
58YQ		
58VS		
58VQ		
47XV		
47XW		
47XR		
47VV		
47XY		
47VW		
47VY		
47YW		
47XT		
48ZT		
4801	18.92	17.55
48TR		
48VT		
47ZW		
4802	18.83	17.31
4701	18.84	16.96
57TS		
57TT		
5806	18.81	17.13
701A	18.85	17.57
57WY		
57YT		
57YW		
57XW		
57ZX		
57YP		
57YZ		
5703		
57ZS		
57ZP		
66YQ		
67XP		
5507		
5505	19.48	17.7
5509	19.51	18.02
551A		
5401	19.7	17.39
6401	19.8	17.67
5303	19.92	17.56
54NK		
54NH		
5403	19.74	17.57
5404	19.73	17.98
44NM		
44NH		
551C		
551F		
551D		
5503	19.44	17.81
57VQ		
57TZ		
57TX		
57RT		
47ZV		
47ZQ		
331A		
341C		
3405		

REFERENCE	COVER LEVEL	INVERT LEVEL
271I		
2601	19.36	17.63
271F		
271A		
271B		
261B		
261D		
3701	19.07	17.84
381B		
381C		
1604	19.22	17.09
1601	19.24	17.39
161F		
271G		
171B		
171A		
171D		
181A		
58YY		
58XW		
58XZ		
57VT		
47XZ		
47ZX		
47XX		
47VP		
47ZY		
47VX		
47VS		
47VZ		
47WT		
47TX		
4803	18.91	17.33
48WT		
48XW		
38ZR		
48YW		
47ZS		
58RY		
58RX		
57TV		
5805	18.82	16.75
57XX		
57YQ		
57ZW		
57ZY		
57ZQ		
57WX		
57ZV		
57YS		
57YV		
5704		
57VW		
67ZY		
67XR		
5504	19.52	17.55
5508	19.64	18.43
551B		
5402	19.78	17.26
6402	19.8	17.62
5302	19.97	18.02
541A		
54NJ		
641A		
44NK		
441A		
44NL		
551G		
4501		
4502		
551E		
57VR		
57VP		
57TY		
57TW		
47ZT		
47WZ		
3401		
3404		
3402		
3301		

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

CDWS/CDWS Standard/2016_3476785

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



















REFERENCE	COVER LEVEL	INVERT LEVEL
3302		
3403		
341B		
4304		
531A		
5409	19.72	18.38

REFERENCE	COVER LEVEL	INVERT LEVEL
3406		
341A		
441B		
4301		
531B		
5301	19.78	18.03








Sewer Key - Commercial Drainage and Water Enquiry

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

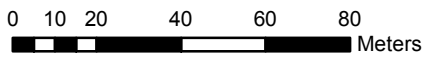
Other Sewer Types (Not Operated or Maintained by Thames Water)

-  Foul Sewer
-  Surface Water Sewer
-  Combined Sewer
-  Gully
-  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 millimetres. 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 Searches on 0118 925 1504.



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








Scale:	1:1790
Width:	500m
Printed By:	Vkumar1
Print Date:	05/01/2017
Map Centre:	513354,173569
Grid Reference:	TQ1373NW

Comments:







Waterworks Key - Commercial Drainage and Water Enquiry


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

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:** Indicates 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.

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')

For your guidance:

- Thames Water Property Searches Complaints Procedure:
 - Thames Water Property Searches offers a robust complaints procedure. Complaints can be made by telephone, in writing, by email (searches@thameswater.co.uk) or through our website (www.thameswater-propertysearches.co.uk)

As a minimum standard Thames Water Property Searches will:

- endeavour to resolve any contact or complaint at the time of receipt. If this isn't possible, we will advise of timescales;
- investigate and research the matter in detail to identify the issue raised (in some cases third party consultation will be required);
- provide a response to the customer within 10 working days of receipt of the complaint;
- provide compensation, if no response or acknowledgment that we are investigating the case is given within 10 working days of receipt of the complaint;
- keep you informed of the progress and, depending on the scale of investigation required, update with new timescales as necessary;
- provide an amended search, free of charge, if required;
- provide a refund if we find your complaint to be justified; take the necessary action within our power to put things right.

If you want us to liaise with a third party on your behalf, just let us know.

If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager, for resolution, who will respond again within 5 working days.

If you remain dissatisfied with our final response you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). Please refer to the final page of the search for further details.

Question 1.1

For your guidance:

- The Water Industry Act 1991 defines Public Sewers as those which Thames Water have responsibility for. Other assets and rivers, watercourses, ponds, culverts or highway drains may be shown for information purposes only.
- 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.
- Assets other than public sewers may be shown on the copy extract, for information.

Question 1.2

For your guidance:

- The “water mains” in this context are those, which are vested in and maintainable by the water company under statute.
- Assets other than public water mains may be shown on the plan, for information only.
- Water companies are not responsible for private supply pipes connecting the property to the public water main and do not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- 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.

Question 2.1

For your guidance:

- Water companies are not responsible for any private drains that connect the property to the public sewerage system and do not hold details of these. The property owner will normally have sole responsibility for private drains serving the property. These may pass through land outside the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- If foul water does not drain to the public sewerage system, the property may have private facilities in the form of a cesspit, septic tank or other type of treatment plant.
- An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

Question 2.2

For your guidance:

- Sewerage Undertakers are not responsible for any private drains that connect the property to the public sewerage system, and do not hold details of these.
- The property owner will normally have sole responsibility for private drains serving the property. These private drains may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- In some cases, 'Sewerage Undertakers' records do not distinguish between foul and surface water connections to the public sewerage system.
- At the time of privatisation in 1989, Sewerage Undertakers were sold with poorly-kept records of sewerage infrastructure. The records did not always show which properties were connected for surface water drainage purposes. Accordingly, billing records have been used to provide an answer for this element of the drainage and water search.
- Due to the potential inadequacy of 'Sewerage Undertakers' infrastructure records with respect to surface water drainage, it is the customer's responsibility to inform the Sewerage Undertaker that they do not receive the surface water drainage service. If on inspection, the buyer finds that surface water from the property does not drain to a public sewer, then the property may be eligible for a rebate of the surface water drainage charge. For further information, please contact Thames Water on Tel: 0800 316 9800, or refer to the website at www.thameswater.co.uk.
- If surface water from the property does not drain to the public sewerage system, the property may have private facilities in the form of a soakaway or private connection to a watercourse.
- An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

Question 2.3

For your guidance:

- If surface water from the property drains to a public sewer, then a surface water drainage charge is payable.
- Where a surface water drainage charge is currently included in the property's water and sewerage bill but, on inspection, the buyer finds that surface water from the property does not drain to a public sewer, then the property may be eligible for a rebate of the surface water drainage charge. For further information, please contact Thames Water on Tel: 0800 316 9800 or refer to the website www.thameswater.co.uk.

Question 2.4

For your guidance:

- Thames Water has a statutory right of access to carry out work on its assets. Employees of Thames Water or its contractors may, therefore, need to enter the property to carry out work.
- Please note if the property was constructed after 1st July 2011 any sewers and/or lateral drain within the boundary of the property are the responsibility of the householder.
- The approximate boundary of the property has been determined by reference to the Ordnance Survey Record or the map supplied.
- The presence of a public sewer running within the boundary of the property may restrict further development. The Company has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the Company, or its contractors, needing to enter the property to carry out work.
- 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.

Question 2.4.1

For your guidance:

- Private pumping stations installed before 1 July 2011 will be transferred into the ownership of the sewerage undertaker.
- From the 1st October 2016 private pumping stations which serve more than one property have been transferred into public ownership but may not be recorded on the public sewer map.
- The approximate boundary of the property has been determined by reference to the Ordnance Survey Record or the map supplied.
- The presence of a public Pumping station running within the boundary of the property may restrict further development. The company has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the company, or its contractors, needing to enter the property to carry out work.
- 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.

Question 2.5

For your guidance:

- This is because there are no buildings from which to measure the distance to any public sewers.
- The presence of a public sewer within 30.48 metres (100 feet) of the building(s) within the property can result in the local authority requiring a property to be connected to the public sewer.
- The measurement is estimated from the Ordnance Survey record, between the building(s) within the boundary of the property and the nearest public sewer.
- 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.

Question 2.5.1

For your guidance:

- Private pumping stations installed before 1 July 2011 will be transferred into the ownership of the sewerage undertaker.
- From the 1st October 2016 private pumping stations which serve more than one property have been transferred into public ownership but may not be recorded on the public sewer map.
- The presence of a public pumping station within 50 metres of the building(s) within the property can result in the local authority requiring a property to be connected to the public sewer.
- The measurement is estimated from the Ordnance Survey record, between the building(s) within the boundary of the property and the nearest public sewer.
- 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.

Question 2.6

For your guidance:

- Any sewers and/or lateral drains within the boundary of the property are not the subject of an adoption agreement and remain the responsibility of the householder. Adoptable sewers are normally those situated in the public highway.
- This enquiry is of interest to purchasers who will want to know whether or not the property will be linked to a public sewer.
- Where the property is part of a very recent or ongoing development and the sewers are not the subject of an adoption application, buyers should consult with the developer to ascertain the extent of private drains and sewers for which they will hold maintenance and renewal liabilities.
- Final adoption is subject to the developer complying with the terms of the adoption agreement under Section 104 of the Water Industry Act 1991 and meeting the requirements of 'Sewers for Adoption' 6th Edition.

Question 2.7

For your guidance:

- From the 1st October 2011 most private sewers, disposal mains and lateral drains were transferred into public ownership and the sewerage undertaker may not have been approved or consulted about any plans to erect a building or extension on the property over or in the vicinity of these.
- Buildings or extensions erected over a sewer in contravention of building controls may have to be removed or altered.

Question 2.8

For your guidance:

- For reporting purposes buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- “Internal flooding” from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- “At Risk” properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company’s reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Question 2.9

For your guidance:

- The nearest sewage treatment works will not always be the sewage treatment works serving the catchment within which the property is situated.
- The sewerage undertaker’s records were inspected to determine the nearest sewage treatment works.
- It should be noted that there may be a private sewage treatment works closer than the one detailed above that has not been identified.
- As a responsible utility operator, Thames Water Utilities seeks to manage the impact of odour from operational sewage works on the surrounding area. This is done in accordance with the Code of Practice on Odour Nuisance from Sewage Treatment Works issued via the Department of Environment, Food and Rural Affairs (DEFRA). This Code recognises that odour from sewage treatment works can have a detrimental impact on the quality of the local environment for those living close to works. However DEFRA also recognises that sewage treatment works provide important services to communities and are essential for maintaining standards in water quality and protecting aquatic based environments. For more information visit www.thameswater.co.uk

Question 3.2

For your guidance:

- The boundary of the property has been determined by reference to the plan supplied. Where a plan was not supplied, the Ordnance Survey Record was used.
- The presence of a public water main within the boundary of the property may restrict further development within it. Water companies have a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of the Company, or its contractors, needing to enter the property to carry out work.

Question 3.3

For your guidance:

- This enquiry is of interest to purchasers who will want to know whether or not the property will be linked to the mains water supply.

Question 3.4

For your guidance:

- The boundary of the property has been determined by reference to the plan supplied. Where a plan was not supplied the Ordnance Survey Record was used.
- "Low water pressure" means water pressure below the regulatory reference level, which is the minimum pressure when demand on the system is not abnormal.
- Water Companies are required to include in the Regulatory Register that is presented annually to the Director General of Water Services, properties receiving pressure below the reference level, provided that allowable exclusions do not apply (i.e. events which can cause pressure to temporarily fall below the reference level)
- The reference level of service is a flow of 9 litres/minute at a pressure of 10metres / head on the customer's side of the outside stop valve (osv). The reference level of service must be applied on the customer's side of a meter or any other company fittings that are on the customer's side of the main stop tap. The reference level applies to a single property. Where more than one property is served by a common service pipe, the flow assumed in the reference level must be appropriately increased to take account of the total number of properties served. For two properties, a flow of 18 litres/minute at a pressure of 10metres/head on the customers' side of the osv is appropriate. For three or more properties the appropriate flow should be calculated from the standard loadings provided in BS6700 or the Institute of Plumbing handbook.
- Allowable exclusions The Company is required to include in the Regulatory Register properties receiving pressure below the reference level, provided that allowable exclusions listed below do not apply.
- Abnormal demand: This exclusion is intended to cover abnormal peaks in demand and not the daily, weekly or monthly peaks in demand, which are normally expected. Companies should exclude from the reported figures properties which are affected by low pressure only on those days with the highest peak demands. During the report year companies may exclude, for each property, up to five days of low pressure caused by peak demand.
- Planned maintenance: Companies should not report low pressures caused by planned maintenance. It is not intended that companies identify the number of properties affected in each instance. However, companies must maintain sufficiently accurate records to verify that low-pressure incidents that are excluded because of planned maintenance are actually caused by maintenance.
- One-off incidents: This exclusion covers a number of causes of low pressure; mains bursts; failures of company equipment (such as pressure reducing valves or booster pumps); firefighting; and action by a third party. However, if problems of this type affect a property frequently, they cannot be classed as one-off events and further investigation will be required before they can be excluded
- Low-pressure incidents of short duration: Properties affected by low pressures, which only occur for a short period, and for which there is evidence that incidents of a longer duration would not occur during the course of the year, may be excluded from the reported figures.
- Please contact your water company mentioned in Question 4.1.2 if you require further information on water pressure.

Question 3.5

For your guidance:

- Water hardness can be expressed in various indices for example the hardness settings for dishwashers are commonly expressed in Clark's degrees, but check with the manufacturer as there are also other units. The following table shows the normal ranges of hardness.
- Sample table for information only:

Hardness category	Calcium (mg/l)	Calcium carbonate (mg/l)	English Clarke degrees	French degrees	General/ German degrees
Soft	0 to 20	0 to 50	0 to 3.5	0 to 5	0 to 2.8
Moderately soft	21 to 40	51 to 100	3.6 to 7	6 to 10	2.9 to 5.6
Slightly hard	41 to 60	101 to 150	8 to 10.5	11 to 15	5.7 to 8.4
Moderately hard	61 to 80	151 to 200	10.6 to 14	16 to 20	8.5 to 11.2
Hard	81 to 120	201 to 300	15 to 21	21 to 30	11.3 to 16.8
Very hard	Over 120	Over 300	Over 21	Over 30	Over 16.8

Question 3.6

For your guidance:

- Where a meter does not serve the property and the customer wishes to consider this method of charging, they should contact the water undertakers mentioned in Question 4.1.2.

Question 4.4

For your guidance:

-
- Records indicate that the Water Company does not levy charges to the property. Water and sewerage companies' full charges are set out in their charges schemes which are available from the company free of charge upon request.
- The Water Industry Act 1991 Section 150, The Water Resale Order 2001 provides protection for people who buy their water or sewerage services from a person or company instead of directly from a water or sewerage company. Details are available from the Office of Water Services (OFWAT) website is www.ofwat.gov.uk.
- Where charges are given, these are based on the data available at the time of the report.
- The Company may install a meter at the premises where a buyer makes a change of use of the property or where the buyer uses water for:
 - Watering the garden other than by hand (this includes the use of sprinklers).
 - Automatically replenishing a pond or swimming pool with a capacity greater than 10,000 litres.
 - A bath with a capacity in excess of 230 litres.
 - A reverse osmosis unit

Question 4.5

For your guidance:

- If a Trade effluent consent applies to the premises which are the subject of this search, it is for the applicant to satisfy itself as to the suitability of the consent for its client's requirements. The occupier of any trade premises in the area of a sewerage undertaker may discharge any trade effluent proceeding from those premises into the undertaker's public sewers if he does so with the undertaker's consent. If, in the case of any trade premises, any trade effluent is discharged without such consent or other authorisation, the occupier of the premises shall be guilty of an offence.
- Please note any existing consent is dependent on the business being carried out at the property and will not transfer automatically upon change of ownership.
- For further information regarding Trade Effluent consents please contact: Trade Effluent Control, Crossness STW, Belvedere Road, Abbey Wood London SE2 9AQ.

CommercialDW Drainage and Water Enquiry Terms and Conditions

Customer and Clients are asked to note these terms, which govern the basis on which this CommercialDW Drainage & Water Enquiry is supplied

Definitions

'Client' means the person, company or body who is the intended recipient of the Report with an actual or potential interest in the Property.

'Company' means a water service company or their data service provider producing the Report.

'Customer' means the person, company, firm or other legal body placing the Order, either on their own behalf as Client, or, as an agent for a Client.

'Order' means any request completed by the Customer requesting the Report.

'Property' means the address or location supplied by the Customer in the Order.

'Report' means the drainage and/or water report prepared by The Company in respect of the Property.

'Thames Water' means Thames Water Utilities Limited registered in England and Wales under number 2366661 whose registered office is at Clearwater Court, Vastern Road, Reading, Berks, RG1 8DB;

Agreement

1 Thames Water agrees to supply the Report to the Customer and the Client subject to these terms. The scope and limitations of the Report are described in paragraph 2 of these terms. Where the Customer is acting as an agent for the Client then the Customer shall be responsible for bringing these terms to the attention of the Client. The Customer and Client agree that the placing of an Order for a Report indicates their acceptance of these terms.

The Report

2. Whilst Thames Water will use reasonable care and skill in producing the Report, it is provided to the Customer and the Client on the basis that they acknowledge and agree to the following:-

2.1 The information contained in the Report can change on a regular basis so Thames Water cannot be responsible to the Customer and the Client for any change in the information contained in the Report after the date on which the Report was produced and sent to the Client.

2.2 The Report does not give details about the actual state or condition of the Property nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the Property for any particular purpose, or relied upon for determining saleability or value, or used as substitute for any physical investigation or inspection. Further advice and information from appropriate experts and professionals should always be obtained.

2.3 The information contained in the Report is based upon the accuracy, completeness and legibility of the address and other information supplied by the Customer or Client.

2.4 The Report provides information as to the location and connection of existing services and should not be relied on for any other purpose. The Report may contain opinions or general advice to the Customer and the Client and Thames Water cannot ensure that any such opinion or general advice is accurate, complete or valid and accepts no liability therefore.

2.5 The position and depth of apparatus shown on any maps attached to the Report are approximate, and are furnished as a general guide only, and no warranty as to its correctness is given or implied. The exact positions and depths should be obtained by excavation trial holes and the maps must not be relied on in the event of excavation or other works made in the vicinity of apparatus shown on any maps.

Liability

3 Thames Water shall not be liable to the Client for any failure, defect or non-performance of its obligations arising from any failure of, or defect in any machine, processing system or transmission link or anything beyond Thames Water's reasonable control or the acts or omissions of any party for whom Thames Water are not responsible.

3.1 Where the Customer sells this report to a Client (other than in the case of a bona fide legal adviser recharging the cost of the Report as a disbursement) Thames Water shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss or damage whatsoever and the Customer shall indemnify Thames Water in respect of any claim by the Client.

3.2 Where a report is requested for an address falling within a geographical area where Thames Water and another Company separately provide Water and Sewerage Services, then it shall be deemed that liability for the information given by Thames Water or the Company as the case may be will remain with Thames Water or the Company as the case may be in respect of the accuracy of the information supplied. Where Thames Water is supplying information which has been provided to it by another Company for the purposes outlined in this agreement Thames Water will therefore not be liable in any way for the accuracy of that information and will supply that information as agent for the Company from which the information was obtained.

3.3 Except in respect of death or personal injury caused by negligence, or as expressly provided in these Terms:

3.3.1 The entire liability of Thames Water or the Company as the case may be in respect of all causes of action arising under or in connection with the Report (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) shall not exceed £2,000,000 (two million pounds); and

3.3.2 Thames Water shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss of profit, loss of goodwill, loss of

reputation, loss of business or any indirect, special or consequential loss, damage or other claims, costs or expenses;

Copyright and Confidentiality

4. The Customer and the Client acknowledge that the Report is confidential and is intended for the personal use of the Client. The copyright and any other intellectual property rights in the Report shall remain the property of Thames Water or the Company as the case may be. No intellectual or other property rights are transferred or licensed to the Customer or the Client except to the extent expressly provided

4.1 The Customer or Client is entitled to make copies of the Report but is not permitted to copy any maps contained in, or attached to the Report

4.2 The maps contained in the Report are protected by Crown Copyright and must not be used for any purpose outside the context of the Report.

4.3 The Customer and Client agree (in respect of both the original and any copies made) to respect and not to alter any trademark, copyright notice or other property marking which appears on the Report.

Payment

5. Unless otherwise stated all prices are inclusive of VAT. The Customer shall pay for the price of the Report specified by Thames Water, without any set off, deduction or counterclaim.

5.1 Unless payment has been received in advance, Customers shall be invoiced for the agreed fee once their request has been processed. Any such invoice must be paid within 14 days. Where the Customer has an account with Thames Water, payment terms will be as agreed with Thames Water.

5.2 No payment shall be deemed to have been received until Thames Water has received cleared funds.

5.3 If the Customer fails to pay Thames Water any sum due Thames Water shall be entitled but not obliged to charge the Customer interest on the sum from the due date for payment at the annual rate of 2% above the base lending rate from time to time of Natwest Bank, accruing on a daily basis until payment is made. Thames Water reserves the right to claim interest under the Late Payment of Commercial Debts (Interest) Act 1998.

5.4 Thames Water reserves the right to increase fees on reasonable prior written notice at any time.

Cancellations or Alterations

6. Once an Order is placed, Thames Water shall not be under any obligation to accept any request to cancel that Order and payment for the Order shall still be due upon completion of the Report. In cases where an error has been made in the original Order (e.g. the Customer has supplied an incorrect address), the Customer will need to place a second Order, detailing the correct information, and shall be liable to pay a second charge in accordance with clause 5 above.

Delivery

7. On receiving your order the reports will be posted to you within 10 working days from receipt.

7.1 Delivery is subject to local post conditions and regulations. All items should arrive within 12 working days, but Thames Water cannot be held responsible should delays be caused by local post conditions, postal strikes or other causes beyond the control of Thames Water.

General

8. If any provision of these terms is or becomes invalid or unenforceable, it will be taken to be removed from the rest of these terms to the extent that it is invalid or unenforceable. No other provision of these terms shall be affected.

8.1 These terms shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts.

8.2 Nothing in this notice shall in any way restrict the Customer or Clients statutory or any other rights of access to the information contained in the Report.

These Terms & Conditions are available in larger print for those with impaired vision.

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 TWUL 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. TWUL 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 TWUL's discretion for increased administration costs.

A copy of TWUL'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 him 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 Water Industry Act 1991, and you remain dissatisfied you can refer your complaint to CC Water on 0845 039 2837 (it will cost you the same as a local call) or write to them at 11 Belgrave Road, London SW1V 1RB.

Ways to pay your bill

By Post – Cheque only, made payable to 'Thames Water Utilities Ltd' writing your Thames Water account number on the back. Please fill in the payment slip below and send it with your cheque to Thames Water Utilities Ltd., PO Box 223, Swindon SN38 2TW	By BACS Payment direct to our bank on account number 90478703, sort code 60-00-01 may be made. A remittance advice must be sent to Thames Water Utilities Ltd., PO Box 223, Swindon SN38 2TW. Or fax to 01793 424599 or email: cashoperations@thameswater.co.uk	Telephone Banking By calling your bank and quoting your invoice number and the Thames Water's bank account number 90478703 and sort code 60-00-01	By Swift Transfer You may make your payment via SWIFT by quoting NWBKGB2L together with our bank account number 90478703, sort code 60-00-01 and invoice number
--	--	---	--

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 he finds that you have suffered actual loss 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
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



Appendix C Developer Enquiry Response



MS A Smolen
56 The Ropewalk
Nottingham
NG1 5DW



Our ref: DS6047140



0800 009 3921

Monday to Friday, 8am to 5pm

24th April 2018

Pre-planning enquiry: Capacity check

Dear Ms Smolen

Thank you for providing information on your development at Turing Hse School Hospital Bridge rd TW2 6LH dated Apr' 18.

Foul

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

Surface Water

In considering your surface water needs, we support the use of sustainable drainage on development sites.

The surface water drainage strategy should follow policy 5.13 of the London Plan. Typically greenfield run off rates of 5l/s/ha should be aimed for using the drainage hierarchy. The hierarchy lists the preference for surface water disposal as follows; Store Rainwater for later use > Use infiltration techniques, such as porous surfaces in non-clay areas > Attenuate rainwater in ponds or open water features for gradual release > Discharge rainwater direct to a watercourse > Discharge rainwater direct to a surface water sewer/drain > Discharge rainwater to the combined sewer.

Please refer to the attached document titled "Planning your wastewater" attached to this letter, specifically to notes relating to surface water. Also I would advise you to liaise with the LA and discuss their criteria regarding surface water discharges in that area and adhere to their stipulation. If you adhere to LA stipulation then TW will be able to accommodate that agreed discharge.

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.

Please note that you must 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 sewerage 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/s.

If you've any further questions, please contact me.

Yours sincerely

Siva Sivarajan

Developer Services- Wastewater Adoptions Engineer

Office:0203 577 7752 Mobile: 07747842608

siva.sivarajan@thameswater.co.uk

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

Find us online at developers.thameswater.co.uk



TW internal ref: DTS57768



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.

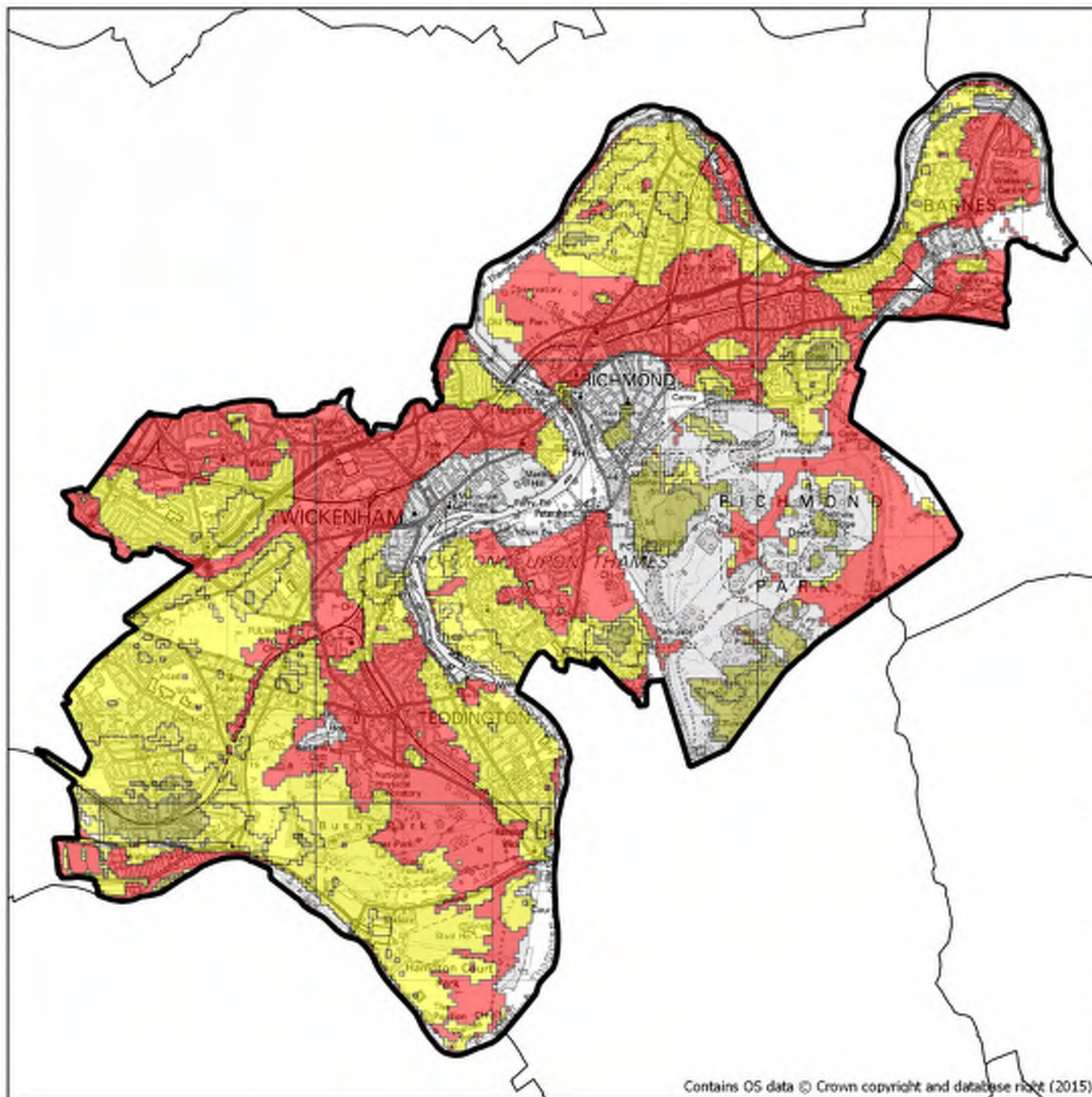
There's no right of discharge of highway drainage into the public sewerage system, and we'd need to agree this with the relevant highway authority under Section 115 of the Water Industry Act 1991. You can contact us to discuss this further.

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 SFRA Mapping




Contains OS data © Crown copyright and database right (2015)

Legend

 Borough Boundary

BGS Susceptibility to Groundwater Flooding

 Limited potential for groundwater flooding to occur

 Potential for groundwater flooding of property situated below ground level

 Potential for groundwater flooding to occur at surface

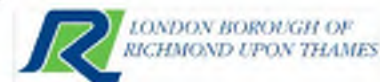
in association with



Metis Consultants Limited



Client



Project Title

London Borough of Richmond Upon Thames Strategic
Flood Risk Assessment Level 1

Drawing Title

BGS Susceptibility to Groundwater Flooding

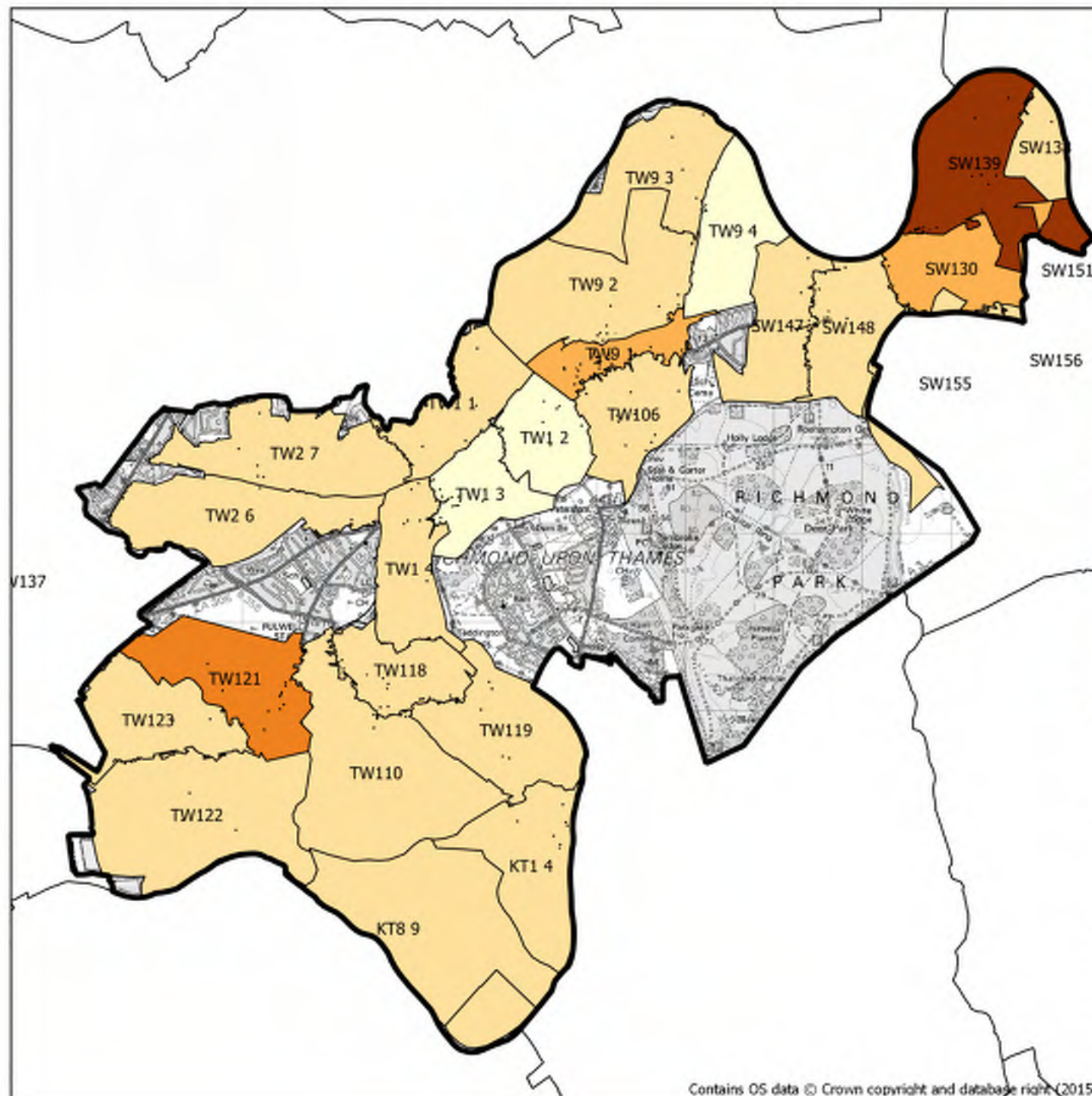
This document has been prepared pursuant to and subject to the terms of Metis' appointment by its client. Metis accepts no liability for any use of this document other than by its original client or following Metis' express agreement to such use, and only for the purpose for which it was prepared and provided.

Drawing Number

FIGURE E

1:65,000

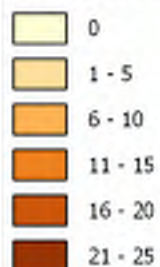




Legend

Borough Boundary

Number of Sewer Flooding Incidents based on DG5 data



in association with



Metis Consultants Limited



Client



Project Title

London Borough of Richmond Upon Thames Strategic
Flood Risk Assessment Level 1

Drawing Title

Sewer Flooding Incidents

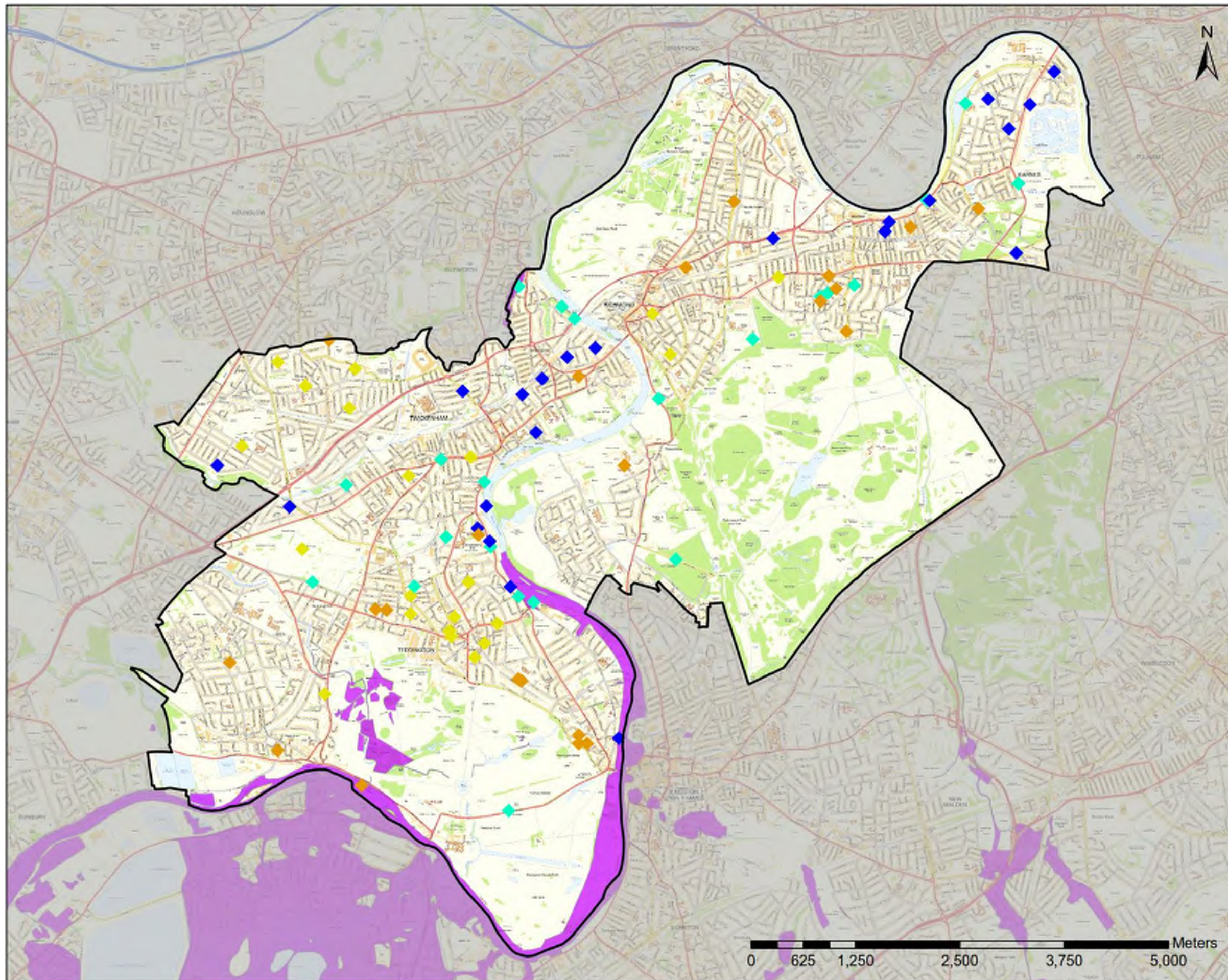
This document has been prepared pursuant to and subject to the terms of Metis' appointment by its client. Metis accepts no liability for any use of this document other than by its original client or following Metis' express agreement to such use, and only for the purpose for which it was prepared and provided.

Drawing Number

FIGURE I

1:65,000





THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

Legend

- Administrative Boundary
- Environment Agency Historic Flood Map

Reported Flooding Incidents

- River
- Multiple
- Surface Water
- Groundwater

Notes
 Flooding incidents have been mapped based on Council records available at the time of the production of the Local Flood Risk Management Strategy. In many cases incidents of flooding may not have been reported to the Council and will therefore not be shown on this map.

Copyright
 Contains Ordnance Survey data © Crown copyright and database right 2014

DRAWN BY	CHECKED BY	PROVED BY	DATE
GA	LT	PH	June 2014

SCALE @ A3	ISSUE OFFICE
1:42,000	Greenham Street

Purpose of Issue
 DRAFT REPORT FOR CONSULTATION

Clients

Project Title
 LONDON BOROUGH OF RICHMOND LOCAL FLOOD RISK MANAGEMENT STRATEGY

Drawing Title
 HISTORIC FLOODING

THIS DOCUMENT HAS BEEN PREPARED PURSUANT TO AND SUBJECT TO THE TERMS OF CAPITA'S APPOINTMENT BY ITS CLIENTS. CAPITA ACCEPTS NO LIABILITY FOR ANY USE OF THIS DOCUMENT OTHER THAN BY ITS ORIGINAL CLIENT OR FOLLOWING CAPITA'S EXPRESS AGREEMENT TO SUCH USE, AND ONLY FOR THE PURPOSES FOR WHICH IT WAS PREPARED AND PROVIDED.

Consultant

DRAWING NUMBER	REV
FIGURE 1	A



Appendix E Topographical Survey

- 1. This drawing has been prepared in accordance with the scope of RPS's agreement with its client and is subject to the terms and conditions of that agreement. RPS accepts no liability for any use of this document other than that for which it was prepared and provided.
- 2. If measured inaccurately it is the recipient's responsibility to print to correct scale. Only written dimensions should be used.
- 3. This drawing should be read in conjunction with all other relevant drawings and specifications.

NOTES

GENERAL NOTES :-
 ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.
 GRID COORDINATES AND DIMENSIONS SURVEY NATIONAL GRID DERIVED FROM GPS TRANSFORMATION.
 GPS COORDINATES AND LEVELS SET AT 100m FOR SCALE FACTOR PURPOSES.
 THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:200
 SERVICE COVERS INDICATED WHERE VISIBLE PIPE WORKING IS DETAIL SUPPLIED FROM SUPPLIER.
 INSPECTION DATA GENERALLY DERIVED USING COVER COVERS WHICH BEING NOT BE DETAIL.
 TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.
 DIMENSIONS GIVEN ARE MEASURED TO CENTRE UNLESS OTHERWISE STATED.
 SERVICE COVERS LOCATED UNDER PARKED VEHICLES/ADJACENT STRUCTURES MAYBE OMITTED.
 BARRIERS SERVICE COVERS WILL NOT BE INDICATED.

TOPOGRAPHICAL SURVEY/UTILITY KEY :-

- 1/1 = spot level
- 1/2 = spot level
- 1/3 = spot level
- 1/4 = spot level
- 1/5 = spot level
- 1/6 = spot level
- 1/7 = spot level
- 1/8 = spot level
- 1/9 = spot level
- 1/10 = spot level
- 1/11 = spot level
- 1/12 = spot level
- 1/13 = spot level
- 1/14 = spot level
- 1/15 = spot level
- 1/16 = spot level
- 1/17 = spot level
- 1/18 = spot level
- 1/19 = spot level
- 1/20 = spot level
- 1/21 = spot level
- 1/22 = spot level
- 1/23 = spot level
- 1/24 = spot level
- 1/25 = spot level
- 1/26 = spot level
- 1/27 = spot level
- 1/28 = spot level
- 1/29 = spot level
- 1/30 = spot level
- 1/31 = spot level
- 1/32 = spot level
- 1/33 = spot level
- 1/34 = spot level
- 1/35 = spot level
- 1/36 = spot level
- 1/37 = spot level
- 1/38 = spot level
- 1/39 = spot level
- 1/40 = spot level
- 1/41 = spot level
- 1/42 = spot level
- 1/43 = spot level
- 1/44 = spot level
- 1/45 = spot level
- 1/46 = spot level
- 1/47 = spot level
- 1/48 = spot level
- 1/49 = spot level
- 1/50 = spot level
- 1/51 = spot level
- 1/52 = spot level
- 1/53 = spot level
- 1/54 = spot level
- 1/55 = spot level
- 1/56 = spot level
- 1/57 = spot level
- 1/58 = spot level
- 1/59 = spot level
- 1/60 = spot level
- 1/61 = spot level
- 1/62 = spot level
- 1/63 = spot level
- 1/64 = spot level
- 1/65 = spot level
- 1/66 = spot level
- 1/67 = spot level
- 1/68 = spot level
- 1/69 = spot level
- 1/70 = spot level
- 1/71 = spot level
- 1/72 = spot level
- 1/73 = spot level
- 1/74 = spot level
- 1/75 = spot level
- 1/76 = spot level
- 1/77 = spot level
- 1/78 = spot level
- 1/79 = spot level
- 1/80 = spot level
- 1/81 = spot level
- 1/82 = spot level
- 1/83 = spot level
- 1/84 = spot level
- 1/85 = spot level
- 1/86 = spot level
- 1/87 = spot level
- 1/88 = spot level
- 1/89 = spot level
- 1/90 = spot level
- 1/91 = spot level
- 1/92 = spot level
- 1/93 = spot level
- 1/94 = spot level
- 1/95 = spot level
- 1/96 = spot level
- 1/97 = spot level
- 1/98 = spot level
- 1/99 = spot level
- 1/100 = spot level

STATION	EASTING	NORTHINGS	LEVEL
SD1	51508.844	173601.307	19.832
SD2	51509.224	173595.177	19.282
SD3	51509.722	173601.000	19.230
SD4	51509.912	173604.000	19.187
SD5	51503.693	173672.444	18.991
SD6	51502.840	173672.286	18.983
SD7	51508.021	173664.487	19.230
SD8	51504.612	173663.123	18.877
SD9	51506.310	173631.436	19.291
SD10	51510.495	173620.047	19.413

- UTILITY SURVEY KEY :-**
- 1/1 = spot level
 - 1/2 = spot level
 - 1/3 = spot level
 - 1/4 = spot level
 - 1/5 = spot level
 - 1/6 = spot level
 - 1/7 = spot level
 - 1/8 = spot level
 - 1/9 = spot level
 - 1/10 = spot level
 - 1/11 = spot level
 - 1/12 = spot level
 - 1/13 = spot level
 - 1/14 = spot level
 - 1/15 = spot level
 - 1/16 = spot level
 - 1/17 = spot level
 - 1/18 = spot level
 - 1/19 = spot level
 - 1/20 = spot level
 - 1/21 = spot level
 - 1/22 = spot level
 - 1/23 = spot level
 - 1/24 = spot level
 - 1/25 = spot level
 - 1/26 = spot level
 - 1/27 = spot level
 - 1/28 = spot level
 - 1/29 = spot level
 - 1/30 = spot level
 - 1/31 = spot level
 - 1/32 = spot level
 - 1/33 = spot level
 - 1/34 = spot level
 - 1/35 = spot level
 - 1/36 = spot level
 - 1/37 = spot level
 - 1/38 = spot level
 - 1/39 = spot level
 - 1/40 = spot level
 - 1/41 = spot level
 - 1/42 = spot level
 - 1/43 = spot level
 - 1/44 = spot level
 - 1/45 = spot level
 - 1/46 = spot level
 - 1/47 = spot level
 - 1/48 = spot level
 - 1/49 = spot level
 - 1/50 = spot level
 - 1/51 = spot level
 - 1/52 = spot level
 - 1/53 = spot level
 - 1/54 = spot level
 - 1/55 = spot level
 - 1/56 = spot level
 - 1/57 = spot level
 - 1/58 = spot level
 - 1/59 = spot level
 - 1/60 = spot level
 - 1/61 = spot level
 - 1/62 = spot level
 - 1/63 = spot level
 - 1/64 = spot level
 - 1/65 = spot level
 - 1/66 = spot level
 - 1/67 = spot level
 - 1/68 = spot level
 - 1/69 = spot level
 - 1/70 = spot level
 - 1/71 = spot level
 - 1/72 = spot level
 - 1/73 = spot level
 - 1/74 = spot level
 - 1/75 = spot level
 - 1/76 = spot level
 - 1/77 = spot level
 - 1/78 = spot level
 - 1/79 = spot level
 - 1/80 = spot level
 - 1/81 = spot level
 - 1/82 = spot level
 - 1/83 = spot level
 - 1/84 = spot level
 - 1/85 = spot level
 - 1/86 = spot level
 - 1/87 = spot level
 - 1/88 = spot level
 - 1/89 = spot level
 - 1/90 = spot level
 - 1/91 = spot level
 - 1/92 = spot level
 - 1/93 = spot level
 - 1/94 = spot level
 - 1/95 = spot level
 - 1/96 = spot level
 - 1/97 = spot level
 - 1/98 = spot level
 - 1/99 = spot level
 - 1/100 = spot level

DISCLAIMER :-
 Electromagnetic techniques have been used in the location of underground services. The results are not accurate and the accuracy should be verified out to confirm service identification, position and particularly depth, where these are critical. The responsibility of the underground services information cannot be guaranteed.
 The location of any gas and electric services and the location of any other services should be verified out to confirm service identification, position and particularly depth, where these are critical. The responsibility of the underground services information cannot be guaranteed.
 Please note the location of any gas and electric services and the location of any other services should be verified out to confirm service identification, position and particularly depth, where these are critical. The responsibility of the underground services information cannot be guaranteed.
 Please note the location of any gas and electric services and the location of any other services should be verified out to confirm service identification, position and particularly depth, where these are critical. The responsibility of the underground services information cannot be guaranteed.

UTILITY NOTES

WHERE GASELLIC AND WATER ENTER THROUGH BUILDING AT THE REAR OF SURVEY AREA, IT IS ASSUMED LOCATED AS SHOWN FOR THE REAR OF BUILDING AND NOT FOR THE FRONT OF BUILDING. THE LOCATION OF GASELLIC AND WATER SERVICES SHOULD BE VERIFIED BY THE RELEVANT SERVICE PROVIDER.
 WHERE GASELLIC AND WATER ENTER THROUGH BUILDING AT THE REAR OF SURVEY AREA, IT IS ASSUMED LOCATED AS SHOWN FOR THE REAR OF BUILDING AND NOT FOR THE FRONT OF BUILDING. THE LOCATION OF GASELLIC AND WATER SERVICES SHOULD BE VERIFIED BY THE RELEVANT SERVICE PROVIDER.

A	ORIGINAL DRAWING ISSUE	MSL AHP 25.06.17
---	------------------------	------------------

Rev	Description	By	Chk	Date

RPS
 Noble House, Capital Drive, Linford Wood,
 Milton Keynes, MK14 6QP
 T: 01908 669 699 E: rpsmk@rpsgroup.com F: 01908 302 625

Client **TURNER & TOWNSEND**

Project **TURING HOUSE SCHOOL,
 HOSPITAL BRIDGE ROAD,
 HOUNSLOW, TW2 6LH**

Title **TOPOGRAPHICAL & UTILITY
 SURVEY**

Status **FINAL** Scale **1:200 @ A0** Date Created **29.06.17**

Project Leader **NB** Drawn By **MSL** Checked By **AHP**

Revised Number	Revision	Subsidiary
JKK9319 - 05	A	



Appendix F Greenfield Runoff Rate Calculations

Calculated by: Javier Plaza
 Site name: Turing School
 Site location: Twickenham

Site coordinates
 Latitude: 51.45029° N
 Longitude: 0.3692° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference: 6336701
 Date: 2018-03-28T09:26:49

Methodology	IH124
-------------	-------

Site characteristics

Total site area (ha)	1.43
----------------------	------

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	600	600
Hydrological region	6	6
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

- (1) Is $Q_{BAR} < 2.0$ l/s/ha?
 Normally limiting discharge rates which are less than 2.0 l/s/ha are set at 2.0 l/s/ha.
- (2) Are flow rates < 5.0 l/s?
 Where flow rates are less than 5.0 l/s consents are usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements
- (3) Is $SPR/SPRHOST \leq 0.3$?
 Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	2.18	2.18
1 in 1 year (l/s)	1.85	1.85
1 in 30 years (l/s)	5	5
1 in 100 years (l/s)	6.94	6.94

Appendix G Drainage Network Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.403	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits





Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.504	4-8	0.557	8-12	0.010

Total Area Contributing (ha) = 1.071

Total Pipe Volume (m³) = 33.123

Network Design Table for Storm

















PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	18.505	0.330	56.1	0.027	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	37.979	0.455	83.5	0.088	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	13.105	0.224	58.5	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	10.059	0.456	22.1	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.000	50.00	5.18	18.030	0.027	0.0	0.0	0.0	1.75	69.6	3.7
S2.001	50.00	5.62	17.700	0.116	0.0	0.0	0.0	1.43	56.9	15.7
S3.000	50.00	5.17	18.000	0.016	0.0	0.0	0.0	1.32	23.3	2.1
S3.001	50.00	5.24	17.776	0.035	0.0	0.0	0.0	2.15	38.0	4.8

XP Solutions Network 2017.1.2











Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.002	13.660	0.333	41.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	3.663	0.164	22.3	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	20.123	0.145	139.0	0.222	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	54.324	0.362	150.0	0.015	5.00	0.0	0.600	o	150	Pipe/Conduit	
S5.001	3.759	0.038	98.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.002	27.202	0.192	141.9	0.029	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.003	10.824	0.090	120.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.003	68.588	0.183	374.8	0.066	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.004	36.347	0.075	484.4	0.179	0.00	0.0	0.600	o	375	Pipe/Conduit	
S6.000	58.641	0.304	192.9	0.058	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	75.295	0.342	220.4	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.002	1.074	0.018	58.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.003	4.922	0.041	119.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.004	11.444	0.076	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.005	38.796	0.280	138.3	0.151	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	28.039	0.419	66.9	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.002	50.00	5.73	17.245	0.151	0.0	0.0	0.0	2.05	81.5	20.5
S4.000	50.00	5.02	17.500	0.000	0.0	0.0	0.0	2.78	110.6	0.0
S4.001	50.00	5.32	17.336	0.222	0.0	0.0	0.0	1.11	44.0	30.1
S5.000	50.00	6.11	18.470	0.015	0.0	0.0	0.0	0.82	14.5	2.0
S5.001	49.88	6.17	18.108	0.015	0.0	0.0	0.0	1.01	17.9	2.0
S4.002	48.34	6.58	17.194	0.266	0.0	0.0	0.0	1.10	43.6	34.8
S4.003	47.81	6.73	17.002	0.266	0.0	0.0	0.0	1.19	47.3	34.8
S2.003	43.90	7.96	16.756	0.483	0.0	0.0	0.0	0.93	102.7	57.4
S2.004	41.87	8.71	16.573	0.662	0.0	0.0	0.0	0.82	90.2	75.1
S6.000	50.00	6.04	18.142	0.058	0.0	0.0	0.0	0.94	37.3	7.9
S6.001	45.37	7.47	17.838	0.083	0.0	0.0	0.0	0.88	34.9	10.1
S6.002	45.33	7.48	17.496	0.083	0.0	0.0	0.0	1.71	68.1	10.1
S6.003	45.12	7.55	17.478	0.083	0.0	0.0	0.0	1.19	47.5	10.1
S6.004	44.58	7.73	17.437	0.083	0.0	0.0	0.0	1.07	42.4	10.1
S6.005	42.91	8.31	17.360	0.233	0.0	0.0	0.0	1.11	44.1	27.1
S7.000	50.00	5.38	17.989	0.025	0.0	0.0	0.0	1.23	21.8	3.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.000	31.401	0.209	150.2	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	10.148	0.177	57.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.000	35.024	0.233	150.0	0.043	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.001	6.231	0.077	80.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S8.002	2.728	0.083	32.7	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.001	10.009	0.100	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.000	34.380	0.229	150.1	0.035	5.00	0.0	0.600	o	150	Pipe/Conduit	
S10.001	26.264	0.175	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.005	7.563	0.050	151.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.006	18.105	0.162	111.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S8.000	50.00	5.49	17.950	0.059	0.0	0.0	0.0	1.06	42.3	8.0
S8.001	50.00	5.59	17.741	0.059	0.0	0.0	0.0	1.73	68.8	8.0
S9.000	50.00	5.71	17.950	0.043	0.0	0.0	0.0	0.82	14.5	5.8
S9.001	50.00	5.81	17.717	0.043	0.0	0.0	0.0	1.12	19.8	5.8
S8.002	50.00	5.83	17.564	0.116	0.0	0.0	0.0	2.30	91.3	15.7
S7.001	50.00	5.95	17.481	0.140	0.0	0.0	0.0	1.31	52.0	19.0
S10.000	50.00	5.70	17.950	0.035	0.0	0.0	0.0	0.82	14.5	4.8
S10.001	49.63	6.24	17.721	0.035	0.0	0.0	0.0	0.82	14.5	4.8
S2.005	41.65	8.79	16.400	1.071	0.0	0.0	0.0	1.47	162.5	120.8
S2.006	41.23	8.97	16.350	1.071	0.0	0.0	0.0	1.71	189.3	120.8

56 The Ropewalk
 Nottingham
 NG1 5DW



Date 13/07/2018 15:02
 File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
 Checked by

XP Solutions

Network 2017.1.2

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	User	-	100	0.027	0.027	0.027
2.001	User	-	100	0.076	0.076	0.076
	User	-	100	0.013	0.013	0.088
3.000	User	-	100	0.016	0.016	0.016
3.001	User	-	100	0.020	0.020	0.020
2.002	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
4.001	User	-	100	0.019	0.019	0.019
	User	-	100	0.110	0.110	0.129
	User	-	100	0.093	0.093	0.222
5.000	User	-	100	0.015	0.015	0.015
5.001	-	-	100	0.000	0.000	0.000
4.002	User	-	100	0.029	0.029	0.029
4.003	-	-	100	0.000	0.000	0.000
2.003	User	-	100	0.066	0.066	0.066
2.004	User	-	100	0.149	0.149	0.149
	User	-	100	0.031	0.031	0.179
6.000	User	-	100	0.018	0.018	0.018
	User	-	100	0.040	0.040	0.058
6.001	User	-	100	0.024	0.024	0.024
6.002	-	-	100	0.000	0.000	0.000
6.003	-	-	100	0.000	0.000	0.000
6.004	-	-	100	0.000	0.000	0.000
6.005	User	-	100	0.139	0.139	0.139
	User	-	100	0.012	0.012	0.151
7.000	User	-	100	0.025	0.025	0.025
8.000	User	-	100	0.059	0.059	0.059
8.001	-	-	100	0.000	0.000	0.000
9.000	User	-	100	0.043	0.043	0.043
9.001	-	-	100	0.000	0.000	0.000
8.002	User	-	100	0.013	0.013	0.013
7.001	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.035	0.035	0.035
10.001	-	-	100	0.000	0.000	0.000
2.005	-	-	100	0.000	0.000	0.000
2.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.071	1.071	1.071

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S2.006	S6	19.050	16.188	0.000	1200	0

56 The Ropewalk
 Nottingham
 NG1 5DW



Date 13/07/2018 15:02
 File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
 Checked by

XP Solutions Network 2017.1.2

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs		0 Number of Storage Structures	
Number of Online Controls		5 Number of Time/Area Diagrams	
Number of Offline Controls		0 Number of Real Time Controls	

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.403		

Online Controls for Storm

Orifice Manhole: S4, DS/PN: S4.001, Volume (m³): 2.1

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 17.336

Orifice Manhole: S15, DS/PN: S8.001, Volume (m³): 2.6

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 17.741

Orifice Manhole: S17, DS/PN: S9.001, Volume (m³): 2.2

Diameter (m) 0.110 Discharge Coefficient 0.600 Invert Level (m) 17.717

Orifice Manhole: S25, DS/PN: S10.001, Volume (m³): 2.1

Diameter (m) 0.060 Discharge Coefficient 0.600 Invert Level (m) 17.721

Hydro-Brake® Optimum Manhole: S5, DS/PN: S2.005, Volume (m³): 9.9

Unit Reference	MD-SHE-0103-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	16.400
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0	Kick-Flo®	0.745	4.0
Flush-Flo™	0.354	5.0	Mean Flow over Head Range	-	4.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	0.800	4.1	2.000	6.3	4.000	8.8
0.200	4.7	1.000	4.6	2.200	6.6	4.500	9.3
0.300	5.0	1.200	5.0	2.400	6.9	5.000	9.8
0.400	5.0	1.400	5.4	2.600	7.2	5.500	10.2
0.500	4.9	1.600	5.7	3.000	7.7	6.000	10.7
0.600	4.7	1.800	6.0	3.500	8.3	6.500	11.1

56 The Ropewalk
 Nottingham
 NG1 5DW



Date 13/07/2018 15:02
 File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
 Checked by

XP Solutions Network 2017.1.2

Hydro-Brake® Optimum Manhole: S5, DS/PN: S2.005, Volume (m³): 9.9

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
7.000	11.5	8.000	12.2	9.000	12.9		
7.500	11.8	8.500	12.6	9.500	13.3		

56 The Ropewalk
Nottingham
NG1 5DW



Date 13/07/2018 15:02
File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
Checked by

XP Solutions

Network 2017.1.2

Storage Structures for Storm

Porous Car Park Manhole: S4, DS/PN: S4.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	36.5
Membrane Percolation (mm/hr)	1000	Length (m)	52.0
Max Percolation (l/s)	527.2	Slope (1:X)	350.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	18.800	Membrane Depth (mm)	0

Porous Car Park Manhole: S15, DS/PN: S8.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	32.5
Max Percolation (l/s)	43.3	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	18.650	Membrane Depth (mm)	0

Porous Car Park Manhole: S17, DS/PN: S9.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	36.0
Max Percolation (l/s)	48.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	18.750	Membrane Depth (mm)	0

Porous Car Park Manhole: S25, DS/PN: S10.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	36.0
Max Percolation (l/s)	48.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	18.700	Membrane Depth (mm)	0

Cellular Storage Manhole: S5, DS/PN: S2.005

Invert Level (m) 16.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	510.0	0.0	1.200	510.0	0.0
0.400	510.0	0.0	1.201	0.0	0.0
0.800	510.0	0.0			

XP Solutions Network 2017.1.2

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 5 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.403
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S1	15 Winter	1	+0%	100/15 Summer				18.066
S2.001	S2	15 Winter	1	+0%	100/15 Summer				17.779
S3.000	S3	15 Winter	1	+0%	100/15 Winter				18.032
S3.001	S4	15 Winter	1	+0%	100/15 Summer				17.813
S2.002	S3	15 Winter	1	+0%	100/15 Summer				17.324
S4.000	S7	480 Winter	1	+0%	1/15 Summer				18.878
S4.001	S4	480 Winter	1	+0%	1/15 Summer				18.878
S5.000	S5	15 Winter	1	+0%					18.508
S5.001	S6	15 Winter	1	+0%					18.148
S4.002	S5	15 Winter	1	+0%	100/15 Summer				17.247
S4.003	S6	15 Winter	1	+0%	100/15 Summer				17.055
S2.003	S3	15 Winter	1	+0%	30/15 Summer				16.902
S2.004	S4	15 Winter	1	+0%	30/15 Summer				16.780
S6.000	S5	15 Winter	1	+0%	100/15 Summer				18.215
S6.001	S6	15 Winter	1	+0%	100/15 Summer				17.924
S6.002	S7	15 Winter	1	+0%	30/15 Summer				17.584
S6.003	S8	15 Winter	1	+0%	30/15 Summer				17.566
S6.004	S9	15 Winter	1	+0%	30/15 Summer				17.519

56 The Ropewalk
 Nottingham
 NG1 5DW



Date 13/07/2018 15:02
 File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
 Checked by

XP Solutions Network 2017.1.2

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S2.000	S1	-0.189	0.000	0.06		3.8	OK	
S2.001	S2	-0.146	0.000	0.26		14.2	OK	
S3.000	S3	-0.118	0.000	0.10		2.2	OK	
S3.001	S4	-0.113	0.000	0.13		4.5	OK	
S2.002	S3	-0.146	0.000	0.26		18.8	OK	
S4.000	S7	1.153	0.000	0.00		0.2	FLOOD RISK	
S4.001	S4	1.317	0.000	0.03		1.0	FLOOD RISK	
S5.000	S5	-0.112	0.000	0.14		2.0	OK	
S5.001	S6	-0.110	0.000	0.16		2.0	OK	
S4.002	S5	-0.171	0.000	0.13		5.1	OK	
S4.003	S6	-0.171	0.000	0.13		5.1	OK	
S2.003	S3	-0.229	0.000	0.30		29.5	OK	
S2.004	S4	-0.169	0.000	0.58		47.3	OK	
S6.000	S5	-0.152	0.000	0.21		7.7	OK	
S6.001	S6	-0.139	0.000	0.28		9.6	OK	
S6.002	S7	-0.137	0.000	0.33		9.7	OK	
S6.003	S8	-0.137	0.000	0.32		9.7	OK	
S6.004	S9	-0.143	0.000	0.27		9.7	OK	

56 The Ropewalk
Nottingham
NG1 5DW



Date 13/07/2018 15:02
File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
Checked by

XP Solutions Network 2017.1.2

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.005	S10	15 Winter	1	+0%	30/15 Summer				17.487
S7.000	S11	15 Winter	1	+0%					18.030
S8.000	S14	30 Winter	1	+0%	1/15 Summer				18.290
S8.001	S15	30 Winter	1	+0%	1/15 Summer				18.283
S9.000	S16	15 Winter	1	+0%	30/15 Summer				18.019
S9.001	S17	15 Winter	1	+0%	30/15 Summer				17.841
S8.002	S16	15 Winter	1	+0%					17.636
S7.001	S12	15 Winter	1	+0%					17.562
S10.000	S12	15 Winter	1	+0%	30/15 Summer				18.012
S10.001	S25	15 Winter	1	+0%	1/15 Summer				17.951
S2.005	S5	480 Winter	1	+0%	30/60 Winter				16.625
S2.006	S27	480 Winter	1	+0%					16.393

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.005	S10	-0.099	0.000	0.60		24.9	OK	
S7.000	S11	-0.109	0.000	0.16		3.4	OK	
S8.000	S14	0.115	0.000	0.13		5.3	SURCHARGED	
S8.001	S15	0.317	0.000	0.04		2.4	SURCHARGED	
S9.000	S16	-0.081	0.000	0.42		5.9	OK	
S9.001	S17	-0.026	0.000	0.34		5.7	OK	
S8.002	S16	-0.153	0.000	0.22		9.1	OK	
S7.001	S12	-0.144	0.000	0.28		12.2	OK	
S10.000	S12	-0.088	0.000	0.34		4.8	OK	
S10.001	S25	0.080	0.000	0.24		3.4	SURCHARGED	
S2.005	S5	-0.150	0.000	0.04		4.8	OK	
S2.006	S27	-0.332	0.000	0.03		4.8	OK	

56 The Ropewalk
Nottingham
NG1 5DW



Date 13/07/2018 15:02
File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
Checked by

XP Solutions Network 2017.1.2

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 5
 Number of Online Controls 5 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.403
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080

Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S1	15 Winter	30	+0%	100/15 Summer				18.088
S2.001	S2	15 Winter	30	+0%	100/15 Summer				17.850
S3.000	S3	15 Winter	30	+0%	100/15 Winter				18.052
S3.001	S4	15 Winter	30	+0%	100/15 Summer				17.839
S2.002	S3	15 Winter	30	+0%	100/15 Summer				17.394
S4.000	S7	480 Winter	30	+0%	1/15 Summer				18.973
S4.001	S4	480 Winter	30	+0%	1/15 Summer				18.974
S5.000	S5	15 Winter	30	+0%					18.533
S5.001	S6	15 Winter	30	+0%					18.173
S4.002	S5	15 Winter	30	+0%	100/15 Summer				17.291
S4.003	S6	15 Winter	30	+0%	100/15 Summer				17.212
S2.003	S3	15 Winter	30	+0%	30/15 Summer				17.191
S2.004	S4	15 Winter	30	+0%	30/15 Summer				17.052
S6.000	S5	15 Winter	30	+0%	100/15 Summer				18.263
S6.001	S6	15 Winter	30	+0%	100/15 Summer				18.015
S6.002	S7	15 Winter	30	+0%	30/15 Summer				17.851
S6.003	S8	15 Winter	30	+0%	30/15 Summer				17.847
S6.004	S9	15 Winter	30	+0%	30/15 Summer				17.838

56 The Ropewalk
Nottingham
NG1 5DW



Date 13/07/2018 15:02
File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
Checked by

XP Solutions

Network 2017.1.2

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)			
S2.000	S1	-0.167	0.000	0.15		9.4	OK	
S2.001	S2	-0.075	0.000	0.76		41.0	OK	
S3.000	S3	-0.098	0.000	0.25		5.4	OK	
S3.001	S4	-0.087	0.000	0.37		12.5	OK	
S2.002	S3	-0.077	0.000	0.75		53.0	OK	
S4.000	S7	1.248	0.000	0.00		0.0	FLOOD RISK	
S4.001	S4	1.413	0.000	0.03		1.1	FLOOD RISK	
S5.000	S5	-0.087	0.000	0.34		4.8	OK	
S5.001	S6	-0.085	0.000	0.39		4.8	OK	
S4.002	S5	-0.127	0.000	0.38		15.2	OK	
S4.003	S6	-0.015	0.000	0.43		17.3	OK	
S2.003	S3	0.059	0.000	0.83		80.2	SURCHARGED	
S2.004	S4	0.104	0.000	1.60		130.2	SURCHARGED	
S6.000	S5	-0.104	0.000	0.53		18.9	OK	
S6.001	S6	-0.048	0.000	0.69		23.2	OK	
S6.002	S7	0.130	0.000	0.96		28.8	SURCHARGED	
S6.003	S8	0.144	0.000	1.00		29.9	SURCHARGED	
S6.004	S9	0.176	0.000	0.86		31.1	SURCHARGED	

56 The Ropewalk
Nottingham
NG1 5DW



Date 13/07/2018 15:02
File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
Checked by

XP Solutions Network 2017.1.2

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.005	S10	15 Winter	30	+0%	30/15 Summer				17.820
S7.000	S11	15 Winter	30	+0%					18.056
S8.000	S14	30 Winter	30	+0%	1/15 Summer				18.773
S8.001	S15	30 Winter	30	+0%	1/15 Summer				18.763
S9.000	S16	15 Winter	30	+0%	30/15 Summer				18.191
S9.001	S17	15 Winter	30	+0%	30/15 Summer				18.002
S8.002	S16	15 Winter	30	+0%					17.671
S7.001	S12	15 Winter	30	+0%					17.608
S10.000	S12	15 Winter	30	+0%	30/15 Summer				18.501
S10.001	S25	15 Winter	30	+0%	1/15 Summer				18.454
S2.005	S5	480 Winter	30	+0%	30/60 Winter				16.965
S2.006	S27	60 Winter	30	+0%					16.393

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.005	S10	0.235	0.000	1.34		56.0	SURCHARGED	
S7.000	S11	-0.083	0.000	0.40		8.2	OK	
S8.000	S14	0.598	0.000	0.37		14.5	FLOOD RISK	
S8.001	S15	0.797	0.000	0.06		3.3	FLOOD RISK	
S9.000	S16	0.091	0.000	0.92		12.9	SURCHARGED	
S9.001	S17	0.135	0.000	0.73		12.1	SURCHARGED	
S8.002	S16	-0.118	0.000	0.45		18.2	OK	
S7.001	S12	-0.098	0.000	0.61		26.4	OK	
S10.000	S12	0.401	0.000	0.61		8.5	SURCHARGED	
S10.001	S25	0.583	0.000	0.46		6.3	SURCHARGED	
S2.005	S5	0.190	0.000	0.05		5.0	SURCHARGED	
S2.006	S27	-0.332	0.000	0.03		5.0	OK	

56 The Ropewalk
Nottingham
NG1 5DW



Date 13/07/2018 15:02
File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
Checked by

XP Solutions Network 2017.1.2

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 5
 Number of Online Controls 5 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.403
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080

Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S1	15 Winter	100	+40%	100/15 Summer				18.628
S2.001	S2	15 Winter	100	+40%	100/15 Summer				18.602
S3.000	S3	15 Winter	100	+40%	100/15 Winter				18.193
S3.001	S4	15 Winter	100	+40%	100/15 Summer				18.165
S2.002	S3	15 Winter	100	+40%	100/15 Summer				18.063
S4.000	S7	720 Winter	100	+40%	1/15 Summer				19.108
S4.001	S4	720 Winter	100	+40%	1/15 Summer				19.108
S5.000	S5	15 Winter	100	+40%					18.560
S5.001	S6	15 Winter	100	+40%					18.203
S4.002	S5	15 Winter	100	+40%	100/15 Summer				17.818
S4.003	S6	15 Winter	100	+40%	100/15 Summer				17.748
S2.003	S3	15 Winter	100	+40%	30/15 Summer				17.715
S2.004	S4	960 Winter	100	+40%	30/15 Summer				17.564
S6.000	S5	15 Winter	100	+40%	100/15 Summer				19.027
S6.001	S6	15 Winter	100	+40%	100/15 Summer				18.958
S6.002	S7	15 Winter	100	+40%	30/15 Summer				18.689
S6.003	S8	15 Winter	100	+40%	30/15 Summer				18.679
S6.004	S9	15 Winter	100	+40%	30/15 Summer				18.665

56 The Ropewalk
Nottingham
NG1 5DW



Date 13/07/2018 15:02
File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
Checked by

XP Solutions Network 2017.1.2

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)					
S2.000	S1	0.373	0.000	0.27		17.2	SURCHARGED	
S2.001	S2	0.677	0.000	1.07		57.7	SURCHARGED	
S3.000	S3	0.043	0.000	0.46		9.7	SURCHARGED	
S3.001	S4	0.239	0.000	0.61		20.8	SURCHARGED	
S2.002	S3	0.593	0.000	1.09		77.2	SURCHARGED	
S4.000	S7	1.383	0.000	0.00		0.0	FLOOD RISK	
S4.001	S4	1.547	0.000	0.03		1.1	FLOOD RISK	
S5.000	S5	-0.060	0.000	0.62		8.8	OK	
S5.001	S6	-0.055	0.000	0.71		8.7	OK	
S4.002	S5	0.399	0.000	0.61		24.5	SURCHARGED	
S4.003	S6	0.522	0.000	0.68		27.2	SURCHARGED	
S2.003	S3	0.584	0.000	1.30		126.0	SURCHARGED	
S2.004	S4	0.616	0.000	0.21		17.2	SURCHARGED	
S6.000	S5	0.660	0.000	0.75		26.8	FLOOD RISK	
S6.001	S6	0.895	0.000	0.96		32.6	FLOOD RISK	
S6.002	S7	0.967	0.000	1.28		38.1	SURCHARGED	
S6.003	S8	0.976	0.000	1.32		39.5	SURCHARGED	
S6.004	S9	1.003	0.000	1.14		41.1	SURCHARGED	

56 The Ropewalk
 Nottingham
 NG1 5DW



Date 13/07/2018 15:02
 File FS0316-CUR-00-00-M3-

Designed by Rowan.Jobling
 Checked by

XP Solutions Network 2017.1.2

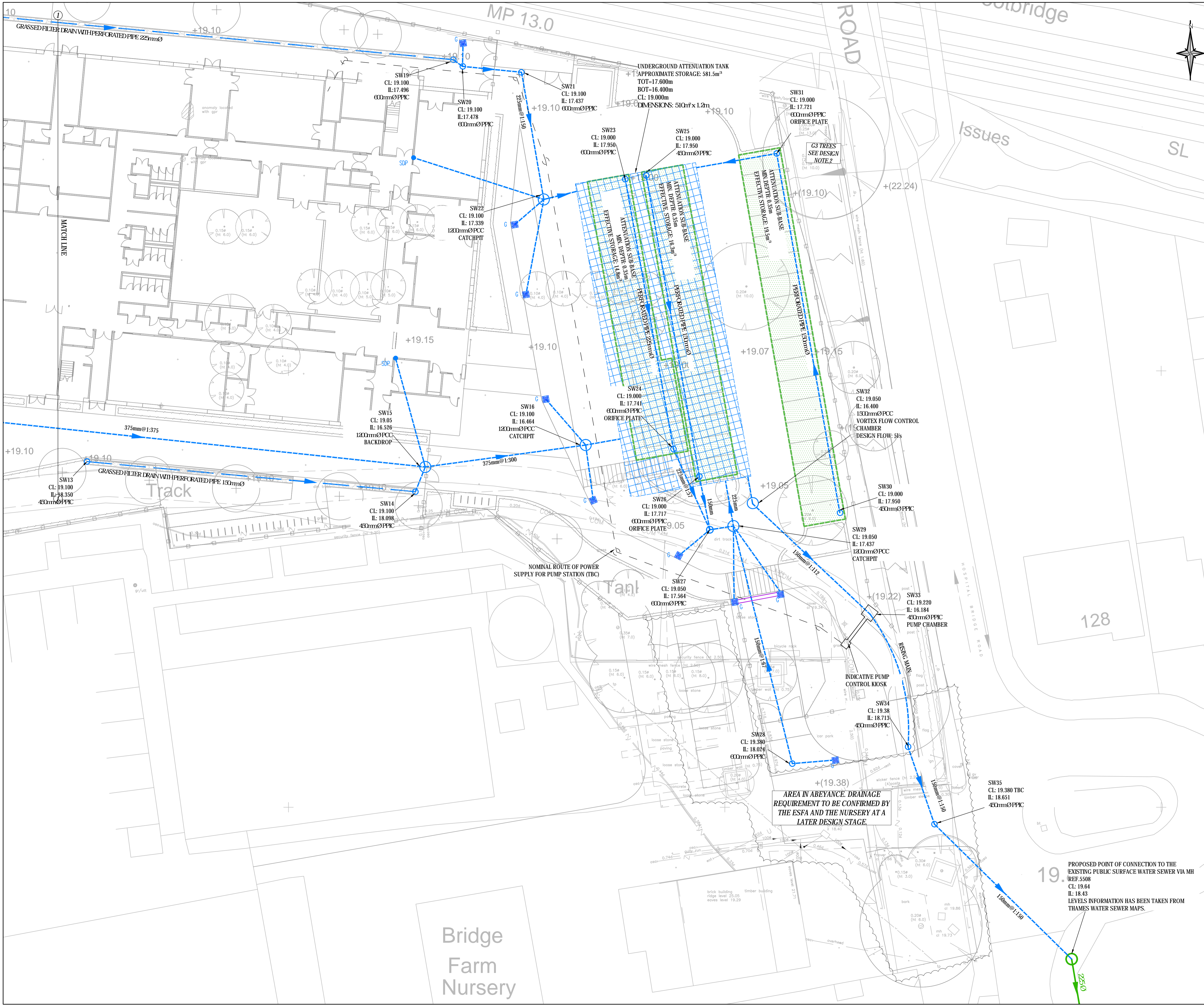
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.005	S10	15 Winter	100	+40%	30/15 Summer				18.643
S7.000	S11	15 Winter	100	+40%					18.086
S8.000	S14	60 Winter	100	+40%	1/15 Summer				18.978
S8.001	S15	60 Winter	100	+40%	1/15 Summer				18.968
S9.000	S16	15 Winter	100	+40%	30/15 Summer				18.895
S9.001	S17	15 Winter	100	+40%	30/15 Summer				18.433
S8.002	S16	15 Winter	100	+40%					17.703
S7.001	S12	15 Winter	100	+40%					17.657
S10.000	S12	15 Winter	100	+40%	30/15 Summer				19.097
S10.001	S25	30 Winter	100	+40%	1/15 Summer				18.775
S2.005	S5	960 Winter	100	+40%	30/60 Winter				17.562
S2.006	S27	15 Summer	100	+40%					16.393

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.005	S10	1.057	0.000	2.16		90.3	SURCHARGED	
S7.000	S11	-0.053	0.000	0.72		15.0	OK	
S8.000	S14	0.803	0.000	0.46		18.2	FLOOD RISK	
S8.001	S15	1.002	0.000	0.06		3.7	FLOOD RISK	
S9.000	S16	0.795	0.000	1.43		20.0	FLOOD RISK	
S9.001	S17	0.566	0.000	1.16		19.3	SURCHARGED	
S8.002	S16	-0.086	0.000	0.68		27.5	OK	
S7.001	S12	-0.048	0.000	0.97		42.2	OK	
S10.000	S12	0.997	0.000	1.18		16.5	FLOOD RISK	
S10.001	S25	0.904	0.000	0.55		7.6	FLOOD RISK	
S2.005	S5	0.787	0.000	0.05		5.0	SURCHARGED	
S2.006	S27	-0.332	0.000	0.03		5.0	OK	



Appendix H Surface Water Drainage Layout



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

TO BE READ IN CONJUNCTION WITH THE DRAWINGS:
 - FS0316-CUR-ZZ-XX-DR-C-9000_GENERAL INFRASTRUCTURE NOTES
 - FS0316-CUR-ZZ-00-DR-C-9200_SURFACE WATER DRAINAGE LAYOUT KEY PLAN
 - FS0316-CUR-ZZ-00-DR-C-9203_SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 2
 - FS0316-CUR-ZZ-00-DR-C-9201_FOUL WATER DRAINAGE LAYOUT

KEY

- PROPOSED SURFACE WATER DRAIN
- PROPOSED SURFACE RAIN WATER PIPE
- PROPOSED SURFACE WATER SIPHONIC DRAIN PIPE
- PROPOSED SURFACE WATER GULLY
- PROPOSED LINEAR DRAINAGE CHANNEL (LDC) WITH A SUMP UNIT AT OUTFALL
- PROPOSED FILTER DRAIN
- PROPOSED ATTENUATION SUB-BASE WITH PERFORATED PIPE
- PROPOSED SURFACE WATER ATTENUATION TANK
- POWER SUPPLY FOR PUMP STATIONS (TBC)
- EXISTING PUBLIC SURFACE WATER SEWER
- PROPOSED DISHED CHANNEL (CD2)
- PUMP CHAMBER

DESIGN NOTES:

1. ALL LEVELS ARE IN METERS ABOVE ORDNANCE DATUM.
2. G3 TREES HAVE BEEN ASSUMED TO BE REMOVED - SUBJECT TO NETWORK RAIL APPROVAL TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT.
3. DRAINAGE NOT PROVIDED FOR THE SITE ENTRANCE. ENTRANCE ARRANGEMENT TO BE CONFIRMED BY THE ESFA AND THE NURSERY AT A LATER DESIGN STAGE.
4. SIPHONIC DRAIN PIPES LOCATIONS ASSUMED FOR THE PURPOSES OF SURFACE WATER DESIGN. LOCATIONS TO BE CONFIRMED BY AN M&E AT A LATER DESIGN STAGE.
5. ALL CHAMBERS WITHIN HARDSTANDING AREAS TO HAVE HEAVY DUTY COVERS (D400 GRADE).
6. RAIN WATER DOWNPIPES LOCATIONS HAVE BEEN BASED ON DRAWING FS0316-STL-XX-00-DR-A-1003-GROUND FLOOR GA PLAN-WEST-P01 ISSUED ON 11.04.18 BY THE ARCHITECT
7. NO INFILTRATION ALLOWED AS PER INFILTRATION TEST RESULTS UNDERTAKEN BY DELTA SIMONS IN APRIL 2018.
8. PROPOSED POINT OF CONNECTION TO THE PUBLIC SEWER - SUBJECT TO SECTION 106 AGREEMENT WITH THAMES WATER.
9. DISCHARGE RATE BASED ON GREENFIELD RUNOFF RATES.
10. ATTENUATION VOLUME BASED ON 100 YEARS +40%CC STORM EVENT.
11. SURFACE WATER PUMPING STATION INDICATIVE ONLY. PUMP TO BE DESIGNED BY A SPECIALIST.

P03	PLANNING ISSUE	01.08.18	RJ	AW
P02	REVISED AS PER IIT CLARIFICATIONS	01.05.18	AS	AW
P01	ISSUED FOR IIT	17.04.18	AS	AW
Rev:	Description:	Date:	By:	Chkd:

curtins
 58 The Row, Nottingham NG1 5DW
 0115 941 5551
 nottingham@curtins.com
 www.curtins.com

Architects • Transport Planning • Environmental • Infrastructure • Geotechnical • Construction Management • Strategic Design • Birmingham • Leeds • Cardiff • Oxford • Dublin • Edinburgh • Glasgow • Leeds • Liverpool • London • Manchester • Nottingham

PLANNING

Project: **TURING HOUSE SCHOOL**

Dwg Title: **SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 2**

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	06.04.18	AS	AS	AW

Scale: 1:200

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category/Number:	Rev:
FS0316 - CUR - ZZ - 00 - DR - C -						9202 - P03	

GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
 - DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
 - ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
 - FOR GENERAL NOTES REFER TO DRAWING.
- TO BE READ IN CONJUNCTION WITH THE DRAWINGS:
- FS0316-CUR-ZZ-XX-DR-C-9000_GENERAL INFRASTRUCTURE NOTES
 - FS0316-CUR-ZZ-00-DR-C-9200_SURFACE WATER DRAINAGE LAYOUT KEY PLAN
 - FS0316-CUR-ZZ-00-DR-C-9202_SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 2
 - FS0316-CUR-ZZ-00-DR-C-9201_FOUL WATER DRAINAGE LAYOUT

KEY

- PROPOSED SURFACE WATER DRAIN
- PROPOSED SURFACE RAIN WATER PIPE
- PROPOSED SURFACE WATER SIPHONIC DRAIN PIPE
- PROPOSED SURFACE WATER GULLY
- PROPOSED LINEAR DRAINAGE CHANNEL (LDC) WITH A SUMP UNIT AT OUTFALL
- PROPOSED FILTER DRAIN
- PROPOSED ATTENUATION SUB-BASE WITH PERFORATED PIPE
- PROPOSED SURFACE WATER ATTENUATION TANK
- POWER SUPPLY FOR PUMP STATIONS (TBC)
- EXISTING PUBLIC SURFACE WATER SEWER
- PROPOSED DISHED CHANNEL (CD2)
- PUMP CHAMBER

DESIGN NOTES:

- ALL LEVELS ARE IN METERS ABOVE ORDNANCE DATUM.
- G3 TREES HAVE BEEN ASSUMED TO BE REMOVED - SUBJECT TO NETWORK RAIL APPROVAL TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT.
- DRAINAGE NOT PROVIDED FOR THE SITE ENTRANCE. ENTRANCE ARRANGEMENT TO BE CONFIRMED BY THE ESFA AND THE NURSERY AT A LATER DESIGN STAGE.
- SIPHONIC DRAIN PIPES LOCATIONS ASSUMED FOR THE PURPOSES OF SURFACE WATER DESIGN. LOCATIONS TO BE CONFIRMED BY AN M&E AT A LATER DESIGN STAGE.
- ALL CHAMBERS WITHIN HARDSTANDING AREAS TO HAVE HEAVY DUTY COVERS (D400 GRADE).
- RAIN WATER DOWNPIPES LOCATIONS HAVE BEEN BASED ON DRAWING FS0316-STL-XX-00-DR-A-1003-GROUND FLOOR GA PLAN-WEST-P01 ISSUED ON 11.04.18 BY THE ARCHITECT
- NO INFILTRATION ALLOWED AS PER INFILTRATION TEST RESULTS UNDERTAKEN BY DELTA SIMONS IN APRIL 2018.
- PROPOSED POINT OF CONNECTION TO THE PUBLIC SEWER- SUBJECT TO SECTION 106 AGREEMENT WITH THAMES WATER.
- DISCHARGE RATE BASED ON GREENFIELD RUNOFF RATES.
- ATTENUATION VOLUME BASED ON 100 YEARS +40%CC STORM EVENT.
- SURFACE WATER PUMPING STATION INDICATIVE ONLY. PUMP TO BE DESIGNED BY A SPECIALIST.

P03	PLANNING ISSUE	01.08.18	RJ	AW
P02	REVISED AS PER IIT CLARIFICATIONS	01.05.18	AS	AW
P01	ISSUED FOR IIT	17.04.18	AS	AW
Rev:	Description:	Date:	By:	Chkd:



38 The Ropewalk, Nottingham NG1 5DW
0115 941 5551
nottingham@curtins.com
www.curtins.com

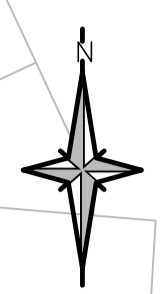
Status: **PLANNING**

Project: **TURING HOUSE SCHOOL**

Doc Title: **SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 2**

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	06.04.18	AS	AS	AW
Scale:	1:200			
Project No:	Originator:	Volume:	Level:	Type:
FS0316 - CUR - ZZ - 00 - DR - C -	9203	- P03		

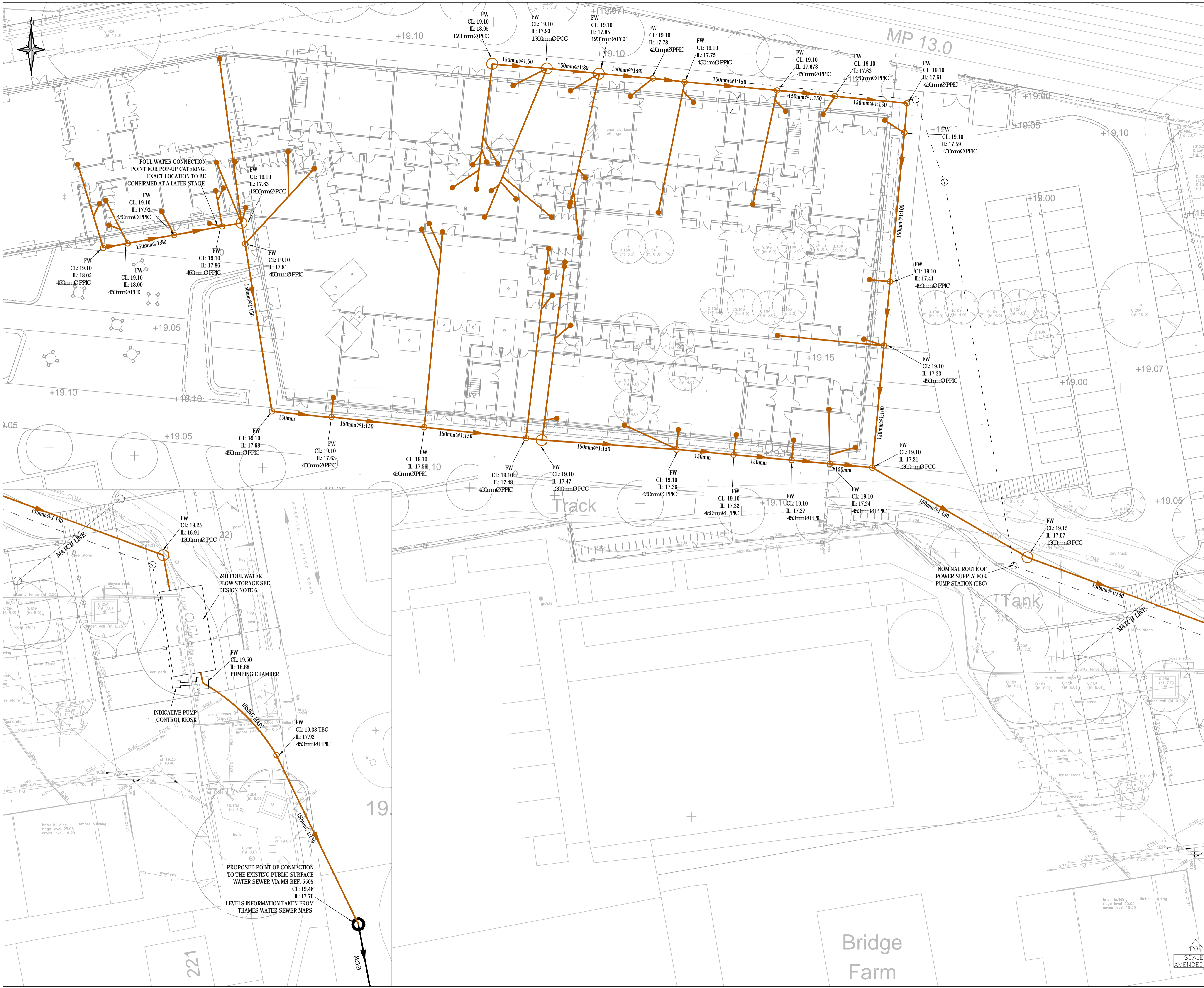
FS0316 - CUR - ZZ - 00 - DR - C - 9203 - P03



MATCH LINE



Appendix I Foul Water Drainage Layout



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

TO BE READ IN CONJUNCTION WITH THE DRAWINGS:
 -FS0316-CUR-ZZ-XX-DR-C-9000_GENERAL INFRASTRUCTURE NOTES
 -FS0316-CUR-ZZ-00-DR-C-9200_SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 2
 -FS0316-CUR-ZZ-00-DR-C-9202_SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 2

KEY:

- PROPOSED FOUL WATER DRAIN
- PROPOSED FOUL WATER SOIL VENT PIPE/ STUB STACK
- - - POWER SUPPLY FOR PUMP STATION (TBC)
- EXISTING FOUL WATER PUBLIC SEWER
- PUMP CHAMBER

DESIGN NOTES:

1. ALL LEVELS ARE IN METERS ABOVE ORDNANCE DATUM.
2. FOUL WATER POP UP LOCATIONS BASED ON THE SKETCH PROVIDED BY M&E ENGINEER ON 11.04.18. REFER TO THIS SKETCH FOR DETAILS OF THE TYPE OF DROP POINT. FOR TYPE OF DROP POINTS REFER TO M&E SKETCH.
3. FOUL WATER DROP POINTS INDICATIVE ONLY. TO BE CONFIRMED BY THE M&E ENGINEER AT A LATER DESIGN STAGE. ANY CHANGES TO THE FOUL WATER DROP POINT LOCATIONS MAY RESULT IN DESIGN AMENDMENTS.
4. FOUL WATER NETWORK CONNECTION TO THE PUBLIC FOUL WATER SEWER SUBJECT TO S106 AGREEMENT WITH THAMES WATER.
5. FOUL WATER PUMPING STATION INDICATIVE. PUMP TO BE DESIGNED BY A SPECIALIST.
6. 24H FOUL WATER STORAGE TO BE DESIGNED BY SPECIALIST OR ALTERNATIVE SOLUTION TO BE PROPOSED BY SPECIALIST.
7. ALL CHAMBERS WITHIN HARDSTANDING AREAS TO HAVE HEAVY DUTY COVERS (D400 GRADE).
8. M&E ENGINEER TO ENSURE THAT A VENTILATING PIPE IS PROVIDED AT OR NEAR THE HEAD OF EACH MAN DRAIN IN ACCORDANCE WITH BUILDING REGULATION PART H.

P05	PLANNING ISSUE	01.08.18	RJ	AW
P04	REVISED AS PER IIT CLARIFICATIONS	01.05.18	AS	AW
P03	AMENDED TO SUIT CONTRACTOR'S COMMENT	18.04.18	AS	AW
P02	AMENDED TO SUIT CONTRACTOR'S COMMENTS	17.04.18	AS	AW
P01	ISSUED FOR IIT	13.04.18	AS	AW
Rev:	Description:	Date:	By:	Chkd:



36 The Ropewalk, Nottingham NG1 5DW
 0115 941 5551
 nottingham@curtins.com
 www.curtins.com

Other Services: Transport Planning • Environmental • Infrastructure • Geotechnical • Construction Management • Structural Design
 Birmingham • Bristol • Cardiff • Dublin • Glasgow • Leeds • Liverpool • London • Manchester • Nottingham

Status: **PLANNING**

Project: **TURING HOUSE SCHOOL**

Dwg Title: **FOUL WATER DRAINAGE LAYOUT**

Size: A1
 Date: 06.04.18
 Drawn By: AS
 Designed By: AS
 Checked By: AW

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category/Number:	Rev:
FS0316 - CUR - ZZ - 00 - DR - C -			9201				P05



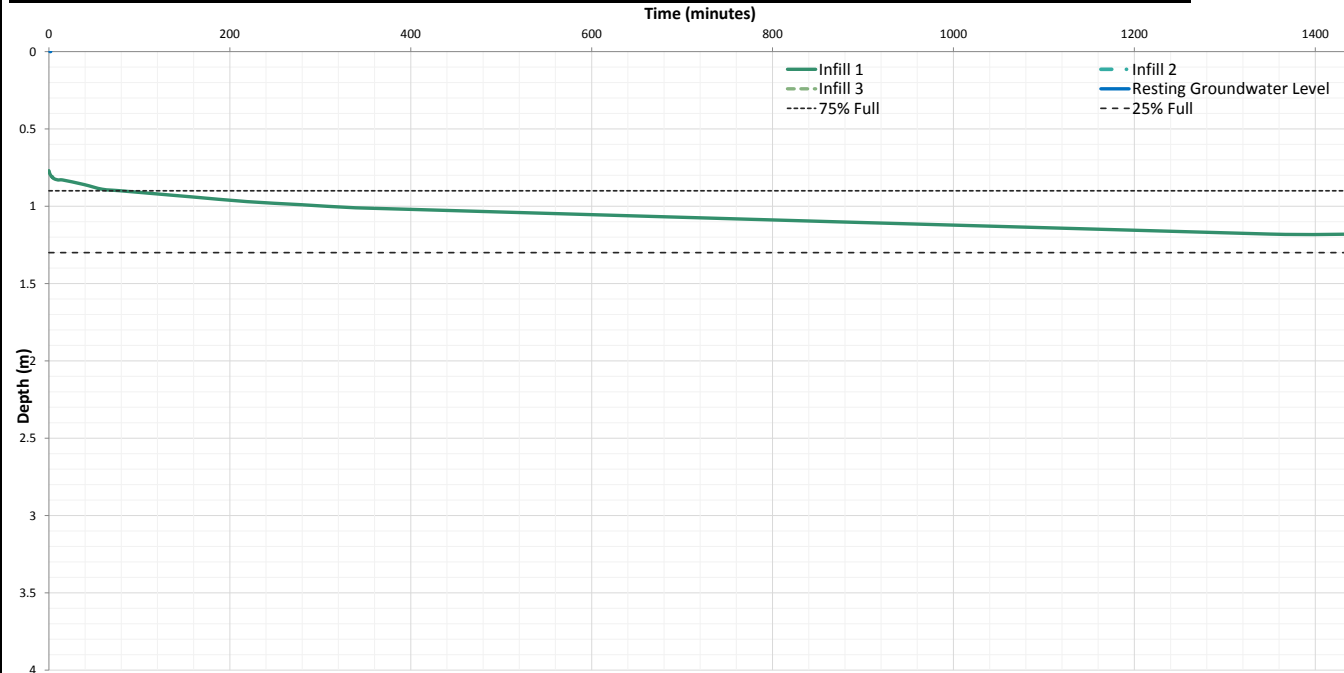
Appendix J Falling Head Infiltration Test Results

	units	Infill 1	Infill 2	Infill 3
Length	m	2.00		
Width	m	0.60		
Depth	m	1.50		
Gravel type		20mm single size		
Voids ratio		0.40		
Resting groundwater level at time of testing	m	Dry		
Depth of first reading	m	0.77	0.00	0.00
Depth of final reading	m	1.18	0.00	0.00
Did soakage test reach 25% of maximum fill depth?		No	No	No
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	0.87	0.00	0.00
Depth at 25% full/effective depth	m	1.08	0.00	0.00
Time at 75% full/effective depth	mins	47.33	#N/A	#N/A
Time at 25% full/effective depth	mins	740.77	#N/A	#N/A
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m ³	0.10	0.00	0.00
Mean surface area for outflow (50% full/effective depth)	m ²	2.27	1.20	1.20
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	693.43	#N/A	#N/A
Soil infiltration rate, f =	m/s	Failed Test	Failed Test	Failed Test
or	m/s	Failed Test	Failed Test	Failed Test

Recommended soil infiltration rate

Failed Test m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.



LOG		BACKFILL	
	DEPTH (m)		DEPTH (m)
Black slightly gravelly sandy SILT	0.0	Arisings	0.0
Black sandy gravelly CLAY	0.3		
Brown sandy CLAY	0.6		
Brown sandy very gravelly CLAY	0.7	Gravel	0.7
	1.5		1.5



TITLE: Soakaway Test Results
Turing House
Bowmer and Kirkland

In accordance with BRE Digest 365 (2016)

DRAWN BY: CB
SCALE: Not to Scale
CHECKED BY: SS
REVISION: 1
DATE: 20/03/2017

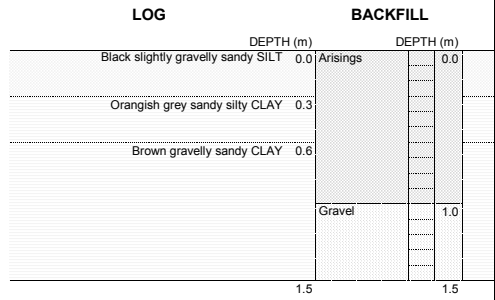
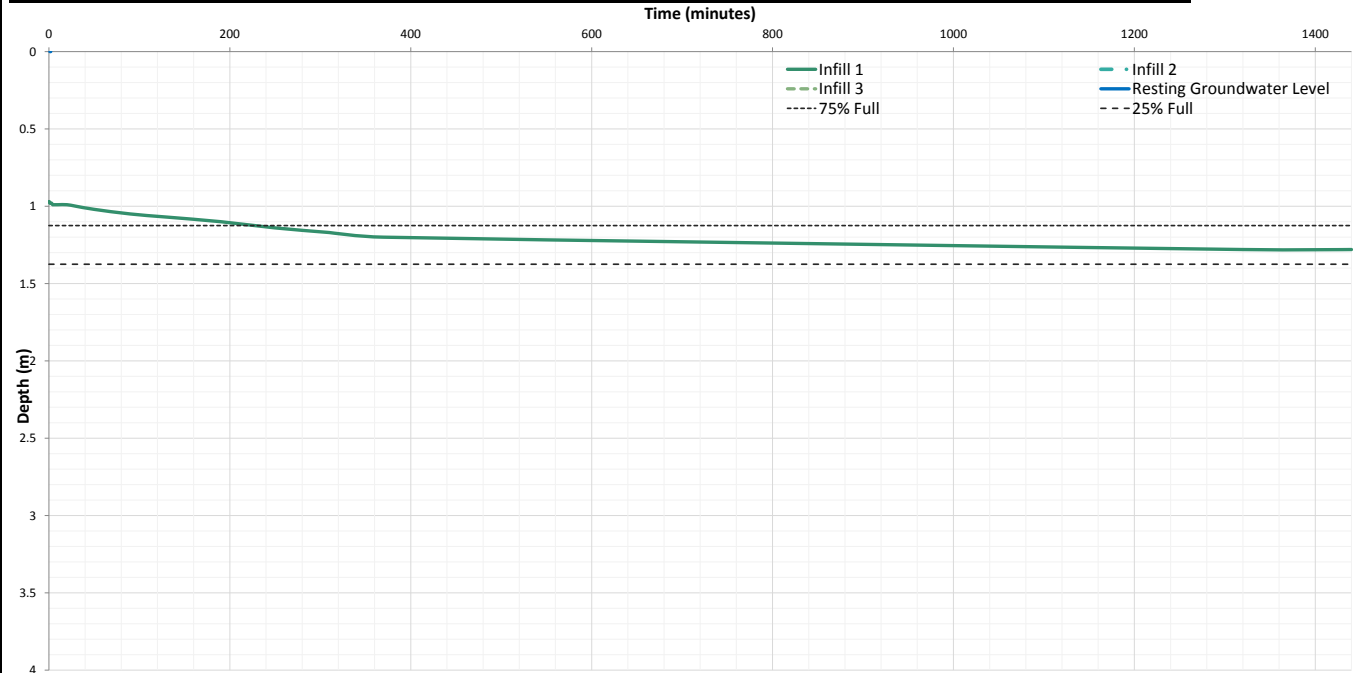
PROJECT NUMBER:
18-0170.01
SOAKAWAY NUMBER:
SA103

	units	Infill 1	Infill 2	Infill 3
Length	m	2.00		
Width	m	0.60		
Depth	m	1.50		
Gravel type		20mm single size		
Voids ratio		0.40		
Resting groundwater level at time of testing	m	Dry		
Depth of first reading	m	0.97	0.00	0.00
Depth of final reading	m	1.28	0.00	0.00
Did soakage test reach 25% of maximum fill depth?		No	No	No
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	1.05	0.00	0.00
Depth at 25% full/effective depth	m	1.20	0.00	0.00
Time at 75% full/effective depth	mins	86.67	#N/A	#N/A
Time at 25% full/effective depth	mins	399.69	#N/A	#N/A
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m ³	0.07	0.00	0.00
Mean surface area for outflow (50% full/effective depth)	m ²	2.01	1.20	1.20
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	313.02	#N/A	#N/A
Soil infiltration rate, f =	m/s	Failed Test	Failed Test	Failed Test
or	m/s	Failed Test	Failed Test	Failed Test

Recommended soil infiltration rate

Failed Test m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.



TITLE: Soakaway Test Results
Turing House
Bowmer and Kirkland

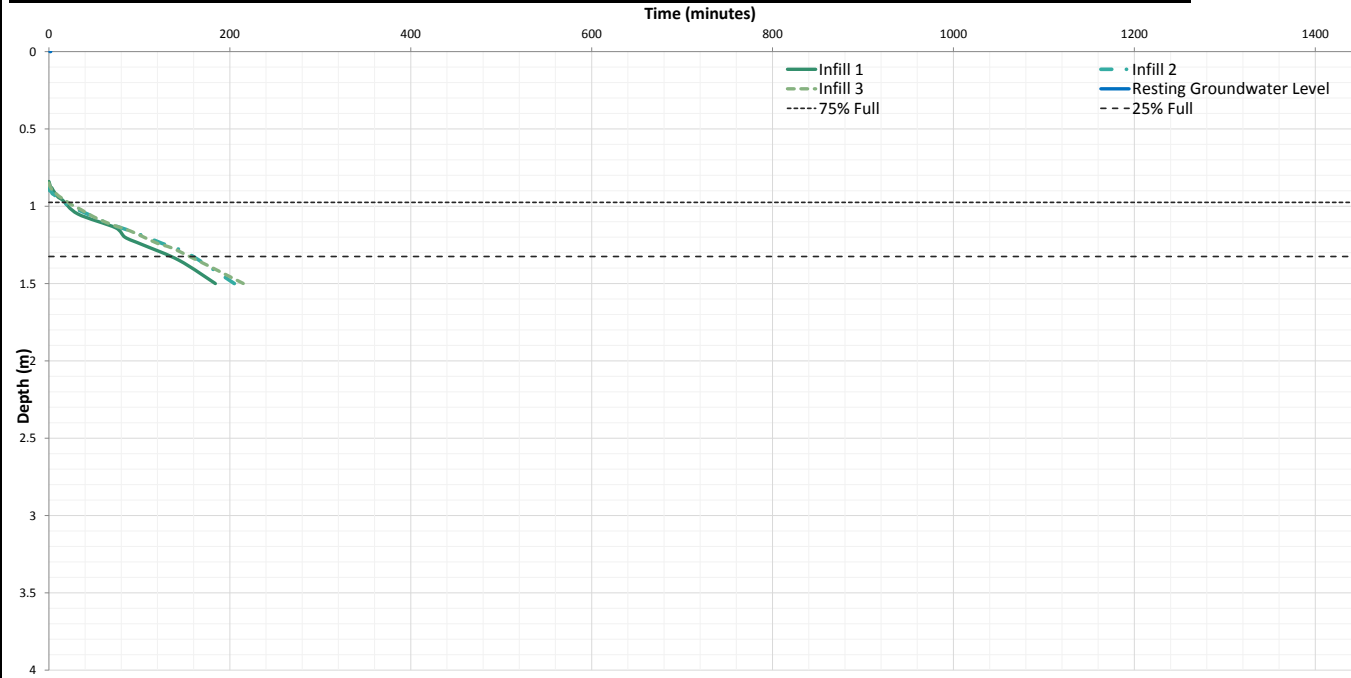
In accordance with BRE Digest 365 (2016)

DRAWN BY: CB	SCALE: Not to Scale	PROJECT NUMBER: 18-0170.01
CHECKED BY: SS	REVISION: 1	SOAKAWAY NUMBER: SA102
DATE: 20/03/2017		

	units	Infill 1	Infill 2	Infill 3
Length	m	2.00		
Width	m	0.60		
Depth	m	1.50		
Gravel type		20mm single size		
Voids ratio		0.40		
Resting groundwater level at time of testing	m	Dry		
Depth of first reading	m	0.84	0.88	0.85
Depth of final reading	m	1.50	1.50	1.50
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		Yes	Yes	Yes
Depth at 75% full/effective depth	m	1.01	1.04	1.01
Depth at 25% full/effective depth	m	1.34	1.35	1.34
Time at 75% full/effective depth	mins	23.50	36.88	32.50
Time at 25% full/effective depth	mins	138.00	164.21	159.60
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m ³	0.16	0.15	0.16
Mean surface area for outflow (50% full/effective depth)	m ²	2.92	2.81	2.89
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	114.50	127.34	127.10
Soil infiltration rate, f =	m/s	0.0000791	0.0000693	0.0000708
or	m/s	7.9E-06	6.9E-06	7.1E-06

Recommended soil infiltration rate	
6.9E-06	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.



LOG		BACKFILL	
	DEPTH (m)		DEPTH (m)
Black slightly gravelly sandy SILT	0.0	Arisings	0.0
Grey sandy sandy gravelly CLAY	0.3		
Orangish grey clayey silty SAND	0.6		
		Gravel	0.8
	1.5		1.5



TITLE: Soakaway Test Results
Turing House
Bowmer and Kirkland

In accordance with BRE Digest 365 (2016)

DRAWN BY: CB	SCALE: Not to Scale	PROJECT NUMBER: 18-0170.01
CHECKED BY: SS	REVISION: 1	SOAKAWAY NUMBER: SA101
DATE: 20/03/2017		

Our Locations

Birmingham

2 The Wharf
Bridge Street
Birmingham
B1 2JS
T. 0121 643 4694
birmingham@curtins.com

Bristol

Quayside
40-58 Hotwell Road
Bristol
BS8 4UQ
T. 0117 302 7560
bristol@curtins.com

Cambridge

50 Cambridge Place
Cambridge
CB2 1NS
T. 01223 631 799
cambridge@curtins.com

Cardiff

3 Cwrt-y-Parc
Earlswood Road
Cardiff
CF14 5GH
T. 029 2068 0900
cardiff@curtins.com

Douglas

Varley House
29-31 Duke Street
Douglas
Isle of Man
IM1 2AZ
T. 01624 624 585
douglas@curtins.com

Dublin

39 Fitzwilliam Square
Dublin 2
Ireland
T. 00353 1 507 9447
dublin@curtins.com

Edinburgh

1a Belford Road
Edinburgh
EH4 3BL
T. 0131 225 2175
edinburgh@curtins.com

Glasgow

Queens House
29 St Vincent Place
Glasgow
G1 2DT
T. 0141 319 8777
glasgow@curtins.com

Kendal

28 Lowther Street
Kendal
Cumbria
LA9 4DH
T. 01539 724 823
kendal@curtins.com

Leeds

Rose Wharf
Ground Floor
Leeds
L29 8EE
T. 0113 274 8509
leeds@curtins.com

Liverpool

Curtin House
Columbus Quay
Riverside Drive
Liverpool
L3 4DB
T. 0151 726 2000
liverpool@curtins.com

London

40 Compton Street
London
EC1V 0BD
T. 020 7324 2240
london@curtins.com

Manchester

Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG
T. 0161 236 2394
manchester@curtins.com

Nottingham

56 The Ropewalk
Nottingham
NG1 5DW
T. 0115 941 5551
nottingham@curtins.com