

**BANNERS GATE**  
CIVIL, STRUCTURAL AND  
TRANSPORTATION ENGINEERS

CALA Homes (Chiltern) Limited

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# **Land at Cotefield Farm, Bodicote**

## **Flood Risk Assessment**

May 2017

Prepared for:



## Revision Schedule

### Land at Cotefield Farm, Bodicote – Flood Risk Assessment 15031 FRA-v1

Rev	Date	Details	Prepared by	Reviewed by	Approved by
00	08/12/2016	Draft	<b>Scott Marshall</b> BSc (Hons), MCIWEM	<b>John Byrne</b> Director	<b>Steve Foxall</b> Managing Director
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# 1 INTRODUCTION & BRIEF

## 1.1 Background Information

- 1.1.1 Banners Gate Limited was commissioned by CALA Homes (Chiltern) Limited in September 2016 to prepare a Flood Risk Assessment to support an application for amendments to Cherwell District Council planning permission reference 11/00617/OUT.
- 1.1.2 An 'RPS Planning and Development Limited' Flood Risk Assessment, reference BES0415, dated April 2010 accompanied the Outline Planning Application.
- 1.1.3 A 'Fairhurst' Addendum to the RPS Flood Risk Assessment, reference 99538/R1.1, dated October 2013 was subsequently submitted in support of a Discharge of Conditions application.
- 1.1.4 Revision 01 of this Report provided an assessment of an alternative surface water drainage strategy and took changes in legislation and published guidance since the preparation of the previous Flood Risk Assessments into consideration.
- 1.1.5 This Revision 02 proposes a revised surface water drainage strategy following indications from the Local Planning Authority that the strategy outlined within the Revision 01 Report was unlikely to be granted planning permission for non-drainage related reasons.

## 1.2 Study Objectives and Methodology

- 1.2.1 The objectives of this Report are as follows:
- Determine likely sources of flooding,
  - Assess the proposals in the context of the National Planning Policy Framework,
  - Propose an appropriate drainage strategy, and
  - Determine appropriate mitigation and / or protection measures.
- 1.2.2 The methodology followed in the preparation of this report included the following:
- Consideration of previous Flood Risk Assessments,
  - Investigation of the flood risk within and external to the Site,
  - Consideration of the pre-development and post-development storm water run-off and identification of a means of storm water disposal, and
  - Consideration of storm events up to and including the 100 year return period storm, including climate change, and calculation of the required volume of attenuation storage, where applicable.
- 1.2.3 This Report deals with environmental issues as they are impacted by flooding, other impacts on the environment are not considered.

## 1.3 Policy Background

- 1.3.1 With the publication of the 'National Planning Policy Framework' (NPPF) in March 2012 a site-specific Flood Risk Assessment became a requirement for:
- Proposals of 1 hectare or greater in Flood Zone 1,
  - All proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the Local Planning Authority by the Environment Agency),

- Where proposed development, or a change of use to a more vulnerable class, may be subject to other sources of flooding.
- 1.3.2 The site-specific Flood Risk Assessment should demonstrate how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.
- 1.3.3 The Department for Communities & Local Government publishes online Planning Practice Guidance to the NPPF, which is regularly updated, to provide additional guidance to ensure the effective implementation of the planning policy as set out in the NPPF.

## 1.4 Climate Change

- 1.4.1 The Environment Agency updated its climate change allowances in February 2016. The following Table shows current anticipated changes in extreme rainfall intensity in small and urban catchments.

**Table 1.4:** Peak rainfall intensity allowance in small and urban catchments

Applies across all of England	Total potential change anticipated		
	2010 to 2039	2040 to 2059	2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

- 1.4.2 For Flood Risk Assessments, and Strategic Flood Risk Assessments, both the Central and Upper end allowances are to be considered so that the range of the impact can be assessed.
- 1.4.3 The design horizon of the proposed development is beyond 2060 and therefore peak rainfall intensity has, where applicable, been increased by 20% and 40%.

## 1.5 Background to Report

- 1.5.1 The Report has been prepared using the following documents for guidance:
- The NPPF and Planning Practice Guidance,
  - Environment Agency/DEFRA Flood Risk Assessment Standing Advice,
  - Environment Agency/DEFRA Rainfall runoff for management for developments - Report-SC030219,
  - DEFRA non-statutory Technical Standards for Sustainable Drainage Systems,
  - CIRIA Report C624 – Development and Flood Risk – Guidance for the Construction Industry,
  - CIRIA Report C753 – The SUDS manual,
  - Cherwell and West Oxfordshire Level 1 Strategic Flood Risk Assessment, Scott Wilson, dated April 2009.
  - RPS Planning and Development Limited Flood Risk Assessment, reference BES0415, dated April 2010.
  - Fairhurst Addendum to RPS Flood Risk Assessment, reference 99538/R1.1, dated October 2013.

## 1.6 Strategic Flood Risk Assessment

- 1.6.1 The Strategic Flood Risk Assessment (SFRA) Final Report dated April 2009, prepared by Scott Wilson, was commissioned by Cherwell District Council, West Oxfordshire District

Council and Oxfordshire County Council to assess and map the different levels and types of flood risk in the study area for the land use planning process.

- 1.6.2 The following extracts from the SFRA are relevant:
- 1.6.3 *The predominant risk of flooding within the Cherwell and West Oxfordshire Districts is due to flooding from rivers and watercourses.*
- 1.6.4 *Flooding from the land caused by overland flow or as a result of sudden intense downpours has led to wide scale flooding of varying degrees across both Cherwell and West Oxfordshire.*
- 1.6.5 *Groundwater flooding is more likely to occur to settlements located at the base of hilly outcrops or where embankments have been formed. The following areas in Cherwell are at a greater risk of ground water flooding: The base of Crouch Hill in Banbury, Upper Heyford, Kidington, Bodicote, Hook Norton, Steeple Aston and Mollington.*
- 1.6.6 *There have been numerous historical flood events in the Cherwell study area. The most severe flood event recorded in Cherwell District, along the River Cherwell Corridor, in terms of danger to life and property occurred in April 1998 when flood levels reached what were at the time considered to have return period of greater than 1 in 100 years.*
- 1.6.7 *All new development should have flood risk management factored in at the planning stage to include the rigorous application of PPS25 with the use of Sustainable Flood Management measures encouraged where possible.*
- 1.6.8 *Development should be directed to Flood Zone 1 wherever possible.*
- 1.6.9 *All sources of flooding must be considered when looking to locate new development. Other sources of flooding that require consideration when site new development allocations include:*
- *Flooding from the Land – Surface Water;*
  - *Flooding from Groundwater;*
  - *Flooding from Sewers and Drains, and*
  - *Flooding from Manmade or Artificial Sources.*
- 1.6.10 *Wherever possible, SuDS techniques should seek to contribute to each of the three goals identified below, with the preferred system contributing significantly to each objective. SuDS solutions for specific sites should seek to:*
- *Reduce flood risk (to the site and neighbouring areas);*
  - *Reduce pollution, and*
  - *Provide landscape and wildlife benefits.*
- 1.6.11 *In the following situations a Flood Risk Assessment should always be provided with a planning application:*
- *Development sites located in Flood Zone 2 or 3;*
  - *Proposed development that is classified as a major development and located in Flood Zone 1. These are residential developments consisting of sites greater than 0.5 ha or greater than 10 dwellings and commercial developments that are greater than 1 ha or have a floor area greater than 1000 m<sup>2</sup>. Since the risk of fluvial flooding is minimal such FRAs should focus on the management of surface water;*

## 1.7 RPS Flood Risk Assessment

- 1.7.1 The RPS Flood Risk Assessment concluded that the Greenfield Site is located entirely within Flood Zone 1, Low Probability, and is not considered to be at risk of fluvial flooding.
- 1.7.2 Groundwater was detected within one of five Trial Pits, at 1.7m below ground level, and further investigation was recommended to determine the nature of the groundwater encountered to establish if localised groundwater flooding could be an issue; it was noted however that due to the gradient of the Site this was unlikely.
- 1.7.3 Greenfield equivalent runoff rates were calculated for a range of return period storms using the methodology outlined within IoH124 in order to estimate a conservative attenuation storage estimate to demonstrate that adequate storage could be provided without difficulty. It was noted that the ADAS 345 methodology may be more suited to determining Greenfield runoff rates, as gradients are taken into consideration, and advises further work will be carried out during the detailed design stage.
- 1.7.4 The results of infiltration testing suggested that the higher parts of the Site could utilise infiltration techniques but the lower part of the were not suitable for discharging surface water to ground owing to the lower infiltration rates observed and the presence of groundwater.
- 1.7.5 The drainage strategy outlined within the Assessment described a preference for infiltration, wherever possible, and a discharge to an existing reservoir to the west of the Site, on land owned by the client, with a controlled discharge into the Sor Brook.

## 1.8 Fairhurst Addendum Flood Risk Assessment

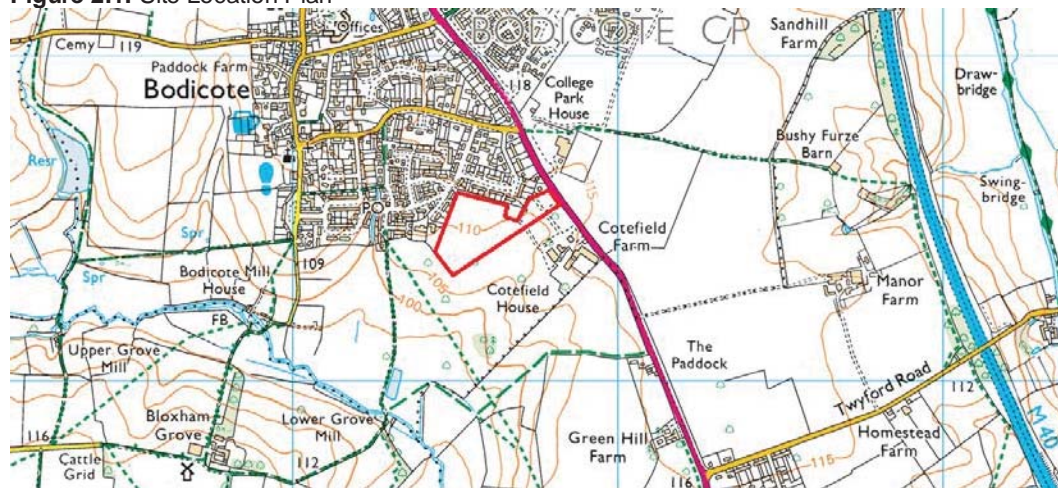
- 1.8.1 The Addendum to the RPS Flood Risk Assessment described a revised surface water drainage strategy, with increased Greenfield equivalent runoff rates calculated using the ADAS 345 methodology and an outfall into the Sor Brook, bypassing the existing reservoir, as Thames Water Utilities Limited had advised that the sewerage would not be adoptable, under a Water industry Act Section 104 Agreement, if the drainage was routed through the private reservoir.
- 1.8.2 It was proposed that the majority of the required attenuation storage would be provided within below ground attenuation tanks.

## 2 EXISTING CONDITIONS

### 2.1 Site Location

- 2.1.1 The Site is located to the southeast of the village of Bodicote in Oxfordshire, at approximate National Grid Reference 446579,237477 and post code OX15 4BD. The Site is shown outlined in red in Figure 2.1 below.

**Figure 2.1: Site Location Plan**



### 2.2 Site Description

- 2.2.1 The Greenfield Site has a total area of approximately 3.7 hectares.
- 2.2.2 The Site is bounded to the north by residential dwellings, to the east by Cotefield Farm buildings and beyond by Oxford Road and Banbury Rugby Club, and to the west and south by agricultural land.
- 2.2.3 The Site generally falls from north to south from approximately 116mAOD to 112mAOD. Topographical levels are shown on the drawings presented in Appendix II.

### 2.3 Local Watercourses

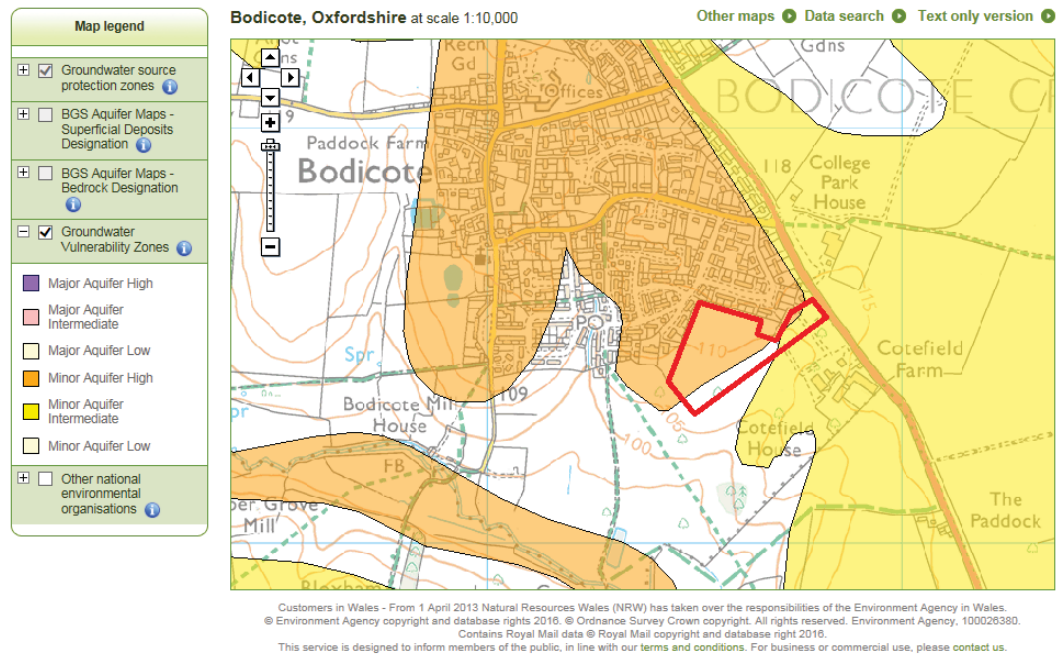
- 2.3.1 The nearest open watercourse is the Sor Brook which is located approximately 500m to the southwest of the Site.
- 2.3.2 A man made reservoir, which receives surface water from the Banbury Rugby Club, is located approximately 385m to the southwest of the Site.

### 2.4 Underlying Geology

- 2.4.1 The 1:50,000 British Geological Survey maps have been analysed to establish the underlying geology of the area and show the Site to be underlain by the Marlstone Rock Formation – Ferruginous Limestone and Ironstone.
- 2.4.2 The 1:10,000 Environment Agency Groundwater Vulnerability Zone map for the area, shown in Figure 2.4 below, shows the Site is partially underlain by a Secondary Aquifer.



**Figure 2.4:** Environment Agency Groundwater Vulnerability Map



## 2.5 Groundwater

- 2.5.1 An additional Site Investigation was undertaken within the Site by 'The Brownfield Consultancy' in June/July 2016 with eleven trial pits excavated. It was reported that the material encountered were consistent with that of the previous investigation.
- 2.5.2 Groundwater was encountered within one trial pit, located towards the eastern boundary of the Site, at a depth of 3.5m below ground level.
- 2.5.3 The Site is not located within a Groundwater Source Protection Zone.

## 2.6 Existing Drainage

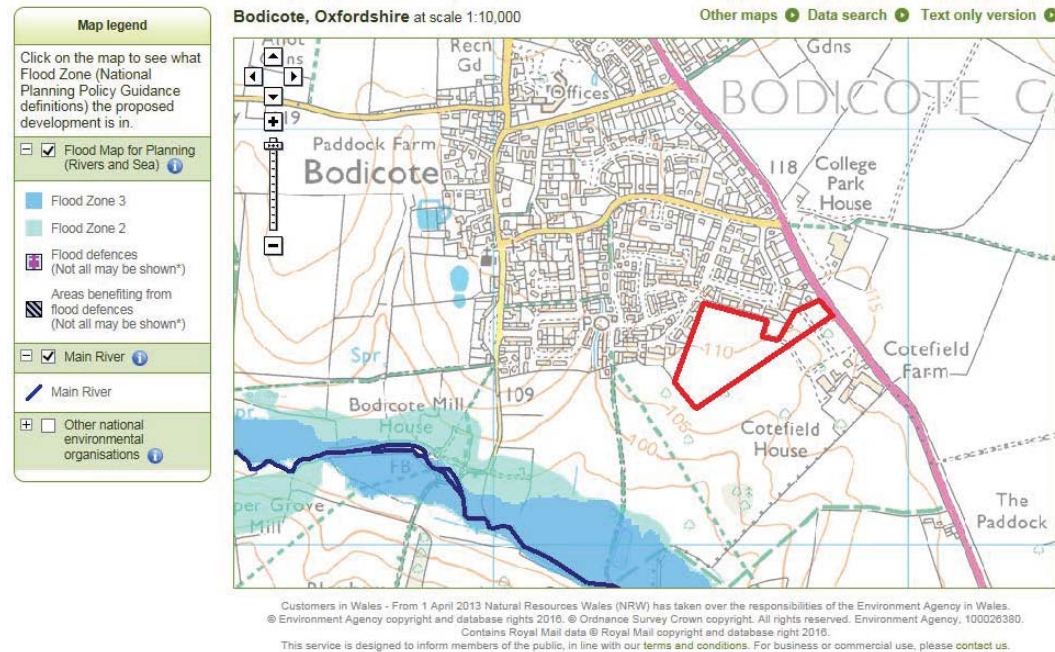
- 2.6.1 The Site is not served by any positive drainage systems.

## 3 ASSESSMENT OF FLOOD RISK

### 3.1 Fluvial Flooding

3.1.1 The Environment Agency’s Flood Zone Map for the Site is shown in Figure 3.1 below. The map shows that the Site is situated entirely within Flood Zone 1 – Low Probability.

**Figure 3.1:** Environment Agency Flood Zone Map



3.1.2 The definitions of each flood zone are as follows:

**Table 3.1:** Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	<b>This zone comprises land where water has to flow or be stored in times of flood.</b> (Not separately distinguished from Zone 3a on the Flood Map.)

### 3.2 Groundwater Flooding

3.2.1 Based upon the additional Site Investigation undertaken by 'The Brownfield Consultancy' the Site is not considered to be at risk of groundwater flooding.

### 3.3 Urban Drainage Flooding

3.3.1 The Site is considered to be at very low risk of flooding from existing drainage systems.

### 3.4 Reservoir Flooding

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

## 3.5 Pluvial Flooding

- 3.5.1 The Environment Agency's 'Risk of Flooding from Surface Water' Map is shown in Figure 3.5 below. The Site is considered to be at a 'Very Low' risk of flooding from Surface Water.

**Figure 3.5:** Environment Agency Risk of Flooding from Surface Water Map



- 3.5.2 It should be noted that the Surface Water Flood Map has been created from the Environment Agency's nationally produced surface water flood mapping and, where appropriate, locally produced mapping from Lead Local Flood Authorities.
- 3.5.3 Due to the modelling techniques used the surface water mapping identifies depressions in the ground surface.

## 3.6 Potential Sources of Flooding

- 3.6.1 The most likely potential source of flooding to the Site is from the surface water runoff generated by the development; this is considered in more detail in Section 5.

## 3.7 Sequential Test

- 3.7.1 The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The aim is to steer new development to Flood Zone 1.
- 3.7.2 The Site is considered to be entirely within Flood Zone 1 and therefore the Site is considered to have passed the Sequential Test.

## 3.8 Exception Test

- 3.8.1 The Exception Test does not need to be applied for the proposed development.

## 4 THE DEVELOPMENT PROPOSALS

### 4.1 Proposed Layout

4.1.1 The Site will provide 86 dwellings as depicted on the Proposed Layout Drawing presented in Appendix II.

### 4.2 Proposed Levels

4.2.1 Proposed ground levels will closely resemble existing levels to minimise the import and export of materials as far as reasonably possible.

### 4.3 Area Take-off

4.3.1 The Site is Greenfield. Table 4.3 summarises the preliminary area take-off for the existing and proposed Sites.

**Table 4.3:** Area Take-Off.

Category	Area Take-off	
	Existing (ha)	Site (ha)
Impermeable Area (Draining to Watercourse)	0.00	1.22
Permeable Area	3.70	2.48
Site Area	3.70	3.70

4.3.2 The above area take-off is based on the Banners Gate Drainage Strategy plan presented in Appendix II.

## 5 SURFACE WATER DRAINAGE

### 5.1 Introduction

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

5.1.2 The drainage calculations attached to this Assessment including calculations of discharge rate, attenuation storage and the proposed methods of providing attenuation are for assessing the level of risk and general feasibility and are therefore indicative only.

### 5.2 Greenfield Rates of Runoff

5.2.1 Different methodologies have been used within the previously completed Flood Risk Assessments to calculate the Greenfield runoff rates.

5.2.2 Following the publication of CIRIA Report C753 'The SuDS Manual' in 2015, which includes a table of acceptable runoff estimation methods, the methodology used within this Assessment is based on the newer ReFH2 method. The estimated Greenfield equivalent rates are summarised in the following table; calculations presented in Appendix I.

**Table 5.2:** Greenfield equivalent Runoff Rates – ReFH2 Method

Return Period (years)	Greenfield Rate of Runoff (l/s)
1	4.7
2	5.1
30	11.1
100	15.2

5.2.3 For the purposes of this Assessment, to provide a conservative drainage solution, it is recommended that storm events up to and including the 1 in 100 year, plus climate change, return period are restricted to the 2 year Greenfield rate.

### 5.3 Disposal Options

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

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

5.3.2 Based upon the previously completed investigations the use of infiltration techniques is considered a viable drainage solution for part of the Site.

5.3.3 For the areas where the use of infiltration techniques are not considered appropriate a restricted discharge to the Sor Brook is proposed.

## 5.4 Attenuation Storage Estimate

- 5.4.1 It will be necessary to provide on-site surface water attenuation storage solution to contain and control surface water runoff from storm events up to and including the 1 in 100 year, including an allowance for climate change, return period.
- 5.4.2 The calculated volumes of storage required are summarised in Table 5.4, calculations presented in Appendix I.

**Table 5.4:** Attenuation Storage Estimate

Return Period (years)	Climate change allowance	Attenuation Storage Estimate (m <sup>3</sup> )
100	20%	717
	40%	870

## 5.5 Sustainable Drainage Systems (SuDS)

- 5.5.1 In accordance with national and local guidance it is a requirement for any new development to include sustainable surface water drainage systems as a technique to manage surface water regimes sustainably.
- 5.5.2 The Environment Agency has published “A Practical Guide” to assist in the design of SuDS. The guide lists various SuDS techniques which are described as varying from the most to the least sustainable. It is worth noting that all of the techniques shown offer the benefit of flood reduction. The techniques offering benefits of Pollution Reduction and Wildlife Benefit determine those described as “Most Sustainable.”

**Table 5.5:** SuDS Techniques

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

- 5.5.3 Infiltration techniques will be used where appropriate in the form of soakaways and pervious paving.

- 5.5.4 The Revision 01 Report proposed an attenuation pond on land adjacent to the Site. However, it is understood that the Local Planning Authority were concerned with the visual impact of this proposal and planning permission was therefore unlikely to be granted. Consequently, the proposed drainage strategy is to revert to the previously consented scheme<sup>1</sup> which incorporated on-site below ground storage structures.
- 5.5.5 It is proposed that oversized pipes and cellular storage crates are incorporated into the development proposals to provide attenuation storage for storm events up to and including the 1 in 100 year, plus climate change, return period as depicted on the Drainage drawings presented in Appendix II.

## 5.6 Water Quality

5.6.1 In accordance with Table 26.2 of CIRIA Report C753 'The SuDS Manual' the pollution hazard level for the proposed residential development is 'Low' and therefore a simple index approach has been applied to ensure minimum water quality requirements are achieved.

5.6.2 The pollution hazard indices for the proposed development are summarised in Table 5.6.1.

Land Use	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential	0.5	0.4	0.4

**Table 5.6.1:** Pollution Hazard Indices (CIRIA Report C753 Table 26.2)

5.6.3 The indicative SuDS mitigation indices for discharges to surface waters and groundwater for pervious paving are summarised in Table 5.6.2.

Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Pervious Paving	0.7	0.6	0.7

**Table 5.6.2:** Indicative SuDS mitigation Indices for discharges to surface waters and groundwater (CIRIA Report C753 Tables 26.3 and 26.4)

5.6.4 As the proposed mitigation indices exceed the land use pollution hazard the proposed SuDS components are considered sufficient in providing pollution risk mitigation.

## 5.7 Surface Water Exceedance Flow Routes

5.7.1 In the event of a drainage network failure or the system being overwhelmed during extreme events flood water will generally be routed along the estate roads towards the south-western corner of the Site.

## 5.8 SuDS Management

5.8.1 The ownership and responsibility of the proposed cellular storage will be transferred on completion to a Management Company who will provide long-term management and maintenance for an annual management charge.

<sup>1</sup> Cherwell District Council Application No: 13/00357/DISC dated 18<sup>th</sup> March 2014

## 6 CONCLUSIONS

- 6.1 This Flood Risk Assessment has been prepared in support of amendments to a proposed residential development on land at Cotefield Field Farm which is located to the southeast of the village of Bodicote in Oxfordshire.
- 6.2 The Greenfield Site is characterised as Flood Zone 1 'Low Probability' and is considered to be at a low risk of flooding from all sources.
- 6.3 The use of infiltration techniques, as a method to dispose of surface water runoff, is considered viable for parts of the Site.
- 6.4 For areas where the use of infiltration techniques are not considered appropriate a restricted discharge to the Sor Brook is proposed.
- 6.5 It is proposed that oversized pipes and cellular storage are provided for surface water attenuation purposes in accordance with a previously consented strategy.
- 6.6 The proposed drainage scheme will comply with current guidance and promote the use of sustainable drainage systems as far as is reasonably possible.
- 6.7 The proposed development will not impede flood flow, will not result in a net loss of floodplain and will not have an adverse impact on flood risk within or external to the Site.

## 7 RECOMMENDATIONS

- 7.1 Based on the work carried out in the preparation of this report the following recommendations are made:
- 7.2 Infiltration testing, in full accordance with BRE Digest 365, should be undertaken at various locations throughout the Site to inform the detailed design stage.



# APPENDIX I – CALCULATIONS

# UK Design Flood Estimation

Generated on Friday, December 09, 2016 10:13:44 AM by Scott  
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

## Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

### Site details

Checksum: A446-8834

Site name: 15031\_FEH

Easting: 446250

Northing: 237450

Country: England, Wales or Northern Ireland

Catchment Area (km<sup>2</sup>): 0.01 [0.55]\*

Using plot scale calculations: Yes

Site description: None

## Model run: 1 year

### Summary of results

Rainfall - FEH 1999 (mm):	17.81	Total runoff (ML):	0.06
Total Rainfall (mm):	11.32	Total flow (ML):	0.12
Peak Rainfall (mm):	3.82	Peak flow (m <sup>3</sup> /s):	0.00

### Parameters

*Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.*

*\* Indicates that the user locked the duration/timestep*

#### Rainfall parameters (Rainfall - FEH 1999 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	n/a

#### Loss model parameters

Name	Value	User-defined?
Cini (mm)	138.12	No
Cmax (mm)	349.45	No
Use alpha correction factor	Yes	No
Alpha correction factor	1	No

#### Routing model parameters

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
Tp (hr)	2.13 [1]	Yes
Up	0.65	No
Uk	0.8	No

**Baseflow model parameters**

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
BFO (m <sup>3</sup> /s)	0	No
BL (hr)	36.6 [27.87]	Yes
BR	1.02	No

**Urbanisation parameters**

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
Urban area (km <sup>2</sup> )	0 [0.01]	Yes
Urbext 2000	0 [0.28]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km <sup>2</sup> )	0.00	Yes
Sewer capacity (m <sup>3</sup> /s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
00:00:00	0.4601	0.0000	0.1821	0.0000	0.000584	0.000584
00:30:00	1.0298	0.0000	0.4099	0.0000	0.000576	0.000599
01:00:00	2.2579	0.0000	0.9093	0.0001	0.00057	0.00069
01:30:00	3.8242	0.0000	1.5734	0.0004	0.000565	0.000948
02:00:00	2.2579	0.0000	0.9486	0.0010	0.000567	0.00153
02:30:00	1.0298	0.0000	0.4375	0.0018	0.000579	0.00241
03:00:00	0.4601	0.0000	0.1964	0.0028	0.000603	0.00338
03:30:00	0.0000	0.0000	0.0000	0.0036	0.000639	0.00423
04:00:00	0.0000	0.0000	0.0000	0.0040	0.000683	0.00468
04:30:00	0.0000	0.0000	0.0000	0.0039	0.000729	0.00459
05:00:00	0.0000	0.0000	0.0000	0.0034	0.000769	0.00418
05:30:00	0.0000	0.0000	0.0000	0.0028	0.000802	0.00364
06:00:00	0.0000	0.0000	0.0000	0.0023	0.000827	0.00312
06:30:00	0.0000	0.0000	0.0000	0.0018	0.000844	0.00269
07:00:00	0.0000	0.0000	0.0000	0.0015	0.000856	0.00234
07:30:00	0.0000	0.0000	0.0000	0.0012	0.000863	0.00203
08:00:00	0.0000	0.0000	0.0000	0.0009	0.000865	0.00173
08:30:00	0.0000	0.0000	0.0000	0.0006	0.000864	0.00144
09:00:00	0.0000	0.0000	0.0000	0.0003	0.000858	0.00118
09:30:00	0.0000	0.0000	0.0000	0.0001	0.00085	0.00099
10:00:00	0.0000	0.0000	0.0000	0.0000	0.000839	0.000888
10:30:00	0.0000	0.0000	0.0000	0.0000	0.000828	0.00084
11:00:00	0.0000	0.0000	0.0000	0.0000	0.000817	0.000818
11:30:00	0.0000	0.0000	0.0000	0.0000	0.000806	0.000806
12:00:00	0.0000	0.0000	0.0000	0.0000	0.000795	0.000795
12:30:00	0.0000	0.0000	0.0000	0.0000	0.000785	0.000785
13:00:00	0.0000	0.0000	0.0000	0.0000	0.000774	0.000774
13:30:00	0.0000	0.0000	0.0000	0.0000	0.000763	0.000763
14:00:00	0.0000	0.0000	0.0000	0.0000	0.000753	0.000753
14:30:00	0.0000	0.0000	0.0000	0.0000	0.000743	0.000743
15:00:00	0.0000	0.0000	0.0000	0.0000	0.000733	0.000733
15:30:00	0.0000	0.0000	0.0000	0.0000	0.000723	0.000723
16:00:00	0.0000	0.0000	0.0000	0.0000	0.000713	0.000713
16:30:00	0.0000	0.0000	0.0000	0.0000	0.000703	0.000703
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000694	0.000694

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.000684	0.000684
18:00:00	0.0000	0.0000	0.0000	0.0000	0.000675	0.000675
18:30:00	0.0000	0.0000	0.0000	0.0000	0.000666	0.000666
19:00:00	0.0000	0.0000	0.0000	0.0000	0.000657	0.000657
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000648	0.000648
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000639	0.000639
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00063	0.00063
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000622	0.000622
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000613	0.000613
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000605	0.000605
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000597	0.000597
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000589	0.000589

## Appendix

### Catchment descriptors \*

Name	Value	User-defined value used?
Area (km <sup>2</sup> )	0.01 [0.55]	Yes
ALTBAR	118	No
ASPBAR	180	No
ASPVAR	0.74	No
BFIHOST	0.44 [0.83]	Yes
DPLBAR (km)	0.71	No
DPSBAR (mkm <sup>-1</sup> )	18.1	No
FARL	1	No
LDP	1.44	No
PROPWET (mm)	0.32	No
RMED1H	10.5	No
RMED1D	32.1	No
RMED2D	39.9	No
SAAR (mm)	644	No
SAAR4170 (mm)	683	No
SPRHOST	16.86	No
Urbext2000	0 [0.28]	Yes
Urbext1990	0.31	No
URBCONC	0.89	No
URBLOC	0.78	No
Urban Area (km <sup>2</sup> )	0 [0.01]	Yes
DDF parameter C	-0.02	No
DDF parameter D1	0.31	No
DDF parameter D2	0.32	No
DDF parameter D3	0.25	No
DDF parameter E	0.3	No
DDF parameter F	2.49	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.31	No
DDF parameter D2 (1km grid value)	0.32	No
DDF parameter D3 (1km grid value)	0.25	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.5	No

*Values in square brackets are the original values loaded from the  Web  Service or  -*

# UK Design Flood Estimation

Generated on Friday, December 09, 2016 10:14:01 AM by Scott  
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

## Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

### Site details

Checksum: A446-8834

Site name: 15031\_FEH

Easting: 446250

Northing: 237450

Country: England, Wales or Northern Ireland

Catchment Area (km<sup>2</sup>): 0.01 [0.55]\*

Using plot scale calculations: Yes

Site description: None

## Model run: 2 year

### Summary of results

Rainfall - FEH 1999 (mm):	19.67	Total runoff (ML):	0.06
Total Rainfall (mm):	12.50	Total flow (ML):	0.13
Peak Rainfall (mm):	4.22	Peak flow (m <sup>3</sup> /s):	0.01

### Parameters

*Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.*

*\* Indicates that the user locked the duration/timestep*

#### Rainfall parameters (Rainfall - FEH 1999 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	n/a

#### Loss model parameters

Name	Value	User-defined?
Cini (mm)	138.12	No
Cmax (mm)	349.45	No
Use alpha correction factor	Yes	No
Alpha correction factor	1	No

#### Routing model parameters

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
Tp (hr)	2.13 [1]	Yes
Up	0.65	No
Uk	0.8	No

**Baseflow model parameters**

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
BFO (m <sup>3</sup> /s)	0	No
BL (hr)	36.6 [27.87]	Yes
BR	1.02	No

**Urbanisation parameters**

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
Urban area (km <sup>2</sup> )	0 [0.01]	Yes
Urbext 2000	0 [0.28]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km <sup>2</sup> )	0.00	Yes
Sewer capacity (m <sup>3</sup> /s)	0.00	Yes



Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
00:00:00	0.5080	0.0000	0.2012	0.0000	0.000584	0.000584
00:30:00	1.1370	0.0000	0.4529	0.0000	0.000576	0.000602
01:00:00	2.4931	0.0000	1.0060	0.0001	0.00057	0.000702
01:30:00	4.2225	0.0000	1.7445	0.0004	0.000566	0.000989
02:00:00	2.4931	0.0000	1.0539	0.0011	0.000568	0.00163
02:30:00	1.1370	0.0000	0.4866	0.0020	0.000582	0.00261
03:00:00	0.5080	0.0000	0.2186	0.0031	0.00061	0.00369
03:30:00	0.0000	0.0000	0.0000	0.0040	0.000651	0.00463
04:00:00	0.0000	0.0000	0.0000	0.0044	0.0007	0.00514
04:30:00	0.0000	0.0000	0.0000	0.0043	0.000751	0.00504
05:00:00	0.0000	0.0000	0.0000	0.0038	0.000797	0.00458
05:30:00	0.0000	0.0000	0.0000	0.0032	0.000835	0.00399
06:00:00	0.0000	0.0000	0.0000	0.0025	0.000863	0.0034
06:30:00	0.0000	0.0000	0.0000	0.0021	0.000883	0.00293
07:00:00	0.0000	0.0000	0.0000	0.0016	0.000897	0.00255
07:30:00	0.0000	0.0000	0.0000	0.0013	0.000905	0.0022
08:00:00	0.0000	0.0000	0.0000	0.0010	0.000908	0.00186
08:30:00	0.0000	0.0000	0.0000	0.0006	0.000907	0.00155
09:00:00	0.0000	0.0000	0.0000	0.0004	0.000902	0.00126
09:30:00	0.0000	0.0000	0.0000	0.0002	0.000893	0.00105
10:00:00	0.0000	0.0000	0.0000	0.0001	0.000882	0.000936
10:30:00	0.0000	0.0000	0.0000	0.0000	0.000871	0.000884
11:00:00	0.0000	0.0000	0.0000	0.0000	0.000859	0.00086
11:30:00	0.0000	0.0000	0.0000	0.0000	0.000848	0.000848
12:00:00	0.0000	0.0000	0.0000	0.0000	0.000836	0.000836
12:30:00	0.0000	0.0000	0.0000	0.0000	0.000825	0.000825
13:00:00	0.0000	0.0000	0.0000	0.0000	0.000813	0.000813
13:30:00	0.0000	0.0000	0.0000	0.0000	0.000802	0.000802
14:00:00	0.0000	0.0000	0.0000	0.0000	0.000792	0.000792
14:30:00	0.0000	0.0000	0.0000	0.0000	0.000781	0.000781
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00077	0.00077
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00076	0.00076
16:00:00	0.0000	0.0000	0.0000	0.0000	0.000749	0.000749
16:30:00	0.0000	0.0000	0.0000	0.0000	0.000739	0.000739
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000729	0.000729

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.000719	0.000719
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00071	0.00071
18:30:00	0.0000	0.0000	0.0000	0.0000	0.0007	0.0007
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00069	0.00069
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000681	0.000681
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000672	0.000672
20:30:00	0.0000	0.0000	0.0000	0.0000	0.000663	0.000663
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000654	0.000654
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000645	0.000645
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000636	0.000636
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000627	0.000627
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000619	0.000619
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000611	0.000611
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000602	0.000602
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000594	0.000594

## Appendix

### Catchment descriptors \*

Name	Value	User-defined value used?
Area (km <sup>2</sup> )	0.01 [0.55]	Yes
ALTBAR	118	No
ASPBAR	180	No
ASPVAR	0.74	No
BFIHOST	0.44 [0.83]	Yes
DPLBAR (km)	0.71	No
DPSBAR (mkm <sup>-1</sup> )	18.1	No
FARL	1	No
LDP	1.44	No
PROPWET (mm)	0.32	No
RMED1H	10.5	No
RMED1D	32.1	No
RMED2D	39.9	No
SAAR (mm)	644	No
SAAR4170 (mm)	683	No
SPRHOST	16.86	No
Urbext2000	0 [0.28]	Yes
Urbext1990	0.31	No
URBCONC	0.89	No
URBLOC	0.78	No
Urban Area (km <sup>2</sup> )	0 [0.01]	Yes
DDF parameter C	-0.02	No
DDF parameter D1	0.31	No
DDF parameter D2	0.32	No
DDF parameter D3	0.25	No
DDF parameter E	0.3	No
DDF parameter F	2.49	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.31	No
DDF parameter D2 (1km grid value)	0.32	No
DDF parameter D3 (1km grid value)	0.25	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.5	No

Values in square brackets are the original values loaded from the  Web  Service or  -

# UK Design Flood Estimation

Generated on Friday, December 09, 2016 10:14:15 AM by Scott  
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

## Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

### Site details

Checksum: A446-8834

Site name: 15031\_FEH

Easting: 446250

Northing: 237450

Country: England, Wales or Northern Ireland

Catchment Area (km<sup>2</sup>): 0.01 [0.55]\*

Using plot scale calculations: Yes

Site description: None

## Model run: 30 year

### Summary of results

Rainfall - FEH 1999 (mm):	44.27	Total runoff (ML):	0.15
Total Rainfall (mm):	28.13	Total flow (ML):	0.30
Peak Rainfall (mm):	9.50	Peak flow (m <sup>3</sup> /s):	0.01

### Parameters

*Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.*

*\* Indicates that the user locked the duration/timestep*

#### Rainfall parameters (Rainfall - FEH 1999 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	n/a

#### Loss model parameters

Name	Value	User-defined?
Cini (mm)	138.12	No
Cmax (mm)	349.45	No
Use alpha correction factor	Yes	No
Alpha correction factor	0.97	No

#### Routing model parameters

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
Tp (hr)	2.13 [1]	Yes
Up	0.65	No
Uk	0.8	No

**Baseflow model parameters**

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
BFO (m <sup>3</sup> /s)	0	No
BL (hr)	36.6 [27.87]	Yes
BR	1.02	No

**Urbanisation parameters**

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
Urban area (km <sup>2</sup> )	0 [0.01]	Yes
Urbext 2000	0 [0.28]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km <sup>2</sup> )	0.00	Yes
Sewer capacity (m <sup>3</sup> /s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
00:00:00	1.1433	0.0000	0.4390	0.0000	0.000584	0.000584
00:30:00	2.5590	0.0000	0.9962	0.0001	0.000577	0.000632
01:00:00	5.6108	0.0000	2.2498	0.0003	0.000571	0.000862
01:30:00	9.5029	0.0000	4.0160	0.0009	0.000572	0.00151
02:00:00	5.6108	0.0000	2.4925	0.0024	0.000587	0.00295
02:30:00	2.5590	0.0000	1.1667	0.0046	0.000627	0.00519
03:00:00	1.1433	0.0000	0.5273	0.0070	0.000699	0.00769
03:30:00	0.0000	0.0000	0.0000	0.0091	0.000802	0.0099
04:00:00	0.0000	0.0000	0.0000	0.0102	0.000925	0.0111
04:30:00	0.0000	0.0000	0.0000	0.0099	0.00105	0.011
05:00:00	0.0000	0.0000	0.0000	0.0088	0.00117	0.00994
05:30:00	0.0000	0.0000	0.0000	0.0073	0.00126	0.00858
06:00:00	0.0000	0.0000	0.0000	0.0059	0.00134	0.00723
06:30:00	0.0000	0.0000	0.0000	0.0048	0.00139	0.00615
07:00:00	0.0000	0.0000	0.0000	0.0038	0.00143	0.00526
07:30:00	0.0000	0.0000	0.0000	0.0030	0.00146	0.00447
08:00:00	0.0000	0.0000	0.0000	0.0022	0.00148	0.00371
08:30:00	0.0000	0.0000	0.0000	0.0015	0.00149	0.00298
09:00:00	0.0000	0.0000	0.0000	0.0008	0.00148	0.00233
09:30:00	0.0000	0.0000	0.0000	0.0004	0.00147	0.00184
10:00:00	0.0000	0.0000	0.0000	0.0001	0.00145	0.00158
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00143	0.00147
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
11:30:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
13:00:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00132
14:00:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
17:00:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000992	0.000992
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000979	0.000979
25:00:00	0.0000	0.0000	0.0000	0.0000	0.000965	0.000965
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000952	0.000952
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000939	0.000939
26:30:00	0.0000	0.0000	0.0000	0.0000	0.000927	0.000927
27:00:00	0.0000	0.0000	0.0000	0.0000	0.000914	0.000914
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000902	0.000902
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000889	0.000889
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000877	0.000877
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000865	0.000865
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000854	0.000854
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000842	0.000842
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000831	0.000831
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000819	0.000819
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000808	0.000808
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000797	0.000797
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000787	0.000787
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000776	0.000776
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000765	0.000765
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000755	0.000755
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000745	0.000745
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000735	0.000735

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000725	0.000725
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000715	0.000715
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000705	0.000705
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000696	0.000696
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000686	0.000686
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000677	0.000677
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000668	0.000668
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000659	0.000659
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00065	0.00065
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000641	0.000641
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000632	0.000632
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000624	0.000624
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000615	0.000615
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000607	0.000607
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000598	0.000598
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00059	0.00059



## Appendix

### Catchment descriptors \*

Name	Value	User-defined value used?
Area (km <sup>2</sup> )	0.01 [0.55]	Yes
ALTBAR	118	No
ASPBAR	180	No
ASPVAR	0.74	No
BFIHOST	0.44 [0.83]	Yes
DPLBAR (km)	0.71	No
DPSBAR (mkm <sup>-1</sup> )	18.1	No
FARL	1	No
LDP	1.44	No
PROPWET (mm)	0.32	No
RMED1H	10.5	No
RMED1D	32.1	No
RMED2D	39.9	No
SAAR (mm)	644	No
SAAR4170 (mm)	683	No
SPRHOST	16.86	No
Urbext2000	0 [0.28]	Yes
Urbext1990	0.31	No
URBCONC	0.89	No
URBLOC	0.78	No
Urban Area (km <sup>2</sup> )	0 [0.01]	Yes
DDF parameter C	-0.02	No
DDF parameter D1	0.31	No
DDF parameter D2	0.32	No
DDF parameter D3	0.25	No
DDF parameter E	0.3	No
DDF parameter F	2.49	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.31	No
DDF parameter D2 (1km grid value)	0.32	No
DDF parameter D3 (1km grid value)	0.25	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.5	No

*Values in square brackets are the original values loaded from the  Web  Service or  -*

# UK Design Flood Estimation

Generated on Friday, December 09, 2016 10:14:26 AM by Scott  
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

## Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

### Site details

Checksum: A446-8834

Site name: 15031\_FEH

Easting: 446250

Northing: 237450

Country: England, Wales or Northern Ireland

Catchment Area (km<sup>2</sup>): 0.01 [0.55]\*

Using plot scale calculations: Yes

Site description: None

## Model run: 100 year

### Summary of results

Rainfall - FEH 1999 (mm):	61.38	Total runoff (ML):	0.21
Total Rainfall (mm):	39.00	Total flow (ML):	0.42
Peak Rainfall (mm):	13.18	Peak flow (m <sup>3</sup> /s):	0.02

### Parameters

*Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.*

*\* Indicates that the user locked the duration/timestep*

#### Rainfall parameters (Rainfall - FEH 1999 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	n/a

#### Loss model parameters

Name	Value	User-defined?
Cini (mm)	138.12	No
Cmax (mm)	349.45	No
Use alpha correction factor	Yes	No
Alpha correction factor	0.92	No

#### Routing model parameters

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
Tp (hr)	2.13 [1]	Yes
Up	0.65	No
Uk	0.8	No

**Baseflow model parameters**

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
BFO (m <sup>3</sup> /s)	0	No
BL (hr)	36.6 [27.87]	Yes
BR	1.02	No

**Urbanisation parameters**

<b>Name</b>	<b>Value</b>	<b>User-defined?</b>
Urban area (km <sup>2</sup> )	0 [0.01]	Yes
Urbext 2000	0 [0.28]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km <sup>2</sup> )	0.00	Yes
Sewer capacity (m <sup>3</sup> /s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
00:00:00	1.5852	0.0000	0.5829	0.0000	0.000584	0.000584
00:30:00	3.5481	0.0000	1.3308	0.0001	0.000577	0.00065
01:00:00	7.7796	0.0000	3.0439	0.0004	0.000572	0.000959
01:30:00	13.1762	0.0000	5.5506	0.0013	0.000576	0.00183
02:00:00	7.7796	0.0000	3.5104	0.0032	0.000599	0.00379
02:30:00	3.5481	0.0000	1.6586	0.0062	0.000656	0.00687
03:00:00	1.5852	0.0000	0.7527	0.0096	0.000757	0.0103
03:30:00	0.0000	0.0000	0.0000	0.0125	0.0009	0.0134
04:00:00	0.0000	0.0000	0.0000	0.0141	0.00107	0.0152
04:30:00	0.0000	0.0000	0.0000	0.0137	0.00125	0.015
05:00:00	0.0000	0.0000	0.0000	0.0122	0.00141	0.0136
05:30:00	0.0000	0.0000	0.0000	0.0102	0.00155	0.0117
06:00:00	0.0000	0.0000	0.0000	0.0082	0.00166	0.00985
06:30:00	0.0000	0.0000	0.0000	0.0066	0.00174	0.00835
07:00:00	0.0000	0.0000	0.0000	0.0053	0.0018	0.00712
07:30:00	0.0000	0.0000	0.0000	0.0042	0.00184	0.00602
08:00:00	0.0000	0.0000	0.0000	0.0031	0.00186	0.00497
08:30:00	0.0000	0.0000	0.0000	0.0021	0.00188	0.00397
09:00:00	0.0000	0.0000	0.0000	0.0012	0.00187	0.00307
09:30:00	0.0000	0.0000	0.0000	0.0005	0.00186	0.00239
10:00:00	0.0000	0.0000	0.0000	0.0002	0.00184	0.00202
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00182	0.00186
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00179	0.00179
11:30:00	0.0000	0.0000	0.0000	0.0000	0.00177	0.00177
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00174	0.00174
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00172	0.00172
13:00:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00167	0.00167
14:00:00	0.0000	0.0000	0.0000	0.0000	0.00165	0.00165
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00158	0.00158
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00156	0.00156
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00154	0.00154
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00146	0.00146
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00144	0.00144
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
20:00:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00133	0.00133
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00131	0.00131
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
29:00:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000996	0.000996
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000982	0.000982
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000969	0.000969
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000956	0.000956
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000943	0.000943
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00093	0.00093

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m <sup>3</sup> /s)	Baseflow (m <sup>3</sup> /s)	Total Flow (m <sup>3</sup> /s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000917	0.000917
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000905	0.000905
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000892	0.000892
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00088	0.00088
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000868	0.000868
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000857	0.000857
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000845	0.000845
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000834	0.000834
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000822	0.000822
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000811	0.000811
40:30:00	0.0000	0.0000	0.0000	0.0000	0.0008	0.0008
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000789	0.000789
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000778	0.000778
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000768	0.000768
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000757	0.000757
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000747	0.000747
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000737	0.000737
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000727	0.000727
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000717	0.000717
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000707	0.000707
45:30:00	0.0000	0.0000	0.0000	0.0000	0.000698	0.000698
46:00:00	0.0000	0.0000	0.0000	0.0000	0.000688	0.000688
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000679	0.000679
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00067	0.00067
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000661	0.000661
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000652	0.000652
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000643	0.000643
49:00:00	0.0000	0.0000	0.0000	0.0000	0.000634	0.000634
49:30:00	0.0000	0.0000	0.0000	0.0000	0.000626	0.000626
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000617	0.000617
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000609	0.000609
51:00:00	0.0000	0.0000	0.0000	0.0000	0.0006	0.0006
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000592	0.000592




## Appendix

### Catchment descriptors \*

Name	Value	User-defined value used?
Area (km <sup>2</sup> )	0.01 [0.55]	Yes
ALTBAR	118	No
ASPBAR	180	No
ASPVAR	0.74	No
BFIHOST	0.44 [0.83]	Yes
DPLBAR (km)	0.71	No
DPSBAR (mkm <sup>-1</sup> )	18.1	No
FARL	1	No
LDP	1.44	No
PROPWET (mm)	0.32	No
RMED1H	10.5	No
RMED1D	32.1	No
RMED2D	39.9	No
SAAR (mm)	644	No
SAAR4170 (mm)	683	No
SPRHOST	16.86	No
Urbext2000	0 [0.28]	Yes
Urbext1990	0.31	No
URBCONC	0.89	No
URBLOC	0.78	No
Urban Area (km <sup>2</sup> )	0 [0.01]	Yes
DDF parameter C	-0.02	No
DDF parameter D1	0.31	No
DDF parameter D2	0.32	No
DDF parameter D3	0.25	No
DDF parameter E	0.3	No
DDF parameter F	2.49	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.31	No
DDF parameter D2 (1km grid value)	0.32	No
DDF parameter D3 (1km grid value)	0.25	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.5	No

*Values in square brackets are the original values loaded from the  Web  Service or  -*



Banners Gate Ltd		Page 0
Cavendish House 10-11 Birmingham Street Halesowen W.Midlands B63 3HN	Cotefield Farm, Bodicote SWS Network 1	
Date 16.01.2017 File 15031 - SWS Network 1	Designed by LJ Checked by	

XP Solutions Network 2014.1.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Sizes 15031 - SWS NETWORK 1 2017.05.03  
Manhole Sizes 15031 - SWS NETWORK 1 2017.05.03

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.800	Minimum Backdrop Height (m)	0.000
Ratio R	0.403	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for 15031 - SWS NETWORK 1 2017.05.08.SWS



Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	12-16	0.000	24-28	0.000	36-40	0.000	48-52	0.311
4-8	0.000	16-20	0.000	28-32	0.000	40-44	0.000	52-56	0.831
8-12	0.000	20-24	0.000	32-36	0.000	44-48	0.000	56-60	0.076

Total Area Contributing (ha) = 1.219

Total Pipe Volume (m³) = 781.626

Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k	n	HYD SECT	DIA (mm)	Auto Design
S1.000	15.778	0.096	164.4	0.023	6.00	0.0	0.600		o	225	
S1.001	23.213	0.139	167.0	0.024	0.00	0.0	0.600		o	225	

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)
S1.000	49.06	6.26	113.400	0.023	0.0	0.0	0.0	1.02	40.4	3.1
S1.001	47.66	6.64	113.304	0.047	0.0	0.0	0.0	1.01	40.1	6.1

Banners Gate Ltd		Page 1
Cavendish House 10-11 Birmingham Street Halesowen W.Midlands B63 3HN		Cotefield Farm, Bodicote SWS Network 1
Date 16.01.2017 File 15031 - SWS Network 1		Designed by LJ Checked by
XP Solutions		Network 2014.1.1



Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k	n	HYD SECT	DIA (mm)	Auto Design
S2.000	17.584	0.985	17.9	0.034	6.00	0.0	0.600		o	225	
S3.000	11.509	0.685	16.8	0.019	6.00	0.0	0.600		o	225	
S1.002	19.036	0.114	167.0	0.013	0.00	0.0	0.600		o	300	
S1.003	50.257	0.801	62.7	0.050	0.00	0.0	0.600		o	300	
S1.004	14.704	0.356	41.3	0.010	0.00	0.0	0.600		o	300	
S1.005	25.186	0.894	28.2	0.020	0.00	0.0	0.600		o	375	
S1.006	17.298	0.850	20.4	0.045	0.00	0.0	0.600		o	375	
S1.007	22.140	0.071	311.8	0.072	0.00	0.0	0.600		o	375	
S1.008	19.772	0.063	313.8	0.038	0.00	0.0	0.600		o	375	
S1.009	18.847	0.060	314.1	0.038	0.00	0.0	0.600		o	375	
S4.000	6.835	0.837	8.2	0.042	6.00	0.0	0.600		o	225	
S4.001	12.759	2.127	6.0	0.009	0.00	0.0	0.600		o	225	
S1.010	19.837	0.063	314.9	0.014	0.00	0.0	0.600		o	375	
S1.011	13.678	0.044	310.9	0.009	0.00	0.0	0.600		o	375	
S1.012	27.821	2.933	9.5	0.083	0.00	0.0	0.600		o	375	
S5.000	22.624	0.873	25.9	0.056	6.00	0.0	0.600		o	225	
S5.001	34.708	3.419	10.2	0.027	0.00	0.0	0.600		o	225	

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	49.68	6.09	114.150	0.034	0.0	0.0	0.0	3.11	123.7	4.6
S3.000	49.82	6.06	113.850	0.019	0.0	0.0	0.0	3.21	127.6	2.6
S1.002	46.76	6.90	113.090	0.113	0.0	0.0	0.0	1.21	85.8	14.3
S1.003	45.39	7.32	112.976	0.163	0.0	0.0	0.0	1.99	140.5	20.0
S1.004	45.08	7.42	112.175	0.173	0.0	0.0	0.0	2.45	173.4	21.1
S1.005	44.70	7.55	111.744	0.193	0.0	0.0	0.0	3.43	378.3	23.4
S1.006	44.48	7.62	110.850	0.238	0.0	0.0	0.0	4.03	445.3	28.7
S1.007	43.43	7.98	110.000	0.310	0.0	0.0	0.0	1.02	112.7	36.5
S1.008	42.53	8.30	109.929	0.348	0.0	0.0	0.0	1.02	112.4	40.1
S1.009	41.71	8.61	109.866	0.386	0.0	0.0	0.0	1.02	112.3	43.6
S4.000	49.96	6.02	112.920	0.042	0.0	0.0	0.0	4.61	183.2	5.7
S4.001	49.80	6.06	112.083	0.051	0.0	0.0	0.0	5.38	213.8	6.9
S1.010	40.88	8.94	109.806	0.451	0.0	0.0	0.0	1.02	112.2	49.9
S1.011	40.36	9.16	109.743	0.460	0.0	0.0	0.0	1.02	112.9	50.3
S1.012	40.18	9.24	109.699	0.543	0.0	0.0	0.0	5.91	653.0	59.1
S5.000	49.48	6.15	114.250	0.056	0.0	0.0	0.0	2.58	102.6	7.5
S5.001	48.95	6.29	113.377	0.083	0.0	0.0	0.0	4.13	164.2	11.0

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Cavendish House 10-11 Birmingham Street Halesowen W.Midlands B63 3HN		Cotefield Farm, Bodicote SWS Network 1
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XP Solutions Network 2014.1.1

Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k	n	HYD SECT	DIA (mm)	Auto Design
S6.000	8.097	0.240	33.7	0.034	6.00	0.0	0.600		o	225	
S6.001	8.524	0.250	34.1	0.025	0.00	0.0	0.600		o	225	
S6.002	33.930	2.242	15.1	0.071	0.00	0.0	0.600		o	225	
S5.002	20.655	0.351	58.8	0.017	0.00	0.0	0.600		o	300	
S5.003	41.833	1.670	25.0	0.058	0.00	0.0	0.600		o	300	
S5.004	9.196	0.412	22.3	0.028	0.00	0.0	0.600		o	300	
S7.000	44.484	2.785	16.0	0.040	6.00	0.0	0.600		o	225	
S7.001	35.845	0.215	166.7	0.013	0.00	0.0	0.600		o	225	
S7.002	20.469	0.175	117.0	0.059	0.00	0.0	0.600		o	225	
S5.005	35.787	0.093	384.8	0.028	0.00	0.0	0.600		o	450	
S5.006	26.879	0.070	384.0	0.022	0.00	0.0	0.600		o	450	
S5.007	40.810	0.106	385.0	0.031	0.00	0.0	0.600		o	450	
S5.008	8.857	0.286	31.0	0.020	0.00	0.0	0.600		o	450	
S8.000	15.524	2.587	6.0	0.026	6.00	0.0	0.600		o	225	
S5.009	13.284	0.035	379.6	0.026	0.00	0.0	0.600		o	450	

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)
S6.000	49.82	6.06	112.690	0.034	0.0	0.0	0.0	2.26	89.9	4.6
S6.001	49.57	6.12	112.450	0.059	0.0	0.0	0.0	2.25	89.4	7.9
S6.002	48.94	6.29	112.200	0.130	0.0	0.0	0.0	3.38	134.4	17.2
S5.002	48.32	6.46	109.883	0.230	0.0	0.0	0.0	2.05	145.2	30.1
S5.003	47.53	6.68	109.532	0.288	0.0	0.0	0.0	3.15	223.0	37.1
S5.004	47.37	6.72	107.862	0.316	0.0	0.0	0.0	3.34	236.3	40.5
S7.000	49.18	6.23	110.700	0.040	0.0	0.0	0.0	3.29	130.8	5.3
S7.001	47.06	6.82	107.915	0.053	0.0	0.0	0.0	1.01	40.1	6.8
S7.002	46.11	7.10	107.700	0.112	0.0	0.0	0.0	1.21	48.0	14.0
S5.005	44.31	7.68	107.300	0.456	0.0	0.0	0.0	1.03	163.9	54.7
S5.006	43.05	8.11	107.207	0.478	0.0	0.0	0.0	1.03	164.0	55.7
S5.007	41.30	8.77	107.137	0.509	0.0	0.0	0.0	1.03	163.8	56.9
S5.008	41.19	8.81	107.031	0.529	0.0	0.0	0.0	3.66	582.7	59.0
S8.000	49.86	6.05	109.557	0.026	0.0	0.0	0.0	5.38	213.8	3.5
S5.009	40.67	9.03	106.745	0.581	0.0	0.0	0.0	1.04	165.0	64.0

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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S9.000	5.000	0.010	500.0	0.000	6.00	0.0	0.600		o	225	
S9.001	5.000	0.865	5.8	0.000	0.00	0.0	0.600		o	225	
S5.010	7.352	0.019	386.9	0.000	0.00	0.0	0.600		o	450	
S1.013	11.422	0.025	455.0	0.040	0.00	0.0	0.600		o	525	
S10.000	5.053	0.010	505.3	0.000	6.00	0.0	0.600		o	225	
S10.001	5.000	0.909	5.5	0.000	0.00	0.0	0.600		o	225	
S1.014	63.156	0.126	501.2	0.020	0.00	0.0	0.600		o	2250	
S1.015	8.022	0.016	501.4	0.020	0.00	0.0	0.600		o	2250	
S1.016	4.950	0.010	495.0	0.000	0.00	0.0	0.600		o	600	
S11.000	5.000	0.010	500.0	0.000	6.00	0.0	0.600		o	525	
S11.001	5.000	1.061	4.7	0.000	0.00	0.0	0.600		o	525	
S1.017	69.174	0.154	449.2	0.015	0.00	0.0	0.600		o	525	
S1.018	68.320	4.060	16.8	0.000	0.00	0.0	0.600		o	525	
S1.019	97.079	4.300	22.6	0.000	0.00	0.0	0.600		o	525	
S1.020	96.999	3.300	29.4	0.000	0.00	0.0	0.600		o	525	
S1.021	99.638	2.400	41.5	0.000	0.00	0.0	0.600		o	525	

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)
S9.000	49.49	6.14	107.810	0.000	0.0	0.0	0.0	0.58	23.0	0.0
S9.001	49.43	6.16	107.800	0.000	0.0	0.0	0.0	5.48	217.8	0.0
S5.010	40.40	9.15	106.710	0.581	0.0	0.0	0.0	1.03	163.4	64.0
S1.013	39.78	9.42	106.616	1.164	0.0	0.0	0.0	1.04	225.9	125.4
S10.000	49.48	6.15	107.810	0.000	0.0	0.0	0.0	0.57	22.9	0.0
S10.001	49.43	6.16	107.800	0.000	0.0	0.0	0.0	5.62	223.3	0.0
S1.014	38.86	9.85	104.866	1.184	0.0	0.0	0.0	2.45	9723.4	125.4
S1.015	38.75	9.91	104.740	1.204	0.0	0.0	0.0	2.45	9722.0	126.3
S1.016	38.59	9.98	104.724	1.204	0.0	0.0	0.0	1.09	307.5	126.3
S11.000	49.73	6.08	107.810	0.000	0.0	0.0	0.0	0.99	215.4	0.0
S11.001	49.69	6.09	107.800	0.000	0.0	0.0	0.0	10.37	2244.0	0.0
S1.017	36.49	11.08	104.714	1.219	0.0	0.0	0.0	1.05	227.4	126.3
S1.018	36.12	11.29	104.560	1.219	0.0	0.0	0.0	5.48	1186.1	126.3
S1.019	35.53	11.63	100.500	1.219	0.0	0.0	0.0	4.73	1023.7	126.3
S1.020	34.89	12.02	96.200	1.219	0.0	0.0	0.0	4.14	896.8	126.3
S1.021	34.14	12.50	92.900	1.219	0.0	0.0	0.0	3.48	754.1	126.3

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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S1.022	53.782	0.554	97.1	0.000	0.00	0.0	0.600		o	525	
S1.023	43.981	0.088	499.8	0.000	0.00	0.0		0.450	3 \=/	525	
S1.024	14.237	0.028	508.5	0.000	0.00	0.0		0.450	3 \=/	525	

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)
S1.022	33.55	12.89	90.500	1.219	0.0	0.0	0.0	2.27	492.2	126.3
S1.023	20.02	30.00	89.946	1.219	0.0	0.0	0.0	0.02	3.1<	126.3
S1.024	20.02	30.00	89.858	1.219	0.0	0.0	0.0	0.02	3.1<	126.3

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Manhole Schedules for 15031 - SWS NETWORK 1 2017.05.08.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S2	115.061	1.661	Open Manhole	1200	S1.000	113.400	225				
S4	115.266	1.962	Open Manhole	1200	S1.001	113.304	225	S1.000	113.304	225	
S6	115.742	1.592	Open Manhole	1200	S2.000	114.150	225				
S8	115.459	1.609	Open Manhole	1200	S3.000	113.850	225				
S10	115.326	2.236	Open Manhole	1200	S1.002	113.090	300	S1.001	113.165	225	
								S2.000	113.165	225	
								S3.000	113.165	225	
S12	114.872	1.896	Open Manhole	1200	S1.003	112.976	300	S1.002	112.976	300	
S14	113.671	1.496	Open Manhole	1200	S1.004	112.175	300	S1.003	112.175	300	
S16	113.319	1.575	Open Manhole	1500	S1.005	111.744	375	S1.004	111.819	300	
S18	112.654	1.804	Open Manhole	1500	S1.006	110.850	375	S1.005	110.850	375	
S20	112.599	2.599	Open Manhole	1500	S1.007	110.000	375	S1.006	110.000	375	
S22	113.099	3.170	Open Manhole	1500	S1.008	109.929	375	S1.007	109.929	375	
S24	113.554	3.688	Open Manhole	1500	S1.009	109.866	375	S1.008	109.866	375	
S26	114.360	1.440	Open Manhole	1200	S4.000	112.920	225				
S28	114.226	2.143	Open Manhole	1200	S4.001	112.083	225	S4.000	112.083	225	
S30	113.727	3.921	Open Manhole	1500	S1.010	109.806	375	S1.009	109.806	375	
								S4.001	109.956	225	
S32	114.385	4.642	Open Manhole	1500	S1.011	109.743	375	S1.010	109.743	375	
S34	114.181	4.482	Open Manhole	1500	S1.012	109.699	375	S1.011	109.699	375	
S36	115.765	1.515	Open Manhole	1200	S5.000	114.250	225				
S38	114.848	1.471	Open Manhole	1200	S5.001	113.377	225	S5.000	113.377	225	
S40	114.126	1.436	Open Manhole	1200	S6.000	112.690	225				
S42	113.600	1.150	Open Manhole	1200	S6.001	112.450	225	S6.000	112.450	225	
S44	113.762	1.562	Open Manhole	1200	S6.002	112.200	225	S6.001	112.200	225	
S46	113.173	3.290	Open Manhole	1200	S5.002	109.883	300	S5.001	109.958	225	
								S6.002	109.958	225	
S48	112.651	3.119	Open Manhole	1200	S5.003	109.532	300	S5.002	109.532	300	
S50	110.137	2.275	Open Manhole	1200	S5.004	107.862	300	S5.003	107.862	300	
SHD1	112.223	1.523	Open Manhole	1200	S7.000	110.700	225				
SHD2	109.976	2.061	Open Manhole	1200	S7.001	107.915	225	S7.000	107.915	225	
SHD3	109.060	1.360	Open Manhole	1200	S7.002	107.700	225	S7.001	107.700	225	
S52	109.778	2.478	Open Manhole	1500	S5.005	107.300	450	S5.004	107.450	300	
								S7.002	107.525	225	
S54	110.794	3.587	Open Manhole	1500	S5.006	107.207	450	S5.005	107.207	450	
S56	111.248	4.111	Open Manhole	1500	S5.007	107.137	450	S5.006	107.137	450	
S58	112.501	5.470	Open Manhole	1500	S5.008	107.031	450	S5.007	107.031	450	

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Manhole Schedules for 15031 - SWS NETWORK 1 2017.05.08.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backd (mm)
S60	113.328	3.771	Open Manhole	1200	S8.000	109.557	225				
S62	112.531	5.786	Open Manhole	1500	S5.009	106.745	450	S5.008	106.745	450	
								S8.000	106.970	225	
SCS1	112.982	5.172	Open Manhole	1200	S9.000	107.810	225				
SCS1	112.982	5.182	Open Manhole	1200	S9.001	107.800	225	S9.000	107.800	225	
S64	112.982	6.272	Open Manhole	1500	S5.010	106.710	450	S5.009	106.710	450	
								S9.001	106.935	225	
S66	113.122	6.506	Open Manhole	1500	S1.013	106.616	525	S1.012	106.766	375	
								S5.010	106.691	450	
SCS2	112.500	4.690	Open Manhole	1200	S10.000	107.810	225				
SCS2	112.500	4.700	Open Manhole	1200	S10.001	107.800	225	S10.000	107.800	225	
S68	112.322	7.456	Open Manhole	3600	S1.014	104.866	2250	S1.013	106.591	525	
								S10.001	106.891	225	
S70	112.149	7.409	Open Manhole	1200	S1.015	104.740	2250	S1.014	104.740	2250	
S72	111.527	6.803	Open Manhole	1200	S1.016	104.724	600	S1.015	104.724	2250	
SCS3	111.603	3.793	Open Manhole	1500	S11.000	107.810	525				
SCS3	111.427	3.627	Open Manhole	1500	S11.001	107.800	525	S11.000	107.800	525	
S74	111.329	6.615	Open Manhole	3600	S1.017	104.714	525	S1.016	104.714	600	
								S11.001	106.739	525	
S76	107.723	3.163	Open Manhole	1200	S1.018	104.560	525	S1.017	104.560	525	
S78	102.482	1.982	Open Manhole	1500	S1.019	100.500	525	S1.018	100.500	525	
S80	97.938	1.738	Open Manhole	1500	S1.020	96.200	525	S1.019	96.200	525	
S82	94.576	1.676	Open Manhole	1500	S1.021	92.900	525	S1.020	92.900	525	
S84	92.155	1.655	Open Manhole	1500	S1.022	90.500	525	S1.021	90.500	525	
SOF1	91.319	1.373	Open Manhole	1500	S1.023	89.946	525	S1.022	89.946	525	
SSWALE	90.785	0.927	Open Manhole	1500	S1.024	89.858	525	S1.023	89.858	525	
SEXGDITCH	90.500	0.670	Open Manhole	1050		OUTFALL		S1.024	89.830	525	

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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S2	115.061	113.400	1.436	Open Manhole	1200
S1.001	o	225	S4	115.266	113.304	1.737	Open Manhole	1200
S2.000	o	225	S6	115.742	114.150	1.367	Open Manhole	1200
S3.000	o	225	S8	115.459	113.850	1.384	Open Manhole	1200
S1.002	o	300	S10	115.326	113.090	1.936	Open Manhole	1200
S1.003	o	300	S12	114.872	112.976	1.596	Open Manhole	1200
S1.004	o	300	S14	113.671	112.175	1.196	Open Manhole	1200
S1.005	o	375	S16	113.319	111.744	1.200	Open Manhole	1500
S1.006	o	375	S18	112.654	110.850	1.429	Open Manhole	1500
S1.007	o	375	S20	112.599	110.000	2.224	Open Manhole	1500
S1.008	o	375	S22	113.099	109.929	2.795	Open Manhole	1500
S1.009	o	375	S24	113.554	109.866	3.313	Open Manhole	1500
S4.000	o	225	S26	114.360	112.920	1.215	Open Manhole	1200
S4.001	o	225	S28	114.226	112.083	1.918	Open Manhole	1200
S1.010	o	375	S30	113.727	109.806	3.546	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	15.778	164.4	S4	115.266	113.304	1.737	Open Manhole	1200
S1.001	23.213	167.0	S10	115.326	113.165	1.936	Open Manhole	1200
S2.000	17.584	17.9	S10	115.326	113.165	1.936	Open Manhole	1200
S3.000	11.509	16.8	S10	115.326	113.165	1.936	Open Manhole	1200
S1.002	19.036	167.0	S12	114.872	112.976	1.596	Open Manhole	1200
S1.003	50.257	62.7	S14	113.671	112.175	1.196	Open Manhole	1200
S1.004	14.704	41.3	S16	113.319	111.819	1.200	Open Manhole	1500
S1.005	25.186	28.2	S18	112.654	110.850	1.429	Open Manhole	1500
S1.006	17.298	20.4	S20	112.599	110.000	2.224	Open Manhole	1500
S1.007	22.140	311.8	S22	113.099	109.929	2.795	Open Manhole	1500
S1.008	19.772	313.8	S24	113.554	109.866	3.313	Open Manhole	1500
S1.009	18.847	314.1	S30	113.727	109.806	3.546	Open Manhole	1500
S4.000	6.835	8.2	S28	114.226	112.083	1.918	Open Manhole	1200
S4.001	12.759	6.0	S30	113.727	109.956	3.546	Open Manhole	1500
S1.010	19.837	314.9	S32	114.385	109.743	4.267	Open Manhole	1500



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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.011	o	375	S32	114.385	109.743	4.267	Open Manhole	1500
S1.012	o	375	S34	114.181	109.699	4.107	Open Manhole	1500
S5.000	o	225	S36	115.765	114.250	1.290	Open Manhole	1200
S5.001	o	225	S38	114.848	113.377	1.246	Open Manhole	1200
S6.000	o	225	S40	114.126	112.690	1.211	Open Manhole	1200
S6.001	o	225	S42	113.600	112.450	0.925	Open Manhole	1200
S6.002	o	225	S44	113.762	112.200	1.337	Open Manhole	1200
S5.002	o	300	S46	113.173	109.883	2.990	Open Manhole	1200
S5.003	o	300	S48	112.651	109.532	2.819	Open Manhole	1200
S5.004	o	300	S50	110.137	107.862	1.975	Open Manhole	1200
S7.000	o	225	SHD1	112.223	110.700	1.298	Open Manhole	1200
S7.001	o	225	SHD2	109.976	107.915	1.836	Open Manhole	1200
S7.002	o	225	SHD3	109.060	107.700	1.135	Open Manhole	1200
S5.005	o	450	S52	109.778	107.300	2.028	Open Manhole	1500
S5.006	o	450	S54	110.794	107.207	3.137	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.011	13.678	310.9	S34	114.181	109.699	4.107	Open Manhole	1500
S1.012	27.821	9.5	S66	113.122	106.766	5.981	Open Manhole	1500
S5.000	22.624	25.9	S38	114.848	113.377	1.246	Open Manhole	1200
S5.001	34.708	10.2	S46	113.173	109.958	2.990	Open Manhole	1200
S6.000	8.097	33.7	S42	113.600	112.450	0.925	Open Manhole	1200
S6.001	8.524	34.1	S44	113.762	112.200	1.337	Open Manhole	1200
S6.002	33.930	15.1	S46	113.173	109.958	2.990	Open Manhole	1200
S5.002	20.655	58.8	S48	112.651	109.532	2.819	Open Manhole	1200
S5.003	41.833	25.0	S50	110.137	107.862	1.975	Open Manhole	1200
S5.004	9.196	22.3	S52	109.778	107.450	2.028	Open Manhole	1500
S7.000	44.484	16.0	SHD2	109.976	107.915	1.836	Open Manhole	1200
S7.001	35.845	166.7	SHD3	109.060	107.700	1.135	Open Manhole	1200
S7.002	20.469	117.0	S52	109.778	107.525	2.028	Open Manhole	1500
S5.005	35.787	384.8	S54	110.794	107.207	3.137	Open Manhole	1500
S5.006	26.879	384.0	S56	111.248	107.137	3.661	Open Manhole	1500

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Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.007	o	450	S56	111.248	107.137	3.661	Open Manhole	1500
S5.008	o	450	S58	112.501	107.031	5.020	Open Manhole	1500
S8.000	o	225	S60	113.328	109.557	3.546	Open Manhole	1200
S5.009	o	450	S62	112.531	106.745	5.336	Open Manhole	1500
S9.000	o	225	SCS1	112.982	107.810	4.947	Open Manhole	1200
S9.001	o	225	SCS1	112.982	107.800	4.957	Open Manhole	1200
S5.010	o	450	S64	112.982	106.710	5.822	Open Manhole	1500
S1.013	o	525	S66	113.122	106.616	5.981	Open Manhole	1500
S10.000	o	225	SCS2	112.500	107.810	4.465	Open Manhole	1200
S10.001	o	225	SCS2	112.500	107.800	4.475	Open Manhole	1200
S1.014	o	2250	S68	112.322	104.866	5.206	Open Manhole	3600
S1.015	o	2250	S70	112.149	104.740	5.159	Open Manhole	1200
S1.016	o	600	S72	111.527	104.724	6.203	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.007	40.810	385.0	S58	112.501	107.031	5.020	Open Manhole	1500
S5.008	8.857	31.0	S62	112.531	106.745	5.336	Open Manhole	1500
S8.000	15.524	6.0	S62	112.531	106.970	5.336	Open Manhole	1500
S5.009	13.284	379.6	S64	112.982	106.710	5.822	Open Manhole	1500
S9.000	5.000	500.0	SCS1	112.982	107.800	4.957	Open Manhole	1200
S9.001	5.000	5.8	S64	112.982	106.935	5.822	Open Manhole	1500
S5.010	7.352	386.9	S66	113.122	106.691	5.981	Open Manhole	1500
S1.013	11.422	455.0	S68	112.322	106.591	5.206	Open Manhole	3600
S10.000	5.053	505.3	SCS2	112.500	107.800	4.475	Open Manhole	1200
S10.001	5.000	5.5	S68	112.322	106.891	5.206	Open Manhole	3600
S1.014	63.156	501.2	S70	112.149	104.740	5.159	Open Manhole	1200
S1.015	8.022	501.4	S72	111.527	104.724	4.553	Open Manhole	1200
S1.016	4.950	495.0	S74	111.329	104.714	6.015	Open Manhole	3600

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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.000	o	525	SCS3	111.603	107.810	3.268	Open Manhole	1500
S11.001	o	525	SCS3	111.427	107.800	3.102	Open Manhole	1500
S1.017	o	525	S74	111.329	104.714	6.090	Open Manhole	3600
S1.018	o	525	S76	107.723	104.560	2.638	Open Manhole	1200
S1.019	o	525	S78	102.482	100.500	1.457	Open Manhole	1500
S1.020	o	525	S80	97.938	96.200	1.213	Open Manhole	1500
S1.021	o	525	S82	94.576	92.900	1.151	Open Manhole	1500
S1.022	o	525	S84	92.155	90.500	1.130	Open Manhole	1500
S1.023	3 \=/	525	SOF1	91.319	89.946	1.223	Open Manhole	1500
S1.024	3 \=/	525	SSWALE	90.785	89.858	0.777	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.000	5.000	500.0	SCS3	111.427	107.800	3.102	Open Manhole	1500
S11.001	5.000	4.7	S74	111.329	106.739	4.065	Open Manhole	3600
S1.017	69.174	449.2	S76	107.723	104.560	2.638	Open Manhole	1200
S1.018	68.320	16.8	S78	102.482	100.500	1.457	Open Manhole	1500
S1.019	97.079	22.6	S80	97.938	96.200	1.213	Open Manhole	1500
S1.020	96.999	29.4	S82	94.576	92.900	1.151	Open Manhole	1500
S1.021	99.638	41.5	S84	92.155	90.500	1.130	Open Manhole	1500
S1.022	53.782	97.1	SOF1	91.319	89.946	0.848	Open Manhole	1500
S1.023	43.981	499.8	SSWALE	90.785	89.858	0.777	Open Manhole	1500
S1.024	14.237	508.5	SEXGDITCH	90.500	89.830	0.520	Open Manhole	1050

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Area Summary for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.023	0.023	0.023
1.001	-	-	100	0.024	0.024	0.024
2.000	-	-	100	0.034	0.034	0.034
3.000	-	-	100	0.019	0.019	0.019
1.002	-	-	100	0.013	0.013	0.013
1.003	-	-	100	0.050	0.050	0.050
1.004	-	-	100	0.010	0.010	0.010
1.005	-	-	100	0.020	0.020	0.020
1.006	-	-	100	0.045	0.045	0.045
1.007	-	-	100	0.072	0.072	0.072
1.008	-	-	100	0.038	0.038	0.038
1.009	-	-	100	0.038	0.038	0.038
4.000	-	-	100	0.042	0.042	0.042
4.001	-	-	100	0.009	0.009	0.009
1.010	-	-	100	0.014	0.014	0.014
1.011	-	-	100	0.009	0.009	0.009
1.012	-	-	100	0.083	0.083	0.083
5.000	-	-	100	0.056	0.056	0.056
5.001	-	-	100	0.027	0.027	0.027
6.000	-	-	100	0.034	0.034	0.034
6.001	-	-	100	0.025	0.025	0.025
6.002	-	-	100	0.071	0.071	0.071
5.002	-	-	100	0.017	0.017	0.017
5.003	-	-	100	0.058	0.058	0.058
5.004	-	-	100	0.028	0.028	0.028
7.000	-	-	100	0.040	0.040	0.040
7.001	-	-	100	0.013	0.013	0.013
7.002	-	-	100	0.059	0.059	0.059
5.005	-	-	100	0.028	0.028	0.028
5.006	-	-	100	0.022	0.022	0.022
5.007	-	-	100	0.031	0.031	0.031
5.008	-	-	100	0.020	0.020	0.020
8.000	-	-	100	0.026	0.026	0.026
5.009	-	-	100	0.026	0.026	0.026
9.000	-	-	100	0.000	0.000	0.000
9.001	-	-	100	0.000	0.000	0.000
5.010	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.040	0.040	0.040
10.000	-	-	100	0.000	0.000	0.000
10.001	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.020	0.020	0.020
1.015	-	-	100	0.020	0.020	0.020
1.016	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.000	0.000	0.000
11.001	-	-	100	0.000	0.000	0.000
1.017	-	-	100	0.015	0.015	0.015
1.018	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000

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Area Summary for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.022	-	-	100	0.000	0.000	0.000
1.023	-	-	100	0.000	0.000	0.000
1.024	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.219	1.219	1.219

Free Flowing Outfall Details for 15031 - SWS NETWORK 1 2017.05.08.SWS


Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.024	SEXGDITCH	90.500	89.830	0.000	1050	0

Simulation Criteria for 15031 - SWS NETWORK 1 2017.05.08.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	4.000
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	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

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)	19.800	Storm Duration (mins)	30
Ratio R	0.403		

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Online Controls for 15031 - SWS NETWORK 1 2017.05.08.SWS

Hydro-Brake Optimum<sup>®</sup> Manhole: S74, DS/PN: S1.017, Volume (m<sup>3</sup>): 68.6

Unit Reference MD-SHE-0077-5100-4346-5100  
 Design Head (m) 4.346  
 Design Flow (l/s) 5.1  
 Flush-Flo<sup>™</sup> Calculated  
 Objective Minimise upstream storage  
 Diameter (mm) 77  
 Invert Level (m) 104.714  
 Minimum Outlet Pipe Diameter (mm) 100  
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	4.346	5.1	Kick-Flo <sup>®</sup>	0.687	2.2
Flush-Flo <sup>™</sup>	0.340	2.7	Mean Flow over Head Range	-	3.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum<sup>®</sup> as specified. Should another type of control device other than a Hydro-Brake Optimum<sup>®</sup> 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	2.1	1.200	2.8	3.000	4.3	7.000	6.4
0.200	2.6	1.400	3.0	3.500	4.6	7.500	6.6
0.300	2.7	1.600	3.2	4.000	4.9	8.000	6.8
0.400	2.7	1.800	3.4	4.500	5.2	8.500	7.0
0.500	2.6	2.000	3.5	5.000	5.4	9.000	7.2
0.600	2.5	2.200	3.7	5.500	5.7	9.500	7.4
0.800	2.3	2.400	3.9	6.000	5.9		
1.000	2.6	2.600	4.0	6.500	6.2		

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Storage Structures for 15031 - SWS NETWORK 1 2017.05.08.SWS

Cellular Storage Manhole: SCS1, DS/PN: S9.000

Invert Level (m) 107.810 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 <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	63.0	63.0	2.600	0.0	104.3
0.200	63.0	69.3	2.800	0.0	104.3
0.400	63.0	75.7	3.000	0.0	104.3
0.600	63.0	82.0	3.200	0.0	104.3
0.800	63.0	88.4	3.400	0.0	104.3
1.000	63.0	94.7	3.600	0.0	104.3
1.200	63.0	101.1	3.800	0.0	104.3
1.400	0.0	104.3	4.000	0.0	104.3
1.600	0.0	104.3	4.200	0.0	104.3
1.800	0.0	104.3	4.400	0.0	104.3
2.000	0.0	104.3	4.600	0.0	104.3
2.200	0.0	104.3	4.800	0.0	104.3
2.400	0.0	104.3	5.000	0.0	104.3

Cellular Storage Manhole: SCS2, DS/PN: S10.000

Invert Level (m) 107.810 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 <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	200.0	200.0	2.600	0.0	273.5
0.200	200.0	211.3	2.800	0.0	273.5
0.400	200.0	222.6	3.000	0.0	273.5
0.600	200.0	233.9	3.200	0.0	273.5
0.800	200.0	245.3	3.400	0.0	273.5
1.000	200.0	256.6	3.600	0.0	273.5
1.200	200.0	267.9	3.800	0.0	273.5
1.400	0.0	273.5	4.000	0.0	273.5
1.600	0.0	273.5	4.200	0.0	273.5
1.800	0.0	273.5	4.400	0.0	273.5
2.000	0.0	273.5	4.600	0.0	273.5
2.200	0.0	273.5	4.800	0.0	273.5
2.400	0.0	273.5	5.000	0.0	273.5

Cellular Storage Manhole: SCS3, DS/PN: S11.000

Invert Level (m) 107.810 Safety Factor 2.0  
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00000

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Cellular Storage Manhole: SCS3, DS/PN: S11.000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	40.0	40.0	2.600	0.0	72.9
0.200	40.0	45.1	2.800	0.0	72.9
0.400	40.0	50.1	3.000	0.0	72.9
0.600	40.0	55.2	3.200	0.0	72.9
0.800	40.0	60.2	3.400	0.0	72.9
1.000	40.0	65.3	3.600	0.0	72.9
1.200	40.0	70.4	3.800	0.0	72.9
1.400	0.0	72.9	4.000	0.0	72.9
1.600	0.0	72.9	4.200	0.0	72.9
1.800	0.0	72.9	4.400	0.0	72.9
2.000	0.0	72.9	4.600	0.0	72.9
2.200	0.0	72.9	4.800	0.0	72.9
2.400	0.0	72.9	5.000	0.0	72.9





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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S6.000	30	Summer	100	+20%				
S6.001	30	Summer	100	+20%				
S6.002	30	Summer	100	+20%				
S5.002	30	Summer	100	+20%				
S5.003	30	Summer	100	+20%				
S5.004	720	Winter	100	+20%	100/30	Summer		
S7.000	30	Summer	100	+20%				
S7.001	720	Winter	100	+20%	100/30	Summer		
S7.002	720	Winter	100	+20%	100/30	Summer		
S5.005	720	Winter	100	+20%	100/30	Summer		
S5.006	720	Winter	100	+20%	100/30	Summer		
S5.007	720	Winter	100	+20%	100/30	Summer		
S5.008	720	Winter	100	+20%	100/30	Summer		
S8.000	30	Summer	100	+20%				
S5.009	720	Winter	100	+20%	100/30	Summer		
S9.000	720	Winter	100	+20%	100/60	Winter		
S9.001	720	Winter	100	+20%	100/60	Summer		
S5.010	720	Winter	100	+20%	100/30	Summer		
S1.013	720	Winter	100	+20%	100/30	Summer		
S10.000	720	Winter	100	+20%	100/60	Winter		
S10.001	720	Winter	100	+20%	100/60	Summer		
S1.014	720	Winter	100	+20%	100/30	Summer		
S1.015	720	Winter	100	+20%	100/30	Summer		
S1.016	720	Winter	100	+20%	100/30	Summer		
S11.000	720	Winter	100	+20%	100/120	Winter		
S11.001	720	Winter	100	+20%	100/120	Winter		
S1.017	720	Winter	100	+20%	100/30	Summer		
S1.018	720	Winter	100	+20%				
S1.019	720	Winter	100	+20%				
S1.020	720	Winter	100	+20%				
S1.021	720	Winter	100	+20%				
S1.022	720	Winter	100	+20%				
S1.023	720	Winter	100	+20%				
S1.024	720	Winter	100	+20%				

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Flow (l/s)	
S1.000	S2	113.480	-0.145	0.000	0.27	0.0	9.8	OK
S1.001	S4	113.427	-0.102	0.000	0.57	0.0	20.9	OK
S2.000	S6	114.204	-0.171	0.000	0.13	0.0	14.5	OK
S3.000	S8	113.891	-0.184	0.000	0.07	0.0	8.1	OK
S1.002	S10	113.270	-0.120	0.000	0.66	0.0	49.0	OK
S1.003	S12	113.135	-0.141	0.000	0.54	0.0	70.9	OK
S1.004	S14	112.330	-0.145	0.000	0.52	0.0	75.0	OK
S1.005	S16	111.874	-0.245	0.000	0.25	0.0	83.4	OK
S1.006	S18	110.988	-0.237	0.000	0.29	0.0	103.3	OK
S1.007	S20	110.886	0.511	0.000	1.31	0.0	125.6	SURCHARGED


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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	US/MH Name	Water	Surch'd Depth (m)	Flooded	Flow / Cap.	O'flow	Pipe	Status
		Level (m)		Volume (m³)		(l/s)	Flow (l/s)	
S1.008	S22	110.767	0.463	0.000	1.45	0.0	136.6	SURCHARGED
S1.009	S24	110.632	0.391	0.000	1.59	0.0	148.9	SURCHARGED
S4.000	S26	112.976	-0.169	0.000	0.14	0.0	18.0	OK
S4.001	S28	112.135	-0.173	0.000	0.12	0.0	22.1	OK
S1.010	S30	110.475	0.294	0.000	1.84	0.0	172.9	SURCHARGED
S1.011	S32	110.256	0.138	0.000	2.00	0.0	174.9	SURCHARGED
S1.012	S34	109.854	-0.220	0.000	0.35	0.0	198.5	OK
S5.000	S36	114.327	-0.148	0.000	0.26	0.0	23.9	OK
S5.001	S38	113.451	-0.151	0.000	0.24	0.0	36.5	OK
S6.000	S40	112.760	-0.155	0.000	0.21	0.0	14.5	OK
S6.001	S42	112.545	-0.130	0.000	0.37	0.0	26.2	OK
S6.002	S44	112.311	-0.114	0.000	0.47	0.0	59.7	OK
S5.002	S46	110.094	-0.089	0.000	0.82	0.0	104.6	OK
S5.003	S48	109.709	-0.123	0.000	0.64	0.0	132.3	OK
S5.004	S50	108.785	0.623	0.000	0.08	0.0	13.2	SURCHARGED
S7.000	SHD1	110.755	-0.170	0.000	0.14	0.0	17.1	OK
S7.001	SHD2	108.786	0.646	0.000	0.06	0.0	2.2	SURCHARGED
S7.002	SHD3	108.785	0.860	0.000	0.11	0.0	4.7	FLOOD RISK
S5.005	S52	108.784	1.034	0.000	0.13	0.0	18.6	SURCHARGED
S5.006	S54	108.783	1.126	0.000	0.14	0.0	19.4	SURCHARGED
S5.007	S56	108.782	1.195	0.000	0.14	0.0	20.5	SURCHARGED
S5.008	S58	108.781	1.300	0.000	0.07	0.0	21.3	SURCHARGED
S8.000	S60	109.592	-0.190	0.000	0.06	0.0	11.1	OK
S5.009	S62	108.780	1.585	0.000	0.21	0.0	23.4	SURCHARGED
S9.000	SCS1	108.779	0.744	0.000	0.04	0.0	0.9	SURCHARGED
S9.001	SCS1	108.779	0.754	0.000	0.01	0.0	0.9	SURCHARGED
S5.010	S64	108.779	1.619	0.000	0.24	0.0	23.2	SURCHARGED
S1.013	S66	108.778	1.637	0.000	0.37	0.0	46.6	SURCHARGED
S10.000	SCS2	108.775	0.740	0.000	0.12	0.0	2.8	SURCHARGED
S10.001	SCS2	108.776	0.751	0.000	0.02	0.0	2.8	SURCHARGED
S1.014	S68	108.777	1.661	0.000	0.01	0.0	46.9	SURCHARGED
S1.015	S70	108.778	1.788	0.000	0.01	0.0	23.4	SURCHARGED
S1.016	S72	108.778	3.454	0.000	0.11	0.0	23.3	SURCHARGED
S11.000	SCS3	108.777	0.442	0.000	0.00	0.0	0.6	SURCHARGED
S11.001	SCS3	108.777	0.452	0.000	0.00	0.0	0.6	SURCHARGED
S1.017	S74	108.777	3.538	0.000	0.02	0.0	4.9	SURCHARGED
S1.018	S76	104.571	-0.514	0.000	0.00	0.0	4.9	OK
S1.019	S78	100.513	-0.512	0.000	0.01	0.0	4.9	OK
S1.020	S80	96.215	-0.510	0.000	0.01	0.0	4.9	OK
S1.021	S82	92.917	-0.508	0.000	0.01	0.0	4.9	OK
S1.022	S84	90.528	-0.497	0.000	0.01	0.0	4.9	OK
S1.023	SOF1	90.143	-1.176	0.000	0.01	0.0	4.9	OK
S1.024	SSWALE	90.046	-0.739	0.000	0.03	0.0	4.9	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Sizes 15031 - SWS NETWORK 1 2017.05.03  
Manhole Sizes 15031 - SWS NETWORK 1 2017.05.03

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.800	Minimum Backdrop Height (m)	0.000
Ratio R	0.403	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for 15031 - SWS NETWORK 1 2017.05.08.SWS



Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	12-16	0.000	24-28	0.000	36-40	0.000	48-52	0.311
4-8	0.000	16-20	0.000	28-32	0.000	40-44	0.000	52-56	0.831
8-12	0.000	20-24	0.000	32-36	0.000	44-48	0.000	56-60	0.076

Total Area Contributing (ha) = 1.219

Total Pipe Volume (m³) = 781.626

Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k	n	HYD SECT	DIA (mm)	Auto Design
S1.000	15.778	0.096	164.4	0.023	6.00	0.0	0.600		o	225	
S1.001	23.213	0.139	167.0	0.024	0.00	0.0	0.600		o	225	

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)
S1.000	49.06	6.26	113.400	0.023	0.0	0.0	0.0	1.02	40.4	3.1
S1.001	47.66	6.64	113.304	0.047	0.0	0.0	0.0	1.01	40.1	6.1

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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S2.000	17.584	0.985	17.9	0.034	6.00	0.0	0.600		o	225	
S3.000	11.509	0.685	16.8	0.019	6.00	0.0	0.600		o	225	
S1.002	19.036	0.114	167.0	0.013	0.00	0.0	0.600		o	300	
S1.003	50.257	0.801	62.7	0.050	0.00	0.0	0.600		o	300	
S1.004	14.704	0.356	41.3	0.010	0.00	0.0	0.600		o	300	
S1.005	25.186	0.894	28.2	0.020	0.00	0.0	0.600		o	375	
S1.006	17.298	0.850	20.4	0.045	0.00	0.0	0.600		o	375	
S1.007	22.140	0.071	311.8	0.072	0.00	0.0	0.600		o	375	
S1.008	19.772	0.063	313.8	0.038	0.00	0.0	0.600		o	375	
S1.009	18.847	0.060	314.1	0.038	0.00	0.0	0.600		o	375	
S4.000	6.835	0.837	8.2	0.042	6.00	0.0	0.600		o	225	
S4.001	12.759	2.127	6.0	0.009	0.00	0.0	0.600		o	225	
S1.010	19.837	0.063	314.9	0.014	0.00	0.0	0.600		o	375	
S1.011	13.678	0.044	310.9	0.009	0.00	0.0	0.600		o	375	
S1.012	27.821	2.933	9.5	0.083	0.00	0.0	0.600		o	375	
S5.000	22.624	0.873	25.9	0.056	6.00	0.0	0.600		o	225	
S5.001	34.708	3.419	10.2	0.027	0.00	0.0	0.600		o	225	

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	49.68	6.09	114.150	0.034	0.0	0.0	0.0	3.11	123.7	4.6
S3.000	49.82	6.06	113.850	0.019	0.0	0.0	0.0	3.21	127.6	2.6
S1.002	46.76	6.90	113.090	0.113	0.0	0.0	0.0	1.21	85.8	14.3
S1.003	45.39	7.32	112.976	0.163	0.0	0.0	0.0	1.99	140.5	20.0
S1.004	45.08	7.42	112.175	0.173	0.0	0.0	0.0	2.45	173.4	21.1
S1.005	44.70	7.55	111.744	0.193	0.0	0.0	0.0	3.43	378.3	23.4
S1.006	44.48	7.62	110.850	0.238	0.0	0.0	0.0	4.03	445.3	28.7
S1.007	43.43	7.98	110.000	0.310	0.0	0.0	0.0	1.02	112.7	36.5
S1.008	42.53	8.30	109.929	0.348	0.0	0.0	0.0	1.02	112.4	40.1
S1.009	41.71	8.61	109.866	0.386	0.0	0.0	0.0	1.02	112.3	43.6
S4.000	49.96	6.02	112.920	0.042	0.0	0.0	0.0	4.61	183.2	5.7
S4.001	49.80	6.06	112.083	0.051	0.0	0.0	0.0	5.38	213.8	6.9
S1.010	40.88	8.94	109.806	0.451	0.0	0.0	0.0	1.02	112.2	49.9
S1.011	40.36	9.16	109.743	0.460	0.0	0.0	0.0	1.02	112.9	50.3
S1.012	40.18	9.24	109.699	0.543	0.0	0.0	0.0	5.91	653.0	59.1
S5.000	49.48	6.15	114.250	0.056	0.0	0.0	0.0	2.58	102.6	7.5
S5.001	48.95	6.29	113.377	0.083	0.0	0.0	0.0	4.13	164.2	11.0

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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k	n	HYD SECT	DIA (mm)	Auto Design
S6.000	8.097	0.240	33.7	0.034	6.00	0.0	0.600		o	225	
S6.001	8.524	0.250	34.1	0.025	0.00	0.0	0.600		o	225	
S6.002	33.930	2.242	15.1	0.071	0.00	0.0	0.600		o	225	
S5.002	20.655	0.351	58.8	0.017	0.00	0.0	0.600		o	300	
S5.003	41.833	1.670	25.0	0.058	0.00	0.0	0.600		o	300	
S5.004	9.196	0.412	22.3	0.028	0.00	0.0	0.600		o	300	
S7.000	44.484	2.785	16.0	0.040	6.00	0.0	0.600		o	225	
S7.001	35.845	0.215	166.7	0.013	0.00	0.0	0.600		o	225	
S7.002	20.469	0.175	117.0	0.059	0.00	0.0	0.600		o	225	
S5.005	35.787	0.093	384.8	0.028	0.00	0.0	0.600		o	450	
S5.006	26.879	0.070	384.0	0.022	0.00	0.0	0.600		o	450	
S5.007	40.810	0.106	385.0	0.031	0.00	0.0	0.600		o	450	
S5.008	8.857	0.286	31.0	0.020	0.00	0.0	0.600		o	450	
S8.000	15.524	2.587	6.0	0.026	6.00	0.0	0.600		o	225	
S5.009	13.284	0.035	379.6	0.026	0.00	0.0	0.600		o	450	

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)
S6.000	49.82	6.06	112.690	0.034	0.0	0.0	0.0	2.26	89.9	4.6
S6.001	49.57	6.12	112.450	0.059	0.0	0.0	0.0	2.25	89.4	7.9
S6.002	48.94	6.29	112.200	0.130	0.0	0.0	0.0	3.38	134.4	17.2
S5.002	48.32	6.46	109.883	0.230	0.0	0.0	0.0	2.05	145.2	30.1
S5.003	47.53	6.68	109.532	0.288	0.0	0.0	0.0	3.15	223.0	37.1
S5.004	47.37	6.72	107.862	0.316	0.0	0.0	0.0	3.34	236.3	40.5
S7.000	49.18	6.23	110.700	0.040	0.0	0.0	0.0	3.29	130.8	5.3
S7.001	47.06	6.82	107.915	0.053	0.0	0.0	0.0	1.01	40.1	6.8
S7.002	46.11	7.10	107.700	0.112	0.0	0.0	0.0	1.21	48.0	14.0
S5.005	44.31	7.68	107.300	0.456	0.0	0.0	0.0	1.03	163.9	54.7
S5.006	43.05	8.11	107.207	0.478	0.0	0.0	0.0	1.03	164.0	55.7
S5.007	41.30	8.77	107.137	0.509	0.0	0.0	0.0	1.03	163.8	56.9
S5.008	41.19	8.81	107.031	0.529	0.0	0.0	0.0	3.66	582.7	59.0
S8.000	49.86	6.05	109.557	0.026	0.0	0.0	0.0	5.38	213.8	3.5
S5.009	40.67	9.03	106.745	0.581	0.0	0.0	0.0	1.04	165.0	64.0

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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S9.000	5.000	0.010	500.0	0.000	6.00	0.0	0.600		o	225	
S9.001	5.000	0.865	5.8	0.000	0.00	0.0	0.600		o	225	
S5.010	7.352	0.019	386.9	0.000	0.00	0.0	0.600		o	450	
S1.013	11.422	0.025	455.0	0.040	0.00	0.0	0.600		o	525	
S10.000	5.053	0.010	505.3	0.000	6.00	0.0	0.600		o	225	
S10.001	5.000	0.909	5.5	0.000	0.00	0.0	0.600		o	225	
S1.014	63.156	0.126	501.2	0.020	0.00	0.0	0.600		o	2250	
S1.015	8.022	0.016	501.4	0.020	0.00	0.0	0.600		o	2250	
S1.016	4.950	0.010	495.0	0.000	0.00	0.0	0.600		o	600	
S11.000	5.000	0.010	500.0	0.000	6.00	0.0	0.600		o	525	
S11.001	5.000	1.061	4.7	0.000	0.00	0.0	0.600		o	525	
S1.017	69.174	0.154	449.2	0.015	0.00	0.0	0.600		o	525	
S1.018	68.320	4.060	16.8	0.000	0.00	0.0	0.600		o	525	
S1.019	97.079	4.300	22.6	0.000	0.00	0.0	0.600		o	525	
S1.020	96.999	3.300	29.4	0.000	0.00	0.0	0.600		o	525	
S1.021	99.638	2.400	41.5	0.000	0.00	0.0	0.600		o	525	

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)
S9.000	49.49	6.14	107.810	0.000	0.0	0.0	0.0	0.58	23.0	0.0
S9.001	49.43	6.16	107.800	0.000	0.0	0.0	0.0	5.48	217.8	0.0
S5.010	40.40	9.15	106.710	0.581	0.0	0.0	0.0	1.03	163.4	64.0
S1.013	39.78	9.42	106.616	1.164	0.0	0.0	0.0	1.04	225.9	125.4
S10.000	49.48	6.15	107.810	0.000	0.0	0.0	0.0	0.57	22.9	0.0
S10.001	49.43	6.16	107.800	0.000	0.0	0.0	0.0	5.62	223.3	0.0
S1.014	38.86	9.85	104.866	1.184	0.0	0.0	0.0	2.45	9723.4	125.4
S1.015	38.75	9.91	104.740	1.204	0.0	0.0	0.0	2.45	9722.0	126.3
S1.016	38.59	9.98	104.724	1.204	0.0	0.0	0.0	1.09	307.5	126.3
S11.000	49.73	6.08	107.810	0.000	0.0	0.0	0.0	0.99	215.4	0.0
S11.001	49.69	6.09	107.800	0.000	0.0	0.0	0.0	10.37	2244.0	0.0
S1.017	36.49	11.08	104.714	1.219	0.0	0.0	0.0	1.05	227.4	126.3
S1.018	36.12	11.29	104.560	1.219	0.0	0.0	0.0	5.48	1186.1	126.3
S1.019	35.53	11.63	100.500	1.219	0.0	0.0	0.0	4.73	1023.7	126.3
S1.020	34.89	12.02	96.200	1.219	0.0	0.0	0.0	4.14	896.8	126.3
S1.021	34.14	12.50	92.900	1.219	0.0	0.0	0.0	3.48	754.1	126.3

Cavendish House  
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Cotefield Farm, Bodicote  
SWS Network 1



Date 16.01.2017  
File 15031 - SWS Network 1

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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S1.022	53.782	0.554	97.1	0.000	0.00	0.0	0.600		o	525	
S1.023	43.981	0.088	499.8	0.000	0.00	0.0		0.450	3 \=/	525	
S1.024	14.237	0.028	508.5	0.000	0.00	0.0		0.450	3 \=/	525	

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)
S1.022	33.55	12.89	90.500	1.219	0.0	0.0	0.0	2.27	492.2	126.3
S1.023	20.02	30.00	89.946	1.219	0.0	0.0	0.0	0.02	3.1<	126.3
S1.024	20.02	30.00	89.858	1.219	0.0	0.0	0.0	0.02	3.1<	126.3



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Manhole Schedules for 15031 - SWS NETWORK 1 2017.05.08.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S2	115.061	1.661	Open Manhole	1200	S1.000	113.400	225				
S4	115.266	1.962	Open Manhole	1200	S1.001	113.304	225	S1.000	113.304	225	
S6	115.742	1.592	Open Manhole	1200	S2.000	114.150	225				
S8	115.459	1.609	Open Manhole	1200	S3.000	113.850	225				
S10	115.326	2.236	Open Manhole	1200	S1.002	113.090	300	S1.001	113.165	225	
								S2.000	113.165	225	
								S3.000	113.165	225	
S12	114.872	1.896	Open Manhole	1200	S1.003	112.976	300	S1.002	112.976	300	
S14	113.671	1.496	Open Manhole	1200	S1.004	112.175	300	S1.003	112.175	300	
S16	113.319	1.575	Open Manhole	1500	S1.005	111.744	375	S1.004	111.819	300	
S18	112.654	1.804	Open Manhole	1500	S1.006	110.850	375	S1.005	110.850	375	
S20	112.599	2.599	Open Manhole	1500	S1.007	110.000	375	S1.006	110.000	375	
S22	113.099	3.170	Open Manhole	1500	S1.008	109.929	375	S1.007	109.929	375	
S24	113.554	3.688	Open Manhole	1500	S1.009	109.866	375	S1.008	109.866	375	
S26	114.360	1.440	Open Manhole	1200	S4.000	112.920	225				
S28	114.226	2.143	Open Manhole	1200	S4.001	112.083	225	S4.000	112.083	225	
S30	113.727	3.921	Open Manhole	1500	S1.010	109.806	375	S1.009	109.806	375	
								S4.001	109.956	225	
S32	114.385	4.642	Open Manhole	1500	S1.011	109.743	375	S1.010	109.743	375	
S34	114.181	4.482	Open Manhole	1500	S1.012	109.699	375	S1.011	109.699	375	
S36	115.765	1.515	Open Manhole	1200	S5.000	114.250	225				
S38	114.848	1.471	Open Manhole	1200	S5.001	113.377	225	S5.000	113.377	225	
S40	114.126	1.436	Open Manhole	1200	S6.000	112.690	225				
S42	113.600	1.150	Open Manhole	1200	S6.001	112.450	225	S6.000	112.450	225	
S44	113.762	1.562	Open Manhole	1200	S6.002	112.200	225	S6.001	112.200	225	
S46	113.173	3.290	Open Manhole	1200	S5.002	109.883	300	S5.001	109.958	225	
								S6.002	109.958	225	
S48	112.651	3.119	Open Manhole	1200	S5.003	109.532	300	S5.002	109.532	300	
S50	110.137	2.275	Open Manhole	1200	S5.004	107.862	300	S5.003	107.862	300	
SHD1	112.223	1.523	Open Manhole	1200	S7.000	110.700	225				
SHD2	109.976	2.061	Open Manhole	1200	S7.001	107.915	225	S7.000	107.915	225	
SHD3	109.060	1.360	Open Manhole	1200	S7.002	107.700	225	S7.001	107.700	225	
S52	109.778	2.478	Open Manhole	1500	S5.005	107.300	450	S5.004	107.450	300	
								S7.002	107.525	225	
S54	110.794	3.587	Open Manhole	1500	S5.006	107.207	450	S5.005	107.207	450	
S56	111.248	4.111	Open Manhole	1500	S5.007	107.137	450	S5.006	107.137	450	
S58	112.501	5.470	Open Manhole	1500	S5.008	107.031	450	S5.007	107.031	450	

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Manhole Schedules for 15031 - SWS NETWORK 1 2017.05.08.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backd (mm)
S60	113.328	3.771	Open Manhole	1200	S8.000	109.557	225				
S62	112.531	5.786	Open Manhole	1500	S5.009	106.745	450	S5.008	106.745	450	
								S8.000	106.970	225	
SCS1	112.982	5.172	Open Manhole	1200	S9.000	107.810	225				
SCS1	112.982	5.182	Open Manhole	1200	S9.001	107.800	225	S9.000	107.800	225	
S64	112.982	6.272	Open Manhole	1500	S5.010	106.710	450	S5.009	106.710	450	
								S9.001	106.935	225	
S66	113.122	6.506	Open Manhole	1500	S1.013	106.616	525	S1.012	106.766	375	
								S5.010	106.691	450	
SCS2	112.500	4.690	Open Manhole	1200	S10.000	107.810	225				
SCS2	112.500	4.700	Open Manhole	1200	S10.001	107.800	225	S10.000	107.800	225	
S68	112.322	7.456	Open Manhole	3600	S1.014	104.866	2250	S1.013	106.591	525	
								S10.001	106.891	225	
S70	112.149	7.409	Open Manhole	1200	S1.015	104.740	2250	S1.014	104.740	2250	
S72	111.527	6.803	Open Manhole	1200	S1.016	104.724	600	S1.015	104.724	2250	
SCS3	111.603	3.793	Open Manhole	1500	S11.000	107.810	525				
SCS3	111.427	3.627	Open Manhole	1500	S11.001	107.800	525	S11.000	107.800	525	
S74	111.329	6.615	Open Manhole	3600	S1.017	104.714	525	S1.016	104.714	600	
								S11.001	106.739	525	
S76	107.723	3.163	Open Manhole	1200	S1.018	104.560	525	S1.017	104.560	525	
S78	102.482	1.982	Open Manhole	1500	S1.019	100.500	525	S1.018	100.500	525	
S80	97.938	1.738	Open Manhole	1500	S1.020	96.200	525	S1.019	96.200	525	
S82	94.576	1.676	Open Manhole	1500	S1.021	92.900	525	S1.020	92.900	525	
S84	92.155	1.655	Open Manhole	1500	S1.022	90.500	525	S1.021	90.500	525	
SOF1	91.319	1.373	Open Manhole	1500	S1.023	89.946	525	S1.022	89.946	525	
SSWALE	90.785	0.927	Open Manhole	1500	S1.024	89.858	525	S1.023	89.858	525	
SEXGDITCH	90.500	0.670	Open Manhole	1050		OUTFALL		S1.024	89.830	525	

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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S2	115.061	113.400	1.436	Open Manhole	1200
S1.001	o	225	S4	115.266	113.304	1.737	Open Manhole	1200
S2.000	o	225	S6	115.742	114.150	1.367	Open Manhole	1200
S3.000	o	225	S8	115.459	113.850	1.384	Open Manhole	1200
S1.002	o	300	S10	115.326	113.090	1.936	Open Manhole	1200
S1.003	o	300	S12	114.872	112.976	1.596	Open Manhole	1200
S1.004	o	300	S14	113.671	112.175	1.196	Open Manhole	1200
S1.005	o	375	S16	113.319	111.744	1.200	Open Manhole	1500
S1.006	o	375	S18	112.654	110.850	1.429	Open Manhole	1500
S1.007	o	375	S20	112.599	110.000	2.224	Open Manhole	1500
S1.008	o	375	S22	113.099	109.929	2.795	Open Manhole	1500
S1.009	o	375	S24	113.554	109.866	3.313	Open Manhole	1500
S4.000	o	225	S26	114.360	112.920	1.215	Open Manhole	1200
S4.001	o	225	S28	114.226	112.083	1.918	Open Manhole	1200
S1.010	o	375	S30	113.727	109.806	3.546	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	15.778	164.4	S4	115.266	113.304	1.737	Open Manhole	1200
S1.001	23.213	167.0	S10	115.326	113.165	1.936	Open Manhole	1200
S2.000	17.584	17.9	S10	115.326	113.165	1.936	Open Manhole	1200
S3.000	11.509	16.8	S10	115.326	113.165	1.936	Open Manhole	1200
S1.002	19.036	167.0	S12	114.872	112.976	1.596	Open Manhole	1200
S1.003	50.257	62.7	S14	113.671	112.175	1.196	Open Manhole	1200
S1.004	14.704	41.3	S16	113.319	111.819	1.200	Open Manhole	1500
S1.005	25.186	28.2	S18	112.654	110.850	1.429	Open Manhole	1500
S1.006	17.298	20.4	S20	112.599	110.000	2.224	Open Manhole	1500
S1.007	22.140	311.8	S22	113.099	109.929	2.795	Open Manhole	1500
S1.008	19.772	313.8	S24	113.554	109.866	3.313	Open Manhole	1500
S1.009	18.847	314.1	S30	113.727	109.806	3.546	Open Manhole	1500
S4.000	6.835	8.2	S28	114.226	112.083	1.918	Open Manhole	1200
S4.001	12.759	6.0	S30	113.727	109.956	3.546	Open Manhole	1500
S1.010	19.837	314.9	S32	114.385	109.743	4.267	Open Manhole	1500

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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.011	o	375	S32	114.385	109.743	4.267	Open Manhole	1500
S1.012	o	375	S34	114.181	109.699	4.107	Open Manhole	1500
S5.000	o	225	S36	115.765	114.250	1.290	Open Manhole	1200
S5.001	o	225	S38	114.848	113.377	1.246	Open Manhole	1200
S6.000	o	225	S40	114.126	112.690	1.211	Open Manhole	1200
S6.001	o	225	S42	113.600	112.450	0.925	Open Manhole	1200
S6.002	o	225	S44	113.762	112.200	1.337	Open Manhole	1200
S5.002	o	300	S46	113.173	109.883	2.990	Open Manhole	1200
S5.003	o	300	S48	112.651	109.532	2.819	Open Manhole	1200
S5.004	o	300	S50	110.137	107.862	1.975	Open Manhole	1200
S7.000	o	225	SHD1	112.223	110.700	1.298	Open Manhole	1200
S7.001	o	225	SHD2	109.976	107.915	1.836	Open Manhole	1200
S7.002	o	225	SHD3	109.060	107.700	1.135	Open Manhole	1200
S5.005	o	450	S52	109.778	107.300	2.028	Open Manhole	1500
S5.006	o	450	S54	110.794	107.207	3.137	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.011	13.678	310.9	S34	114.181	109.699	4.107	Open Manhole	1500
S1.012	27.821	9.5	S66	113.122	106.766	5.981	Open Manhole	1500
S5.000	22.624	25.9	S38	114.848	113.377	1.246	Open Manhole	1200
S5.001	34.708	10.2	S46	113.173	109.958	2.990	Open Manhole	1200
S6.000	8.097	33.7	S42	113.600	112.450	0.925	Open Manhole	1200
S6.001	8.524	34.1	S44	113.762	112.200	1.337	Open Manhole	1200
S6.002	33.930	15.1	S46	113.173	109.958	2.990	Open Manhole	1200
S5.002	20.655	58.8	S48	112.651	109.532	2.819	Open Manhole	1200
S5.003	41.833	25.0	S50	110.137	107.862	1.975	Open Manhole	1200
S5.004	9.196	22.3	S52	109.778	107.450	2.028	Open Manhole	1500
S7.000	44.484	16.0	SHD2	109.976	107.915	1.836	Open Manhole	1200
S7.001	35.845	166.7	SHD3	109.060	107.700	1.135	Open Manhole	1200
S7.002	20.469	117.0	S52	109.778	107.525	2.028	Open Manhole	1500
S5.005	35.787	384.8	S54	110.794	107.207	3.137	Open Manhole	1500
S5.006	26.879	384.0	S56	111.248	107.137	3.661	Open Manhole	1500

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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.007	o	450	S56	111.248	107.137	3.661	Open Manhole	1500
S5.008	o	450	S58	112.501	107.031	5.020	Open Manhole	1500
S8.000	o	225	S60	113.328	109.557	3.546	Open Manhole	1200
S5.009	o	450	S62	112.531	106.745	5.336	Open Manhole	1500
S9.000	o	225	SCS1	112.982	107.810	4.947	Open Manhole	1200
S9.001	o	225	SCS1	112.982	107.800	4.957	Open Manhole	1200
S5.010	o	450	S64	112.982	106.710	5.822	Open Manhole	1500
S1.013	o	525	S66	113.122	106.616	5.981	Open Manhole	1500
S10.000	o	225	SCS2	112.500	107.810	4.465	Open Manhole	1200
S10.001	o	225	SCS2	112.500	107.800	4.475	Open Manhole	1200
S1.014	o	2250	S68	112.322	104.866	5.206	Open Manhole	3600
S1.015	o	2250	S70	112.149	104.740	5.159	Open Manhole	1200
S1.016	o	600	S72	111.527	104.724	6.203	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.007	40.810	385.0	S58	112.501	107.031	5.020	Open Manhole	1500
S5.008	8.857	31.0	S62	112.531	106.745	5.336	Open Manhole	1500
S8.000	15.524	6.0	S62	112.531	106.970	5.336	Open Manhole	1500
S5.009	13.284	379.6	S64	112.982	106.710	5.822	Open Manhole	1500
S9.000	5.000	500.0	SCS1	112.982	107.800	4.957	Open Manhole	1200
S9.001	5.000	5.8	S64	112.982	106.935	5.822	Open Manhole	1500
S5.010	7.352	386.9	S66	113.122	106.691	5.981	Open Manhole	1500
S1.013	11.422	455.0	S68	112.322	106.591	5.206	Open Manhole	3600
S10.000	5.053	505.3	SCS2	112.500	107.800	4.475	Open Manhole	1200
S10.001	5.000	5.5	S68	112.322	106.891	5.206	Open Manhole	3600
S1.014	63.156	501.2	S70	112.149	104.740	5.159	Open Manhole	1200
S1.015	8.022	501.4	S72	111.527	104.724	4.553	Open Manhole	1200
S1.016	4.950	495.0	S74	111.329	104.714	6.015	Open Manhole	3600

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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.000	o	525	SCS3	111.603	107.810	3.268	Open Manhole	1500
S11.001	o	525	SCS3	111.427	107.800	3.102	Open Manhole	1500
S1.017	o	525	S74	111.329	104.714	6.090	Open Manhole	3600
S1.018	o	525	S76	107.723	104.560	2.638	Open Manhole	1200
S1.019	o	525	S78	102.482	100.500	1.457	Open Manhole	1500
S1.020	o	525	S80	97.938	96.200	1.213	Open Manhole	1500
S1.021	o	525	S82	94.576	92.900	1.151	Open Manhole	1500
S1.022	o	525	S84	92.155	90.500	1.130	Open Manhole	1500
S1.023	3 \=/	525	SOF1	91.319	89.946	1.223	Open Manhole	1500
S1.024	3 \=/	525	SSWALE	90.785	89.858	0.777	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.000	5.000	500.0	SCS3	111.427	107.800	3.102	Open Manhole	1500
S11.001	5.000	4.7	S74	111.329	106.739	4.065	Open Manhole	3600
S1.017	69.174	449.2	S76	107.723	104.560	2.638	Open Manhole	1200
S1.018	68.320	16.8	S78	102.482	100.500	1.457	Open Manhole	1500
S1.019	97.079	22.6	S80	97.938	96.200	1.213	Open Manhole	1500
S1.020	96.999	29.4	S82	94.576	92.900	1.151	Open Manhole	1500
S1.021	99.638	41.5	S84	92.155	90.500	1.130	Open Manhole	1500
S1.022	53.782	97.1	SOF1	91.319	89.946	0.848	Open Manhole	1500
S1.023	43.981	499.8	SSWALE	90.785	89.858	0.777	Open Manhole	1500
S1.024	14.237	508.5	SEXGDITCH	90.500	89.830	0.520	Open Manhole	1050

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Area Summary for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.023	0.023	0.023
1.001	-	-	100	0.024	0.024	0.024
2.000	-	-	100	0.034	0.034	0.034
3.000	-	-	100	0.019	0.019	0.019
1.002	-	-	100	0.013	0.013	0.013
1.003	-	-	100	0.050	0.050	0.050
1.004	-	-	100	0.010	0.010	0.010
1.005	-	-	100	0.020	0.020	0.020
1.006	-	-	100	0.045	0.045	0.045
1.007	-	-	100	0.072	0.072	0.072
1.008	-	-	100	0.038	0.038	0.038
1.009	-	-	100	0.038	0.038	0.038
4.000	-	-	100	0.042	0.042	0.042
4.001	-	-	100	0.009	0.009	0.009
1.010	-	-	100	0.014	0.014	0.014
1.011	-	-	100	0.009	0.009	0.009
1.012	-	-	100	0.083	0.083	0.083
5.000	-	-	100	0.056	0.056	0.056
5.001	-	-	100	0.027	0.027	0.027
6.000	-	-	100	0.034	0.034	0.034
6.001	-	-	100	0.025	0.025	0.025
6.002	-	-	100	0.071	0.071	0.071
5.002	-	-	100	0.017	0.017	0.017
5.003	-	-	100	0.058	0.058	0.058
5.004	-	-	100	0.028	0.028	0.028
7.000	-	-	100	0.040	0.040	0.040
7.001	-	-	100	0.013	0.013	0.013
7.002	-	-	100	0.059	0.059	0.059
5.005	-	-	100	0.028	0.028	0.028
5.006	-	-	100	0.022	0.022	0.022
5.007	-	-	100	0.031	0.031	0.031
5.008	-	-	100	0.020	0.020	0.020
8.000	-	-	100	0.026	0.026	0.026
5.009	-	-	100	0.026	0.026	0.026
9.000	-	-	100	0.000	0.000	0.000
9.001	-	-	100	0.000	0.000	0.000
5.010	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.040	0.040	0.040
10.000	-	-	100	0.000	0.000	0.000
10.001	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.020	0.020	0.020
1.015	-	-	100	0.020	0.020	0.020
1.016	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.000	0.000	0.000
11.001	-	-	100	0.000	0.000	0.000
1.017	-	-	100	0.015	0.015	0.015
1.018	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000

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Area Summary for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.022	-	-	100	0.000	0.000	0.000
1.023	-	-	100	0.000	0.000	0.000
1.024	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.219	1.219	1.219

Free Flowing Outfall Details for 15031 - SWS NETWORK 1 2017.05.08.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.024	SEXGDITCH	90.500	89.830	0.000	1050	0


Simulation Criteria for 15031 - SWS NETWORK 1 2017.05.08.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	4.000
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		1	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)	19.800	Storm Duration (mins)	30
Ratio R	0.403		



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Online Controls for 15031 - SWS NETWORK 1 2017.05.08.SWS

Hydro-Brake Optimum® Manhole: S74, DS/PN: S1.017, Volume (m³): 68.6

Unit Reference MD-SHE-0077-5100-4346-5100  
 Design Head (m) 4.346  
 Design Flow (l/s) 5.1  
 Flush-Flo™ Calculated  
 Objective Minimise upstream storage  
 Diameter (mm) 77  
 Invert Level (m) 104.714  
 Minimum Outlet Pipe Diameter (mm) 100  
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	4.346	5.1	Kick-Flo®	0.687	2.2
Flush-Flo™	0.340	2.7	Mean Flow over Head Range	-	3.6

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	2.1	1.200	2.8	3.000	4.3	7.000	6.4
0.200	2.6	1.400	3.0	3.500	4.6	7.500	6.6
0.300	2.7	1.600	3.2	4.000	4.9	8.000	6.8
0.400	2.7	1.800	3.4	4.500	5.2	8.500	7.0
0.500	2.6	2.000	3.5	5.000	5.4	9.000	7.2
0.600	2.5	2.200	3.7	5.500	5.7	9.500	7.4
0.800	2.3	2.400	3.9	6.000	5.9		
1.000	2.6	2.600	4.0	6.500	6.2		

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Storage Structures for 15031 - SWS NETWORK 1 2017.05.08.SWS

Cellular Storage Manhole: SCS1, DS/PN: S9.000

Invert Level (m) 107.810 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 <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	63.0	63.0	2.600	0.0	104.3
0.200	63.0	69.3	2.800	0.0	104.3
0.400	63.0	75.7	3.000	0.0	104.3
0.600	63.0	82.0	3.200	0.0	104.3
0.800	63.0	88.4	3.400	0.0	104.3
1.000	63.0	94.7	3.600	0.0	104.3
1.200	63.0	101.1	3.800	0.0	104.3
1.400	0.0	104.3	4.000	0.0	104.3
1.600	0.0	104.3	4.200	0.0	104.3
1.800	0.0	104.3	4.400	0.0	104.3
2.000	0.0	104.3	4.600	0.0	104.3
2.200	0.0	104.3	4.800	0.0	104.3
2.400	0.0	104.3	5.000	0.0	104.3

Cellular Storage Manhole: SCS2, DS/PN: S10.000

Invert Level (m) 107.810 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 <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	200.0	200.0	2.600	0.0	273.5
0.200	200.0	211.3	2.800	0.0	273.5
0.400	200.0	222.6	3.000	0.0	273.5
0.600	200.0	233.9	3.200	0.0	273.5
0.800	200.0	245.3	3.400	0.0	273.5
1.000	200.0	256.6	3.600	0.0	273.5
1.200	200.0	267.9	3.800	0.0	273.5
1.400	0.0	273.5	4.000	0.0	273.5
1.600	0.0	273.5	4.200	0.0	273.5
1.800	0.0	273.5	4.400	0.0	273.5
2.000	0.0	273.5	4.600	0.0	273.5
2.200	0.0	273.5	4.800	0.0	273.5
2.400	0.0	273.5	5.000	0.0	273.5

Cellular Storage Manhole: SCS3, DS/PN: S11.000

Invert Level (m) 107.810 Safety Factor 2.0  
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00000

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Cellular Storage Manhole: SCS3, DS/PN: S11.000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	40.0	40.0	2.600	0.0	72.9
0.200	40.0	45.1	2.800	0.0	72.9
0.400	40.0	50.1	3.000	0.0	72.9
0.600	40.0	55.2	3.200	0.0	72.9
0.800	40.0	60.2	3.400	0.0	72.9
1.000	40.0	65.3	3.600	0.0	72.9
1.200	40.0	70.4	3.800	0.0	72.9
1.400	0.0	72.9	4.000	0.0	72.9
1.600	0.0	72.9	4.200	0.0	72.9
1.800	0.0	72.9	4.400	0.0	72.9
2.000	0.0	72.9	4.600	0.0	72.9
2.200	0.0	72.9	4.800	0.0	72.9
2.400	0.0	72.9	5.000	0.0	72.9



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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S6.000	30	Summer	100	+30%				
S6.001	30	Summer	100	+30%				
S6.002	30	Summer	100	+30%				
S5.002	30	Summer	100	+30%				
S5.003	30	Summer	100	+30%				
S5.004	960	Winter	100	+30%	100/30	Summer		
S7.000	30	Summer	100	+30%				
S7.001	960	Winter	100	+30%	100/30	Summer		
S7.002	960	Winter	100	+30%	100/30	Summer		
S5.005	960	Winter	100	+30%	100/30	Summer		
S5.006	960	Winter	100	+30%	100/30	Summer		
S5.007	960	Winter	100	+30%	100/30	Summer		
S5.008	960	Winter	100	+30%	100/30	Summer		
S8.000	30	Summer	100	+30%				
S5.009	960	Winter	100	+30%	100/30	Summer		
S9.000	960	Winter	100	+30%	100/60	Summer		
S9.001	960	Winter	100	+30%	100/30	Winter		
S5.010	960	Winter	100	+30%	100/30	Summer		
S1.013	960	Winter	100	+30%	100/30	Summer		
S10.000	960	Winter	100	+30%	100/60	Summer		
S10.001	960	Winter	100	+30%	100/30	Winter		
S1.014	960	Winter	100	+30%	100/30	Summer		
S1.015	960	Winter	100	+30%	100/30	Summer		
S1.016	960	Winter	100	+30%	100/30	Summer		
S11.000	960	Winter	100	+30%	100/120	Winter		
S11.001	960	Winter	100	+30%	100/120	Winter		
S1.017	960	Winter	100	+30%	100/30	Summer		
S1.018	960	Winter	100	+30%				
S1.019	960	Winter	100	+30%				
S1.020	960	Winter	100	+30%				
S1.021	960	Winter	100	+30%				
S1.022	960	Winter	100	+30%				
S1.023	960	Winter	100	+30%				
S1.024	960	Winter	100	+30%				

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Flow (l/s)	
S1.000	S2	113.484	-0.141	0.000	0.30	0.0	10.6	OK
S1.001	S4	113.433	-0.096	0.000	0.61	0.0	22.6	OK
S2.000	S6	114.206	-0.169	0.000	0.14	0.0	15.8	OK
S3.000	S8	113.893	-0.182	0.000	0.08	0.0	8.8	OK
S1.002	S10	113.280	-0.110	0.000	0.71	0.0	53.1	OK
S1.003	S12	113.143	-0.133	0.000	0.58	0.0	76.7	OK
S1.004	S14	112.338	-0.137	0.000	0.56	0.0	81.2	OK
S1.005	S16	111.880	-0.239	0.000	0.28	0.0	90.3	OK
S1.006	S18	111.169	-0.056	0.000	0.31	0.0	110.7	OK
S1.007	S20	110.973	0.598	0.000	1.37	0.0	131.2	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	US/MH Name	Water	Surch'd Depth (m)	Flooded	Flow / Cap.	O'flow	Pipe	Status
		Level (m)		Volume (m³)		(l/s)	Flow (l/s)	
S1.008	S22	110.856	0.552	0.000	1.55	0.0	145.6	SURCHARGED
S1.009	S24	110.713	0.472	0.000	1.68	0.0	157.3	SURCHARGED
S4.000	S26	112.978	-0.167	0.000	0.15	0.0	19.5	OK
S4.001	S28	112.137	-0.171	0.000	0.13	0.0	23.9	OK
S1.010	S30	110.538	0.357	0.000	1.96	0.0	184.4	SURCHARGED
S1.011	S32	110.288	0.170	0.000	2.15	0.0	187.6	SURCHARGED
S1.012	S34	109.860	-0.214	0.000	0.37	0.0	213.6	OK
S5.000	S36	114.331	-0.144	0.000	0.28	0.0	25.9	OK
S5.001	S38	113.454	-0.148	0.000	0.26	0.0	39.5	OK
S6.000	S40	112.763	-0.152	0.000	0.23	0.0	15.7	OK
S6.001	S42	112.550	-0.125	0.000	0.40	0.0	28.4	OK
S6.002	S44	112.316	-0.109	0.000	0.51	0.0	64.7	OK
S5.002	S46	110.107	-0.076	0.000	0.89	0.0	113.3	OK
S5.003	S48	109.718	-0.114	0.000	0.69	0.0	143.3	OK
S5.004	S50	108.990	0.828	0.000	0.07	0.0	11.2	SURCHARGED
S7.000	SHD1	110.758	-0.167	0.000	0.15	0.0	18.5	OK
S7.001	SHD2	108.991	0.851	0.000	0.05	0.0	1.9	SURCHARGED
S7.002	SHD3	108.991	1.066	0.000	0.09	0.0	3.9	FLOOD RISK
S5.005	S52	108.989	1.239	0.000	0.11	0.0	15.8	SURCHARGED
S5.006	S54	108.988	1.331	0.000	0.12	0.0	16.5	SURCHARGED
S5.007	S56	108.988	1.401	0.000	0.12	0.0	17.5	SURCHARGED
S5.008	S58	108.986	1.505	0.000	0.06	0.0	18.1	SURCHARGED
S8.000	S60	109.594	-0.188	0.000	0.06	0.0	12.1	OK
S5.009	S62	108.986	1.791	0.000	0.18	0.0	19.9	SURCHARGED
S9.000	SCS1	108.985	0.950	0.000	0.04	0.0	0.9	SURCHARGED
S9.001	SCS1	108.985	0.960	0.000	0.01	0.0	0.9	SURCHARGED
S5.010	S64	108.985	1.825	0.000	0.20	0.0	19.1	SURCHARGED
S1.013	S66	108.984	1.843	0.000	0.30	0.0	38.3	SURCHARGED
S10.000	SCS2	108.982	0.947	0.000	0.12	0.0	2.8	SURCHARGED
S10.001	SCS2	108.983	0.958	0.000	0.02	0.0	2.8	SURCHARGED
S1.014	S68	108.983	1.867	0.000	0.01	0.0	38.0	SURCHARGED
S1.015	S70	108.984	1.994	0.000	0.01	0.0	21.0	SURCHARGED
S1.016	S72	108.984	3.660	0.000	0.10	0.0	20.9	SURCHARGED
S11.000	SCS3	108.983	0.648	0.000	0.00	0.0	0.6	SURCHARGED
S11.001	SCS3	108.983	0.658	0.000	0.00	0.0	0.6	SURCHARGED
S1.017	S74	108.983	3.744	0.000	0.02	0.0	5.0	SURCHARGED
S1.018	S76	104.572	-0.513	0.000	0.00	0.0	5.0	OK
S1.019	S78	100.513	-0.512	0.000	0.01	0.0	5.0	OK
S1.020	S80	96.215	-0.510	0.000	0.01	0.0	5.0	OK
S1.021	S82	92.918	-0.507	0.000	0.01	0.0	5.0	OK
S1.022	S84	90.528	-0.497	0.000	0.01	0.0	5.0	OK
S1.023	SOF1	90.146	-1.173	0.000	0.01	0.0	5.0	OK
S1.024	SSWALE	90.048	-0.737	0.000	0.04	0.0	5.0	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Sizes 15031 - SWS NETWORK 1 2017.05.03  
Manhole Sizes 15031 - SWS NETWORK 1 2017.05.03

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.800	Minimum Backdrop Height (m)	0.000
Ratio R	0.403	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for 15031 - SWS NETWORK 1 2017.05.08.SWS



Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	12-16	0.000	24-28	0.000	36-40	0.000	48-52	0.311
4-8	0.000	16-20	0.000	28-32	0.000	40-44	0.000	52-56	0.831
8-12	0.000	20-24	0.000	32-36	0.000	44-48	0.000	56-60	0.076

Total Area Contributing (ha) = 1.219

Total Pipe Volume (m³) = 781.626

Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k	n	HYD SECT	DIA (mm)	Auto Design
S1.000	15.778	0.096	164.4	0.023	6.00	0.0	0.600		o	225	
S1.001	23.213	0.139	167.0	0.024	0.00	0.0	0.600		o	225	

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)
S1.000	49.06	6.26	113.400	0.023	0.0	0.0	0.0	1.02	40.4	3.1
S1.001	47.66	6.64	113.304	0.047	0.0	0.0	0.0	1.01	40.1	6.1

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Cavendish House 10-11 Birmingham Street Halesowen W.Midlands B63 3HN		Cotefield Farm, Bodicote SWS Network 1
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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S2.000	17.584	0.985	17.9	0.034	6.00	0.0	0.600		o	225	
S3.000	11.509	0.685	16.8	0.019	6.00	0.0	0.600		o	225	
S1.002	19.036	0.114	167.0	0.013	0.00	0.0	0.600		o	300	
S1.003	50.257	0.801	62.7	0.050	0.00	0.0	0.600		o	300	
S1.004	14.704	0.356	41.3	0.010	0.00	0.0	0.600		o	300	
S1.005	25.186	0.894	28.2	0.020	0.00	0.0	0.600		o	375	
S1.006	17.298	0.850	20.4	0.045	0.00	0.0	0.600		o	375	
S1.007	22.140	0.071	311.8	0.072	0.00	0.0	0.600		o	375	
S1.008	19.772	0.063	313.8	0.038	0.00	0.0	0.600		o	375	
S1.009	18.847	0.060	314.1	0.038	0.00	0.0	0.600		o	375	
S4.000	6.835	0.837	8.2	0.042	6.00	0.0	0.600		o	225	
S4.001	12.759	2.127	6.0	0.009	0.00	0.0	0.600		o	225	
S1.010	19.837	0.063	314.9	0.014	0.00	0.0	0.600		o	375	
S1.011	13.678	0.044	310.9	0.009	0.00	0.0	0.600		o	375	
S1.012	27.821	2.933	9.5	0.083	0.00	0.0	0.600		o	375	
S5.000	22.624	0.873	25.9	0.056	6.00	0.0	0.600		o	225	
S5.001	34.708	3.419	10.2	0.027	0.00	0.0	0.600		o	225	

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	49.68	6.09	114.150	0.034	0.0	0.0	0.0	3.11	123.7	4.6
S3.000	49.82	6.06	113.850	0.019	0.0	0.0	0.0	3.21	127.6	2.6
S1.002	46.76	6.90	113.090	0.113	0.0	0.0	0.0	1.21	85.8	14.3
S1.003	45.39	7.32	112.976	0.163	0.0	0.0	0.0	1.99	140.5	20.0
S1.004	45.08	7.42	112.175	0.173	0.0	0.0	0.0	2.45	173.4	21.1
S1.005	44.70	7.55	111.744	0.193	0.0	0.0	0.0	3.43	378.3	23.4
S1.006	44.48	7.62	110.850	0.238	0.0	0.0	0.0	4.03	445.3	28.7
S1.007	43.43	7.98	110.000	0.310	0.0	0.0	0.0	1.02	112.7	36.5
S1.008	42.53	8.30	109.929	0.348	0.0	0.0	0.0	1.02	112.4	40.1
S1.009	41.71	8.61	109.866	0.386	0.0	0.0	0.0	1.02	112.3	43.6
S4.000	49.96	6.02	112.920	0.042	0.0	0.0	0.0	4.61	183.2	5.7
S4.001	49.80	6.06	112.083	0.051	0.0	0.0	0.0	5.38	213.8	6.9
S1.010	40.88	8.94	109.806	0.451	0.0	0.0	0.0	1.02	112.2	49.9
S1.011	40.36	9.16	109.743	0.460	0.0	0.0	0.0	1.02	112.9	50.3
S1.012	40.18	9.24	109.699	0.543	0.0	0.0	0.0	5.91	653.0	59.1
S5.000	49.48	6.15	114.250	0.056	0.0	0.0	0.0	2.58	102.6	7.5
S5.001	48.95	6.29	113.377	0.083	0.0	0.0	0.0	4.13	164.2	11.0



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XP Solutions Network 2014.1.1

Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S6.000	8.097	0.240	33.7	0.034	6.00	0.0	0.600		o	225	
S6.001	8.524	0.250	34.1	0.025	0.00	0.0	0.600		o	225	
S6.002	33.930	2.242	15.1	0.071	0.00	0.0	0.600		o	225	
S5.002	20.655	0.351	58.8	0.017	0.00	0.0	0.600		o	300	
S5.003	41.833	1.670	25.0	0.058	0.00	0.0	0.600		o	300	
S5.004	9.196	0.412	22.3	0.028	0.00	0.0	0.600		o	300	
S7.000	44.484	2.785	16.0	0.040	6.00	0.0	0.600		o	225	
S7.001	35.845	0.215	166.7	0.013	0.00	0.0	0.600		o	225	
S7.002	20.469	0.175	117.0	0.059	0.00	0.0	0.600		o	225	
S5.005	35.787	0.093	384.8	0.028	0.00	0.0	0.600		o	450	
S5.006	26.879	0.070	384.0	0.022	0.00	0.0	0.600		o	450	
S5.007	40.810	0.106	385.0	0.031	0.00	0.0	0.600		o	450	
S5.008	8.857	0.286	31.0	0.020	0.00	0.0	0.600		o	450	
S8.000	15.524	2.587	6.0	0.026	6.00	0.0	0.600		o	225	
S5.009	13.284	0.035	379.6	0.026	0.00	0.0	0.600		o	450	

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)
S6.000	49.82	6.06	112.690	0.034	0.0	0.0	0.0	2.26	89.9	4.6
S6.001	49.57	6.12	112.450	0.059	0.0	0.0	0.0	2.25	89.4	7.9
S6.002	48.94	6.29	112.200	0.130	0.0	0.0	0.0	3.38	134.4	17.2
S5.002	48.32	6.46	109.883	0.230	0.0	0.0	0.0	2.05	145.2	30.1
S5.003	47.53	6.68	109.532	0.288	0.0	0.0	0.0	3.15	223.0	37.1
S5.004	47.37	6.72	107.862	0.316	0.0	0.0	0.0	3.34	236.3	40.5
S7.000	49.18	6.23	110.700	0.040	0.0	0.0	0.0	3.29	130.8	5.3
S7.001	47.06	6.82	107.915	0.053	0.0	0.0	0.0	1.01	40.1	6.8
S7.002	46.11	7.10	107.700	0.112	0.0	0.0	0.0	1.21	48.0	14.0
S5.005	44.31	7.68	107.300	0.456	0.0	0.0	0.0	1.03	163.9	54.7
S5.006	43.05	8.11	107.207	0.478	0.0	0.0	0.0	1.03	164.0	55.7
S5.007	41.30	8.77	107.137	0.509	0.0	0.0	0.0	1.03	163.8	56.9
S5.008	41.19	8.81	107.031	0.529	0.0	0.0	0.0	3.66	582.7	59.0
S8.000	49.86	6.05	109.557	0.026	0.0	0.0	0.0	5.38	213.8	3.5
S5.009	40.67	9.03	106.745	0.581	0.0	0.0	0.0	1.04	165.0	64.0

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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S9.000	5.000	0.010	500.0	0.000	6.00	0.0	0.600		o	225	
S9.001	5.000	0.865	5.8	0.000	0.00	0.0	0.600		o	225	
S5.010	7.352	0.019	386.9	0.000	0.00	0.0	0.600		o	450	
S1.013	11.422	0.025	455.0	0.040	0.00	0.0	0.600		o	525	
S10.000	5.053	0.010	505.3	0.000	6.00	0.0	0.600		o	225	
S10.001	5.000	0.909	5.5	0.000	0.00	0.0	0.600		o	225	
S1.014	63.156	0.126	501.2	0.020	0.00	0.0	0.600		o	2250	
S1.015	8.022	0.016	501.4	0.020	0.00	0.0	0.600		o	2250	
S1.016	4.950	0.010	495.0	0.000	0.00	0.0	0.600		o	600	
S11.000	5.000	0.010	500.0	0.000	6.00	0.0	0.600		o	525	
S11.001	5.000	1.061	4.7	0.000	0.00	0.0	0.600		o	525	
S1.017	69.174	0.154	449.2	0.015	0.00	0.0	0.600		o	525	
S1.018	68.320	4.060	16.8	0.000	0.00	0.0	0.600		o	525	
S1.019	97.079	4.300	22.6	0.000	0.00	0.0	0.600		o	525	
S1.020	96.999	3.300	29.4	0.000	0.00	0.0	0.600		o	525	
S1.021	99.638	2.400	41.5	0.000	0.00	0.0	0.600		o	525	

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)
S9.000	49.49	6.14	107.810	0.000	0.0	0.0	0.0	0.58	23.0	0.0
S9.001	49.43	6.16	107.800	0.000	0.0	0.0	0.0	5.48	217.8	0.0
S5.010	40.40	9.15	106.710	0.581	0.0	0.0	0.0	1.03	163.4	64.0
S1.013	39.78	9.42	106.616	1.164	0.0	0.0	0.0	1.04	225.9	125.4
S10.000	49.48	6.15	107.810	0.000	0.0	0.0	0.0	0.57	22.9	0.0
S10.001	49.43	6.16	107.800	0.000	0.0	0.0	0.0	5.62	223.3	0.0
S1.014	38.86	9.85	104.866	1.184	0.0	0.0	0.0	2.45	9723.4	125.4
S1.015	38.75	9.91	104.740	1.204	0.0	0.0	0.0	2.45	9722.0	126.3
S1.016	38.59	9.98	104.724	1.204	0.0	0.0	0.0	1.09	307.5	126.3
S11.000	49.73	6.08	107.810	0.000	0.0	0.0	0.0	0.99	215.4	0.0
S11.001	49.69	6.09	107.800	0.000	0.0	0.0	0.0	10.37	2244.0	0.0
S1.017	36.49	11.08	104.714	1.219	0.0	0.0	0.0	1.05	227.4	126.3
S1.018	36.12	11.29	104.560	1.219	0.0	0.0	0.0	5.48	1186.1	126.3
S1.019	35.53	11.63	100.500	1.219	0.0	0.0	0.0	4.73	1023.7	126.3
S1.020	34.89	12.02	96.200	1.219	0.0	0.0	0.0	4.14	896.8	126.3
S1.021	34.14	12.50	92.900	1.219	0.0	0.0	0.0	3.48	754.1	126.3

Cavendish House  
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Cotefield Farm, Bodicote  
SWS Network 1



Date 16.01.2017  
File 15031 - SWS Network 1

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Network Design Table for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Auto Design
S1.022	53.782	0.554	97.1	0.000	0.00	0.0	0.600		o	525	
S1.023	43.981	0.088	499.8	0.000	0.00	0.0		0.450 3 \=/		525	
S1.024	14.237	0.028	508.5	0.000	0.00	0.0		0.450 3 \=/		525	

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)
S1.022	33.55	12.89	90.500	1.219	0.0	0.0	0.0	2.27	492.2	126.3
S1.023	20.02	30.00	89.946	1.219	0.0	0.0	0.0	0.02	3.1<	126.3
S1.024	20.02	30.00	89.858	1.219	0.0	0.0	0.0	0.02	3.1<	126.3

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Manhole Schedules for 15031 - SWS NETWORK 1 2017.05.08.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S2	115.061	1.661	Open Manhole	1200	S1.000	113.400	225				
S4	115.266	1.962	Open Manhole	1200	S1.001	113.304	225	S1.000	113.304	225	
S6	115.742	1.592	Open Manhole	1200	S2.000	114.150	225				
S8	115.459	1.609	Open Manhole	1200	S3.000	113.850	225				
S10	115.326	2.236	Open Manhole	1200	S1.002	113.090	300	S1.001	113.165	225	
								S2.000	113.165	225	
								S3.000	113.165	225	
S12	114.872	1.896	Open Manhole	1200	S1.003	112.976	300	S1.002	112.976	300	
S14	113.671	1.496	Open Manhole	1200	S1.004	112.175	300	S1.003	112.175	300	
S16	113.319	1.575	Open Manhole	1500	S1.005	111.744	375	S1.004	111.819	300	
S18	112.654	1.804	Open Manhole	1500	S1.006	110.850	375	S1.005	110.850	375	
S20	112.599	2.599	Open Manhole	1500	S1.007	110.000	375	S1.006	110.000	375	
S22	113.099	3.170	Open Manhole	1500	S1.008	109.929	375	S1.007	109.929	375	
S24	113.554	3.688	Open Manhole	1500	S1.009	109.866	375	S1.008	109.866	375	
S26	114.360	1.440	Open Manhole	1200	S4.000	112.920	225				
S28	114.226	2.143	Open Manhole	1200	S4.001	112.083	225	S4.000	112.083	225	
S30	113.727	3.921	Open Manhole	1500	S1.010	109.806	375	S1.009	109.806	375	
								S4.001	109.956	225	
S32	114.385	4.642	Open Manhole	1500	S1.011	109.743	375	S1.010	109.743	375	
S34	114.181	4.482	Open Manhole	1500	S1.012	109.699	375	S1.011	109.699	375	
S36	115.765	1.515	Open Manhole	1200	S5.000	114.250	225				
S38	114.848	1.471	Open Manhole	1200	S5.001	113.377	225	S5.000	113.377	225	
S40	114.126	1.436	Open Manhole	1200	S6.000	112.690	225				
S42	113.600	1.150	Open Manhole	1200	S6.001	112.450	225	S6.000	112.450	225	
S44	113.762	1.562	Open Manhole	1200	S6.002	112.200	225	S6.001	112.200	225	
S46	113.173	3.290	Open Manhole	1200	S5.002	109.883	300	S5.001	109.958	225	
								S6.002	109.958	225	
S48	112.651	3.119	Open Manhole	1200	S5.003	109.532	300	S5.002	109.532	300	
S50	110.137	2.275	Open Manhole	1200	S5.004	107.862	300	S5.003	107.862	300	
SHD1	112.223	1.523	Open Manhole	1200	S7.000	110.700	225				
SHD2	109.976	2.061	Open Manhole	1200	S7.001	107.915	225	S7.000	107.915	225	
SHD3	109.060	1.360	Open Manhole	1200	S7.002	107.700	225	S7.001	107.700	225	
S52	109.778	2.478	Open Manhole	1500	S5.005	107.300	450	S5.004	107.450	300	
								S7.002	107.525	225	
S54	110.794	3.587	Open Manhole	1500	S5.006	107.207	450	S5.005	107.207	450	
S56	111.248	4.111	Open Manhole	1500	S5.007	107.137	450	S5.006	107.137	450	
S58	112.501	5.470	Open Manhole	1500	S5.008	107.031	450	S5.007	107.031	450	

Cavendish House  
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 Halesowen W.Midlands B63 3HN

Cotefield Farm, Bodicote  
 SWS Network 1



Date 16.01.2017  
 File 15031 - SWS Network 1

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Manhole Schedules for 15031 - SWS NETWORK 1 2017.05.08.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backd (mm)
S60	113.328	3.771	Open Manhole	1200	S8.000	109.557	225				
S62	112.531	5.786	Open Manhole	1500	S5.009	106.745	450	S5.008	106.745	450	
								S8.000	106.970	225	
SCS1	112.982	5.172	Open Manhole	1200	S9.000	107.810	225				
SCS1	112.982	5.182	Open Manhole	1200	S9.001	107.800	225	S9.000	107.800	225	
S64	112.982	6.272	Open Manhole	1500	S5.010	106.710	450	S5.009	106.710	450	
								S9.001	106.935	225	
S66	113.122	6.506	Open Manhole	1500	S1.013	106.616	525	S1.012	106.766	375	
								S5.010	106.691	450	
SCS2	112.500	4.690	Open Manhole	1200	S10.000	107.810	225				
SCS2	112.500	4.700	Open Manhole	1200	S10.001	107.800	225	S10.000	107.800	225	
S68	112.322	7.456	Open Manhole	3600	S1.014	104.866	2250	S1.013	106.591	525	
								S10.001	106.891	225	
S70	112.149	7.409	Open Manhole	1200	S1.015	104.740	2250	S1.014	104.740	2250	
S72	111.527	6.803	Open Manhole	1200	S1.016	104.724	600	S1.015	104.724	2250	
SCS3	111.603	3.793	Open Manhole	1500	S11.000	107.810	525				
SCS3	111.427	3.627	Open Manhole	1500	S11.001	107.800	525	S11.000	107.800	525	
S74	111.329	6.615	Open Manhole	3600	S1.017	104.714	525	S1.016	104.714	600	
								S11.001	106.739	525	
S76	107.723	3.163	Open Manhole	1200	S1.018	104.560	525	S1.017	104.560	525	
S78	102.482	1.982	Open Manhole	1500	S1.019	100.500	525	S1.018	100.500	525	
S80	97.938	1.738	Open Manhole	1500	S1.020	96.200	525	S1.019	96.200	525	
S82	94.576	1.676	Open Manhole	1500	S1.021	92.900	525	S1.020	92.900	525	
S84	92.155	1.655	Open Manhole	1500	S1.022	90.500	525	S1.021	90.500	525	
SOF1	91.319	1.373	Open Manhole	1500	S1.023	89.946	525	S1.022	89.946	525	
SSWALE	90.785	0.927	Open Manhole	1500	S1.024	89.858	525	S1.023	89.858	525	
SEXGDITCH	90.500	0.670	Open Manhole	1050		OUTFALL		S1.024	89.830	525	

Cavendish House  
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Cotefield Farm, Bodicote  
SWS Network 1



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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S2	115.061	113.400	1.436	Open Manhole	1200
S1.001	o	225	S4	115.266	113.304	1.737	Open Manhole	1200
S2.000	o	225	S6	115.742	114.150	1.367	Open Manhole	1200
S3.000	o	225	S8	115.459	113.850	1.384	Open Manhole	1200
S1.002	o	300	S10	115.326	113.090	1.936	Open Manhole	1200
S1.003	o	300	S12	114.872	112.976	1.596	Open Manhole	1200
S1.004	o	300	S14	113.671	112.175	1.196	Open Manhole	1200
S1.005	o	375	S16	113.319	111.744	1.200	Open Manhole	1500
S1.006	o	375	S18	112.654	110.850	1.429	Open Manhole	1500
S1.007	o	375	S20	112.599	110.000	2.224	Open Manhole	1500
S1.008	o	375	S22	113.099	109.929	2.795	Open Manhole	1500
S1.009	o	375	S24	113.554	109.866	3.313	Open Manhole	1500
S4.000	o	225	S26	114.360	112.920	1.215	Open Manhole	1200
S4.001	o	225	S28	114.226	112.083	1.918	Open Manhole	1200
S1.010	o	375	S30	113.727	109.806	3.546	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	15.778	164.4	S4	115.266	113.304	1.737	Open Manhole	1200
S1.001	23.213	167.0	S10	115.326	113.165	1.936	Open Manhole	1200
S2.000	17.584	17.9	S10	115.326	113.165	1.936	Open Manhole	1200
S3.000	11.509	16.8	S10	115.326	113.165	1.936	Open Manhole	1200
S1.002	19.036	167.0	S12	114.872	112.976	1.596	Open Manhole	1200
S1.003	50.257	62.7	S14	113.671	112.175	1.196	Open Manhole	1200
S1.004	14.704	41.3	S16	113.319	111.819	1.200	Open Manhole	1500
S1.005	25.186	28.2	S18	112.654	110.850	1.429	Open Manhole	1500
S1.006	17.298	20.4	S20	112.599	110.000	2.224	Open Manhole	1500
S1.007	22.140	311.8	S22	113.099	109.929	2.795	Open Manhole	1500
S1.008	19.772	313.8	S24	113.554	109.866	3.313	Open Manhole	1500
S1.009	18.847	314.1	S30	113.727	109.806	3.546	Open Manhole	1500
S4.000	6.835	8.2	S28	114.226	112.083	1.918	Open Manhole	1200
S4.001	12.759	6.0	S30	113.727	109.956	3.546	Open Manhole	1500
S1.010	19.837	314.9	S32	114.385	109.743	4.267	Open Manhole	1500

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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.011	o	375	S32	114.385	109.743	4.267	Open Manhole	1500
S1.012	o	375	S34	114.181	109.699	4.107	Open Manhole	1500
S5.000	o	225	S36	115.765	114.250	1.290	Open Manhole	1200
S5.001	o	225	S38	114.848	113.377	1.246	Open Manhole	1200
S6.000	o	225	S40	114.126	112.690	1.211	Open Manhole	1200
S6.001	o	225	S42	113.600	112.450	0.925	Open Manhole	1200
S6.002	o	225	S44	113.762	112.200	1.337	Open Manhole	1200
S5.002	o	300	S46	113.173	109.883	2.990	Open Manhole	1200
S5.003	o	300	S48	112.651	109.532	2.819	Open Manhole	1200
S5.004	o	300	S50	110.137	107.862	1.975	Open Manhole	1200
S7.000	o	225	SHD1	112.223	110.700	1.298	Open Manhole	1200
S7.001	o	225	SHD2	109.976	107.915	1.836	Open Manhole	1200
S7.002	o	225	SHD3	109.060	107.700	1.135	Open Manhole	1200
S5.005	o	450	S52	109.778	107.300	2.028	Open Manhole	1500
S5.006	o	450	S54	110.794	107.207	3.137	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.011	13.678	310.9	S34	114.181	109.699	4.107	Open Manhole	1500
S1.012	27.821	9.5	S66	113.122	106.766	5.981	Open Manhole	1500
S5.000	22.624	25.9	S38	114.848	113.377	1.246	Open Manhole	1200
S5.001	34.708	10.2	S46	113.173	109.958	2.990	Open Manhole	1200
S6.000	8.097	33.7	S42	113.600	112.450	0.925	Open Manhole	1200
S6.001	8.524	34.1	S44	113.762	112.200	1.337	Open Manhole	1200
S6.002	33.930	15.1	S46	113.173	109.958	2.990	Open Manhole	1200
S5.002	20.655	58.8	S48	112.651	109.532	2.819	Open Manhole	1200
S5.003	41.833	25.0	S50	110.137	107.862	1.975	Open Manhole	1200
S5.004	9.196	22.3	S52	109.778	107.450	2.028	Open Manhole	1500
S7.000	44.484	16.0	SHD2	109.976	107.915	1.836	Open Manhole	1200
S7.001	35.845	166.7	SHD3	109.060	107.700	1.135	Open Manhole	1200
S7.002	20.469	117.0	S52	109.778	107.525	2.028	Open Manhole	1500
S5.005	35.787	384.8	S54	110.794	107.207	3.137	Open Manhole	1500
S5.006	26.879	384.0	S56	111.248	107.137	3.661	Open Manhole	1500

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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.007	o	450	S56	111.248	107.137	3.661	Open Manhole	1500
S5.008	o	450	S58	112.501	107.031	5.020	Open Manhole	1500
S8.000	o	225	S60	113.328	109.557	3.546	Open Manhole	1200
S5.009	o	450	S62	112.531	106.745	5.336	Open Manhole	1500
S9.000	o	225	SCS1	112.982	107.810	4.947	Open Manhole	1200
S9.001	o	225	SCS1	112.982	107.800	4.957	Open Manhole	1200
S5.010	o	450	S64	112.982	106.710	5.822	Open Manhole	1500
S1.013	o	525	S66	113.122	106.616	5.981	Open Manhole	1500
S10.000	o	225	SCS2	112.500	107.810	4.465	Open Manhole	1200
S10.001	o	225	SCS2	112.500	107.800	4.475	Open Manhole	1200
S1.014	o	2250	S68	112.322	104.866	5.206	Open Manhole	3600
S1.015	o	2250	S70	112.149	104.740	5.159	Open Manhole	1200
S1.016	o	600	S72	111.527	104.724	6.203	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.007	40.810	385.0	S58	112.501	107.031	5.020	Open Manhole	1500
S5.008	8.857	31.0	S62	112.531	106.745	5.336	Open Manhole	1500
S8.000	15.524	6.0	S62	112.531	106.970	5.336	Open Manhole	1500
S5.009	13.284	379.6	S64	112.982	106.710	5.822	Open Manhole	1500
S9.000	5.000	500.0	SCS1	112.982	107.800	4.957	Open Manhole	1200
S9.001	5.000	5.8	S64	112.982	106.935	5.822	Open Manhole	1500
S5.010	7.352	386.9	S66	113.122	106.691	5.981	Open Manhole	1500
S1.013	11.422	455.0	S68	112.322	106.591	5.206	Open Manhole	3600
S10.000	5.053	505.3	SCS2	112.500	107.800	4.475	Open Manhole	1200
S10.001	5.000	5.5	S68	112.322	106.891	5.206	Open Manhole	3600
S1.014	63.156	501.2	S70	112.149	104.740	5.159	Open Manhole	1200
S1.015	8.022	501.4	S72	111.527	104.724	4.553	Open Manhole	1200
S1.016	4.950	495.0	S74	111.329	104.714	6.015	Open Manhole	3600



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PIPELINE SCHEDULES for 15031 - SWS NETWORK 1 2017.05.08.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.000	o	525	SCS3	111.603	107.810	3.268	Open Manhole	1500
S11.001	o	525	SCS3	111.427	107.800	3.102	Open Manhole	1500
S1.017	o	525	S74	111.329	104.714	6.090	Open Manhole	3600
S1.018	o	525	S76	107.723	104.560	2.638	Open Manhole	1200
S1.019	o	525	S78	102.482	100.500	1.457	Open Manhole	1500
S1.020	o	525	S80	97.938	96.200	1.213	Open Manhole	1500
S1.021	o	525	S82	94.576	92.900	1.151	Open Manhole	1500
S1.022	o	525	S84	92.155	90.500	1.130	Open Manhole	1500
S1.023	3 \=/	525	SOF1	91.319	89.946	1.223	Open Manhole	1500
S1.024	3 \=/	525	SSWALE	90.785	89.858	0.777	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.000	5.000	500.0	SCS3	111.427	107.800	3.102	Open Manhole	1500
S11.001	5.000	4.7	S74	111.329	106.739	4.065	Open Manhole	3600
S1.017	69.174	449.2	S76	107.723	104.560	2.638	Open Manhole	1200
S1.018	68.320	16.8	S78	102.482	100.500	1.457	Open Manhole	1500
S1.019	97.079	22.6	S80	97.938	96.200	1.213	Open Manhole	1500
S1.020	96.999	29.4	S82	94.576	92.900	1.151	Open Manhole	1500
S1.021	99.638	41.5	S84	92.155	90.500	1.130	Open Manhole	1500
S1.022	53.782	97.1	SOF1	91.319	89.946	0.848	Open Manhole	1500
S1.023	43.981	499.8	SSWALE	90.785	89.858	0.777	Open Manhole	1500
S1.024	14.237	508.5	SEXGDITCH	90.500	89.830	0.520	Open Manhole	1050

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Cotefield Farm, Bodicote  
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Area Summary for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.023	0.023	0.023
1.001	-	-	100	0.024	0.024	0.024
2.000	-	-	100	0.034	0.034	0.034
3.000	-	-	100	0.019	0.019	0.019
1.002	-	-	100	0.013	0.013	0.013
1.003	-	-	100	0.050	0.050	0.050
1.004	-	-	100	0.010	0.010	0.010
1.005	-	-	100	0.020	0.020	0.020
1.006	-	-	100	0.045	0.045	0.045
1.007	-	-	100	0.072	0.072	0.072
1.008	-	-	100	0.038	0.038	0.038
1.009	-	-	100	0.038	0.038	0.038
4.000	-	-	100	0.042	0.042	0.042
4.001	-	-	100	0.009	0.009	0.009
1.010	-	-	100	0.014	0.014	0.014
1.011	-	-	100	0.009	0.009	0.009
1.012	-	-	100	0.083	0.083	0.083
5.000	-	-	100	0.056	0.056	0.056
5.001	-	-	100	0.027	0.027	0.027
6.000	-	-	100	0.034	0.034	0.034
6.001	-	-	100	0.025	0.025	0.025
6.002	-	-	100	0.071	0.071	0.071
5.002	-	-	100	0.017	0.017	0.017
5.003	-	-	100	0.058	0.058	0.058
5.004	-	-	100	0.028	0.028	0.028
7.000	-	-	100	0.040	0.040	0.040
7.001	-	-	100	0.013	0.013	0.013
7.002	-	-	100	0.059	0.059	0.059
5.005	-	-	100	0.028	0.028	0.028
5.006	-	-	100	0.022	0.022	0.022
5.007	-	-	100	0.031	0.031	0.031
5.008	-	-	100	0.020	0.020	0.020
8.000	-	-	100	0.026	0.026	0.026
5.009	-	-	100	0.026	0.026	0.026
9.000	-	-	100	0.000	0.000	0.000
9.001	-	-	100	0.000	0.000	0.000
5.010	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.040	0.040	0.040
10.000	-	-	100	0.000	0.000	0.000
10.001	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.020	0.020	0.020
1.015	-	-	100	0.020	0.020	0.020
1.016	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.000	0.000	0.000
11.001	-	-	100	0.000	0.000	0.000
1.017	-	-	100	0.015	0.015	0.015
1.018	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000

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Area Summary for 15031 - SWS NETWORK 1 2017.05.08.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.022	-	-	100	0.000	0.000	0.000
1.023	-	-	100	0.000	0.000	0.000
1.024	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.219	1.219	1.219

Free Flowing Outfall Details for 15031 - SWS NETWORK 1 2017.05.08.SWS


Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.024	SEXGDITCH	90.500	89.830	0.000	1050	0

Simulation Criteria for 15031 - SWS NETWORK 1 2017.05.08.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	4.000
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	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

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)	19.800	Storm Duration (mins)	30
Ratio R	0.403		

Banners Gate Ltd		Page 13
Cavendish House 10-11 Birmingham Street Halesowen W.Midlands B63 3HN	Cotefield Farm, Bodicote SWS Network 1	
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Online Controls for 15031 - SWS NETWORK 1 2017.05.08.SWS

Hydro-Brake Optimum<sup>®</sup> Manhole: S74, DS/PN: S1.017, Volume (m<sup>3</sup>): 68.6

Unit Reference MD-SHE-0077-5100-4346-5100  
 Design Head (m) 4.346  
 Design Flow (l/s) 5.1  
 Flush-Flo<sup>™</sup> Calculated  
 Objective Minimise upstream storage  
 Diameter (mm) 77  
 Invert Level (m) 104.714  
 Minimum Outlet Pipe Diameter (mm) 100  
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	4.346	5.1	Kick-Flo <sup>®</sup>	0.687	2.2
Flush-Flo <sup>™</sup>	0.340	2.7	Mean Flow over Head Range	-	3.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum<sup>®</sup> as specified. Should another type of control device other than a Hydro-Brake Optimum<sup>®</sup> 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	2.1	1.200	2.8	3.000	4.3	7.000	6.4
0.200	2.6	1.400	3.0	3.500	4.6	7.500	6.6
0.300	2.7	1.600	3.2	4.000	4.9	8.000	6.8
0.400	2.7	1.800	3.4	4.500	5.2	8.500	7.0
0.500	2.6	2.000	3.5	5.000	5.4	9.000	7.2
0.600	2.5	2.200	3.7	5.500	5.7	9.500	7.4
0.800	2.3	2.400	3.9	6.000	5.9		
1.000	2.6	2.600	4.0	6.500	6.2		

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Storage Structures for 15031 - SWS NETWORK 1 2017.05.08.SWS

Cellular Storage Manhole: SCS1, DS/PN: S9.000

Invert Level (m) 107.810 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 <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	63.0	63.0	2.600	0.0	104.3
0.200	63.0	69.3	2.800	0.0	104.3
0.400	63.0	75.7	3.000	0.0	104.3
0.600	63.0	82.0	3.200	0.0	104.3
0.800	63.0	88.4	3.400	0.0	104.3
1.000	63.0	94.7	3.600	0.0	104.3
1.200	63.0	101.1	3.800	0.0	104.3
1.400	0.0	104.3	4.000	0.0	104.3
1.600	0.0	104.3	4.200	0.0	104.3
1.800	0.0	104.3	4.400	0.0	104.3
2.000	0.0	104.3	4.600	0.0	104.3
2.200	0.0	104.3	4.800	0.0	104.3
2.400	0.0	104.3	5.000	0.0	104.3

Cellular Storage Manhole: SCS2, DS/PN: S10.000

Invert Level (m) 107.810 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 <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	200.0	200.0	2.600	0.0	273.5
0.200	200.0	211.3	2.800	0.0	273.5
0.400	200.0	222.6	3.000	0.0	273.5
0.600	200.0	233.9	3.200	0.0	273.5
0.800	200.0	245.3	3.400	0.0	273.5
1.000	200.0	256.6	3.600	0.0	273.5
1.200	200.0	267.9	3.800	0.0	273.5
1.400	0.0	273.5	4.000	0.0	273.5
1.600	0.0	273.5	4.200	0.0	273.5
1.800	0.0	273.5	4.400	0.0	273.5
2.000	0.0	273.5	4.600	0.0	273.5
2.200	0.0	273.5	4.800	0.0	273.5
2.400	0.0	273.5	5.000	0.0	273.5

Cellular Storage Manhole: SCS3, DS/PN: S11.000

Invert Level (m) 107.810 Safety Factor 2.0  
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00000

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Halesowen W.Midlands B63 3HN

Cotefield Farm, Bodicote  
SWS Network 1



Date 16.01.2017  
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Cellular Storage Manhole: SCS3, DS/PN: S11.000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	40.0	40.0	2.600	0.0	72.9
0.200	40.0	45.1	2.800	0.0	72.9
0.400	40.0	50.1	3.000	0.0	72.9
0.600	40.0	55.2	3.200	0.0	72.9
0.800	40.0	60.2	3.400	0.0	72.9
1.000	40.0	65.3	3.600	0.0	72.9
1.200	40.0	70.4	3.800	0.0	72.9
1.400	0.0	72.9	4.000	0.0	72.9
1.600	0.0	72.9	4.200	0.0	72.9
1.800	0.0	72.9	4.400	0.0	72.9
2.000	0.0	72.9	4.600	0.0	72.9
2.200	0.0	72.9	4.800	0.0	72.9
2.400	0.0	72.9	5.000	0.0	72.9



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Cavendish House 10-11 Birmingham Street Halesowen W.Midlands B63 3HN		Cotefield Farm, Bodicote SWS Network 1
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S6.000	30	Summer	100	+40%				
S6.001	30	Summer	100	+40%				
S6.002	30	Summer	100	+40%				
S5.002	30	Summer	100	+40%				
S5.003	30	Summer	100	+40%				
S5.004	720	Winter	100	+40%	100/30	Summer		
S7.000	30	Summer	100	+40%				
S7.001	960	Winter	100	+40%	100/30	Summer		
S7.002	960	Winter	100	+40%	100/30	Summer	100/480	Winter
S5.005	960	Winter	100	+40%	100/30	Summer		5
S5.006	960	Winter	100	+40%	100/30	Summer		
S5.007	960	Winter	100	+40%	100/30	Summer		
S5.008	960	Winter	100	+40%	100/30	Summer		
S8.000	30	Summer	100	+40%				
S5.009	960	Winter	100	+40%	100/30	Summer		
S9.000	720	Winter	100	+40%	100/30	Winter		
S9.001	720	Winter	100	+40%	100/30	Summer		
S5.010	720	Winter	100	+40%	100/30	Summer		
S1.013	720	Winter	100	+40%	100/30	Summer		
S10.000	720	Winter	100	+40%	100/60	Summer		
S10.001	720	Winter	100	+40%	100/30	Summer		
S1.014	720	Winter	100	+40%	100/30	Summer		
S1.015	720	Winter	100	+40%	100/30	Summer		
S1.016	720	Winter	100	+40%	100/30	Summer		
S11.000	720	Winter	100	+40%	100/60	Winter		
S11.001	720	Winter	100	+40%	100/60	Winter		
S1.017	720	Winter	100	+40%	100/30	Summer		
S1.018	720	Winter	100	+40%				
S1.019	720	Winter	100	+40%				
S1.020	720	Winter	100	+40%				
S1.021	720	Winter	100	+40%				
S1.022	720	Winter	100	+40%				
S1.023	720	Winter	100	+40%				
S1.024	720	Winter	100	+40%				

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap. (l/s)	O'flow (l/s)	Flow (l/s)	
S1.000	S2	113.488	-0.137	0.000	0.32	0.0	11.4	OK
S1.001	S4	113.439	-0.090	0.000	0.66	0.0	24.3	OK
S2.000	S6	114.209	-0.166	0.000	0.15	0.0	17.0	OK
S3.000	S8	113.895	-0.180	0.000	0.09	0.0	9.5	OK
S1.002	S10	113.291	-0.099	0.000	0.77	0.0	57.1	OK
S1.003	S12	113.151	-0.125	0.000	0.62	0.0	82.6	OK
S1.004	S14	112.346	-0.129	0.000	0.60	0.0	87.5	OK
S1.005	S16	111.885	-0.234	0.000	0.30	0.0	97.3	OK
S1.006	S18	111.380	0.155	0.000	0.30	0.0	110.0	SURCHARGED
S1.007	S20	111.068	0.693	0.000	1.41	0.0	135.4	SURCHARGED



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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1 2017.05.08.SWS

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Flow (l/s)	
S1.008	S22	110.919	0.615	0.000	1.57	0.0	148.1	SURCHARGED
S1.009	S24	110.762	0.521	0.000	1.76	0.0	164.5	SURCHARGED
S4.000	S26	112.981	-0.164	0.000	0.16	0.0	21.0	OK
S4.001	S28	112.139	-0.169	0.000	0.14	0.0	25.8	OK
S1.010	S30	110.581	0.400	0.000	2.04	0.0	192.0	SURCHARGED
S1.011	S32	110.312	0.194	0.000	2.25	0.0	196.4	SURCHARGED
S1.012	S34	109.866	-0.208	0.000	0.40	0.0	226.7	OK
S5.000	S36	114.334	-0.141	0.000	0.30	0.0	27.9	OK
S5.001	S38	113.457	-0.145	0.000	0.28	0.0	42.6	OK
S6.000	S40	112.766	-0.149	0.000	0.25	0.0	17.0	OK
S6.001	S42	112.554	-0.121	0.000	0.43	0.0	30.6	OK
S6.002	S44	112.322	-0.103	0.000	0.55	0.0	69.7	OK
S5.002	S46	110.120	-0.063	0.000	0.96	0.0	122.0	OK
S5.003	S48	109.728	-0.104	0.000	0.74	0.0	154.4	OK
S5.004	S50	109.107	0.945	0.000	0.09	0.0	15.3	SURCHARGED
S7.000	SHD1	110.760	-0.165	0.000	0.16	0.0	20.0	OK
S7.001	SHD2	109.102	0.962	0.000	0.05	0.0	1.9	SURCHARGED
S7.002	SHD3	109.102	1.177	42.165	0.10	0.0	4.3	FLOOD
S5.005	S52	109.105	1.355	0.000	0.12	0.0	17.0	SURCHARGED
S5.006	S54	109.105	1.448	0.000	0.13	0.0	17.8	SURCHARGED
S5.007	S56	109.106	1.519	0.000	0.13	0.0	18.8	SURCHARGED
S5.008	S58	109.106	1.625	0.000	0.06	0.0	19.5	SURCHARGED
S8.000	S60	109.596	-0.186	0.000	0.07	0.0	13.0	OK
S5.009	S62	109.105	1.910	0.000	0.20	0.0	21.4	SURCHARGED
S9.000	SCS1	109.105	1.070	0.000	0.05	0.0	1.1	SURCHARGED
S9.001	SCS1	109.105	1.080	0.000	0.01	0.0	1.1	SURCHARGED
S5.010	S64	109.105	1.945	0.000	0.26	0.0	24.9	SURCHARGED
S1.013	S66	109.105	1.964	0.000	0.40	0.0	50.2	SURCHARGED
S10.000	SCS2	109.104	1.069	0.000	0.12	0.0	2.8	SURCHARGED
S10.001	SCS2	109.104	1.079	0.000	0.02	0.0	2.9	SURCHARGED
S1.014	S68	109.104	1.988	0.000	0.01	0.0	50.5	SURCHARGED
S1.015	S70	109.105	2.115	0.000	0.01	0.0	25.3	SURCHARGED
S1.016	S72	109.105	3.781	0.000	0.12	0.0	25.2	SURCHARGED
S11.000	SCS3	109.104	0.769	0.000	0.01	0.0	0.8	SURCHARGED
S11.001	SCS3	109.104	0.779	0.000	0.00	0.0	0.9	SURCHARGED
S1.017	S74	109.104	3.865	0.000	0.02	0.0	5.1	SURCHARGED
S1.018	S76	104.572	-0.513	0.000	0.00	0.0	5.1	OK
S1.019	S78	100.513	-0.512	0.000	0.01	0.0	5.1	OK
S1.020	S80	96.215	-0.510	0.000	0.01	0.0	5.1	OK
S1.021	S82	92.918	-0.507	0.000	0.01	0.0	5.1	OK
S1.022	S84	90.529	-0.496	0.000	0.01	0.0	5.1	OK
S1.023	SOF1	90.147	-1.172	0.000	0.01	0.0	5.1	OK
S1.024	SSWALE	90.049	-0.736	0.000	0.04	0.0	5.1	OK

# APPENDIX II – DRAWINGS

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