Melia Smith & Jones
Consulting Civil & Structural Engineers

Project	By	Checked	Job No.
Jack Lunn Ltd	**MH**		**225114**
Drainage Design – Proposed Housing Development – Hanging Heaton	Date 17.03.26	Date	Sheet No. **/ 1**

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Drainage Calculations

225114-MSJ-ZZ-XX-CA-D-0001-S3-P1

Introduction

These calculations are for the foul and surface water drainage systems at a proposed housing development at Hanging Heaton. They are intended to support the planning application associated with this development and to achieve technical approval for any subsequent sewer adoption process.

Existing Site

The existing site is an irregularly shaped plot covering an area of appropriately 0.85ha located off Heaton Grange, Hanging Heaton. It is approximately 1.5km North East Of Dewsbury. See Appendix A for location Plan. The site is completely undeveloped and is currently overgrown with vegetation. The site generally falls from the South to the North at an approximate gradient of 1:13, but falls quite rapidly at the northern and western boundaries. The site has an elongated section at the north east which falls to the east, again shelving away steeply towards the northern boundary. See Appendix B.

The site is bounded by industrial units to the north, residential areas to the south and east and rail lines to the west.

There are existing public foul and surface water sewers crossing the site, and public sewers located in the adjacent road network to the west and in domestic gardens to the south. See Appendix C.

Existing Drainage

The existing site is greenfield and has no surface or foul water discharges. There is an open watercourse beyond the rail lines approximately 250m to the West and an open watercourses (Greenhill Beck) approximately 650m to the East. As mentioned above, there are several public sewers that cross or are adjacent to the site.

Drainage Philosophy

In accordance with Approved Doc H, surface water should, in order of priority, discharge to

- The site itself via infiltration
- A local watercourse
- Surface water sewer
- Combined sewer

In addition to this, planning policy dictates that new development should utilise sustainable drainage systems (SuDS) wherever possible.

Infiltration testing has been carried out although the results are not available at this time. The testing demonstrated that disposal of surface water on site via soakaways is technically feasible. However as the site is substantially elevated to the over the road to the west, the housing to the east and the industrial units to the north, it is considered that the use of soakaways would present an unacceptable risk of surface water re emergence, and soakaways have therefore been discounted.

The watercourses to the East and West are inaccessible due to the railway to the west and housing developments to the East. The watercourse to the east is also 650m away. Disposal of surface water to watercourse has therefore been discounted.

There are both foul and surface water public sewers crossing the site. A pre planning enquiry was made to Yorkshire Water (see Appendix D) and they have stated that, subject to a satisfactory explanation as to why disposal to soakaway or watercourse in not viable, foul and surface water may discharge into the public sewers located in Mill Lane to the West.

It is considered however that due to the slope down from the site down to Mill Lane and the presence of an old stone retaining wall along the boundary, connecting to the public sewers in Mill Lane will not be possible.

Subsequent correspondence with Yorkshire Water has however shown that connection both foul and surface water to the public sewer crossing the site is a more technically appropriate solution. The surface water flow restriction has however been reduced to 2.5 litres per second. See Appendix E.

<u>SuDS Analysis</u>

Planning Policy dictates that SuDS systems should be used wherever possible. Of these systems, infiltration methods of disposal such as soakaways or infiltration basins have been discounted on this site, due to the potential of surface water re emergence on the adjacent sites.

SuDS systems are however not limited to systems that simply dispose of water and other components can be used to convey and treat surface water on site. Examples of such systems are:-

- Swales
- Filter Strips of drains
- Permeable paving
- Green roofs
- Detention ponds
- Attenuation tanks

Linear features such as swales and filter strips are generally located adjacent to highways and are intended to accept sheet flow from roads and areas of hardstanding. They require an area of green space adjacent to roads. The layout for planning is designed in such a way that in many cases the private parking bays are immediately adjacent to the highway. There is very little green space adjacent to most of the highways and private drives. Linear Suds features such swales, filter strips and drains are therefore not considered viable on this site.

Green roofs generally require relatively flat roof to be able to work effectively. As this is a housing development which uses pitched roofs, green roofs are not considered viable.

Permeable paving is most effective when the ground is suitable for infiltration. Additionally, permeable paving is unsuitable for adopted highways. For these reasons, permeable paving has been discounted.

Detention basins and attenuation tanks are both viable and as there is a surface flow restriction on this site, some form of attenuation is necessary. Both systems temporarily store water during heavy rainfall. An underground tank is the preferred option on this site as there is an inherent safety risk with open bodies of water, plus the space required for a detention basin is likely to be too great at this site

Based on the above, it is prosed to drain this site with and underground system of pipes to an underground attenuation tank. Discharge from the tank will flow via a flow control set at 2.5 l/sec to the public surface water sewer crossing the site.

Additionally the surface water system will be designed to the following standards:

- System will not surcharge for 1 year RP events
- System will surcharge but not flood for 30 year + 40% CC RP events
- System will flood for 100 year +45 %CC but that any floodwater will be managed in such a way that it will not pose a risk to property
- A 10% Urban creep factor will be used (for domestic areas only, not public highway)

- Flood flow paths will be identified to assess the risks to properties in the event of exceedance or sewer failure.

<u>Maintenance</u>

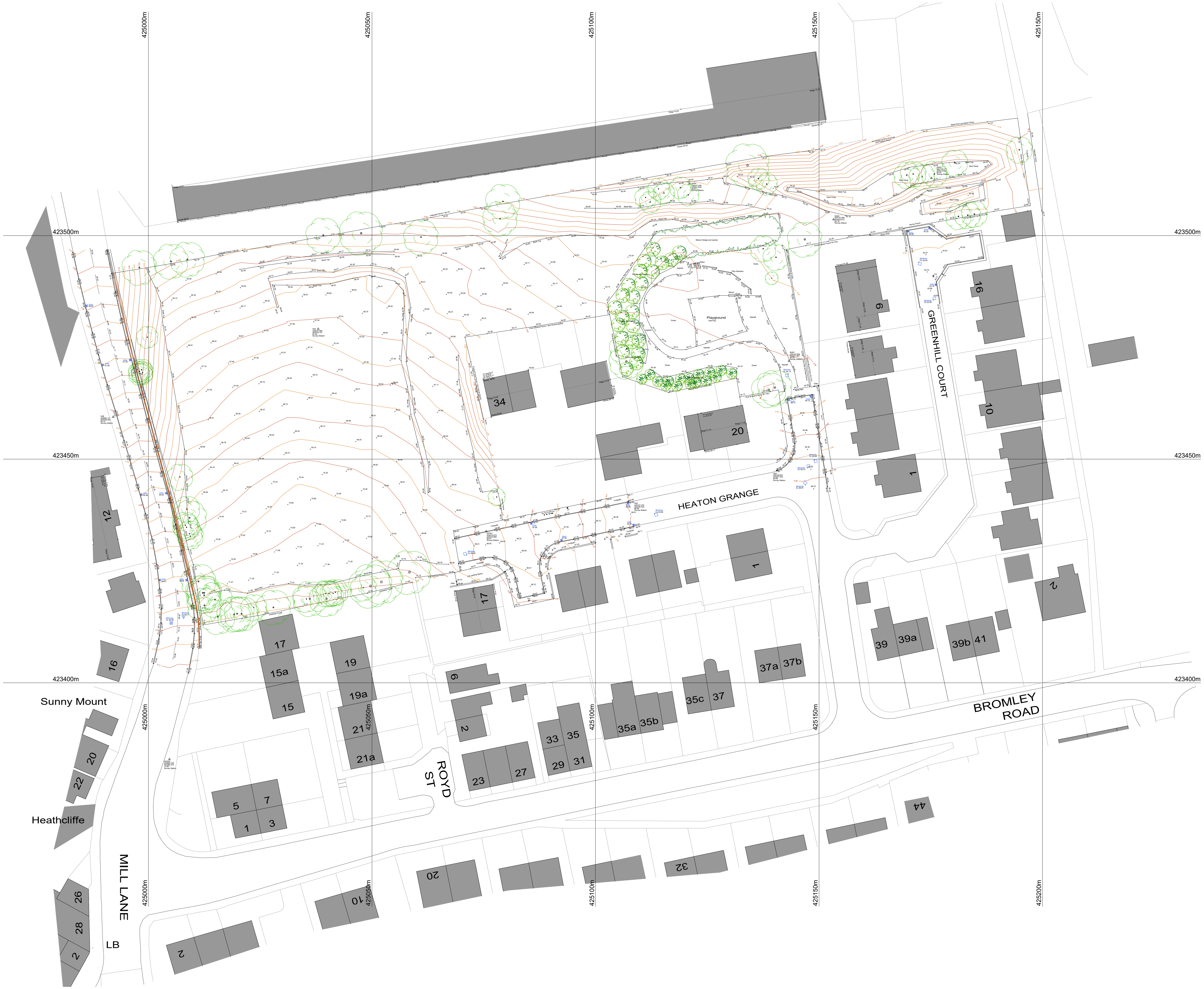
It is essential that surface water systems are adequately maintained to ensure their long term performance. Attenuation tanks require maintenance and also silt removal facilities to ensure that the volume in the tank is maintained and also to help reduce the likelihood blockages. The private drainage systems will drain via trapped gullies and linear drainage channels that will have silt traps. These must be periodically cleaned out and it will be the responsibility of individual home owners to do this. Road gullies for the adoptable highway will also have silt traps and it will be the responsibility of the local highways authority to ensure that they are adequately maintained.

The attenuation tank and flow controls will be adopted by Yorkshire Water under a Section 104 agreement. The long term maintenance of these elements together with the adopted sewers in the roads will be the responsibility of Yorkshire Water.

<u>Foul Water</u>

Foul water will drain from properties via gravity to a system of underground sewers. These sewers will drain to the public sewers crossing the site. Maintenance of private drains in gardens will be the responsibility of homeowners and the foul sewers in the roads and public open space will be the responsibility of Yorkshire Water.

Appendix A



NOTES:

DO NOT SCALE FROM THIS DRAWING EXCEPT FOR PLANNING PURPOSES

1. This drawing is copyright of Wardman Brown.
2. All dimensions to be verified on site prior to any shop or site works being commenced.
3. Any discrepencies to be reported to the Designer BEFORE any work is put in hand.
4. This drawing must be read in conjunction with relevant consultants and specialists drawings.
5. This drawing must be read in conjunction with the drawings specified.

HAZARDS:

CDM2015

1. Live services adjacent/on site.
2. Excavations - Ground Collapse
3. Handling major components
4. Working at height - Falling
5. Machinery & Equipment
6. Ensure all blockwork has a minimum crushing strength of 3.5N/mm²
7. The weight of each block must not exceed 20Kg

N

REV DATE DETAILS

REVISIONS:

Wardman Brown

113 Stanhope Road South
Darlington, DL3 7SF
Tel: 01325 460227

info@wardmanbrown.com
www.wardmanbrown.com

CIAT
CHARTERED PRACTICE

CLIENT:
Mandale

PROJECT:
Bromley Lane - Batley

DRAWING TITLE:
Existing Site Layout Plan

PURPOSE OF ISSUE:
PLANNING

SCALE: 1:800 @ A3 / 1:400 @ A1

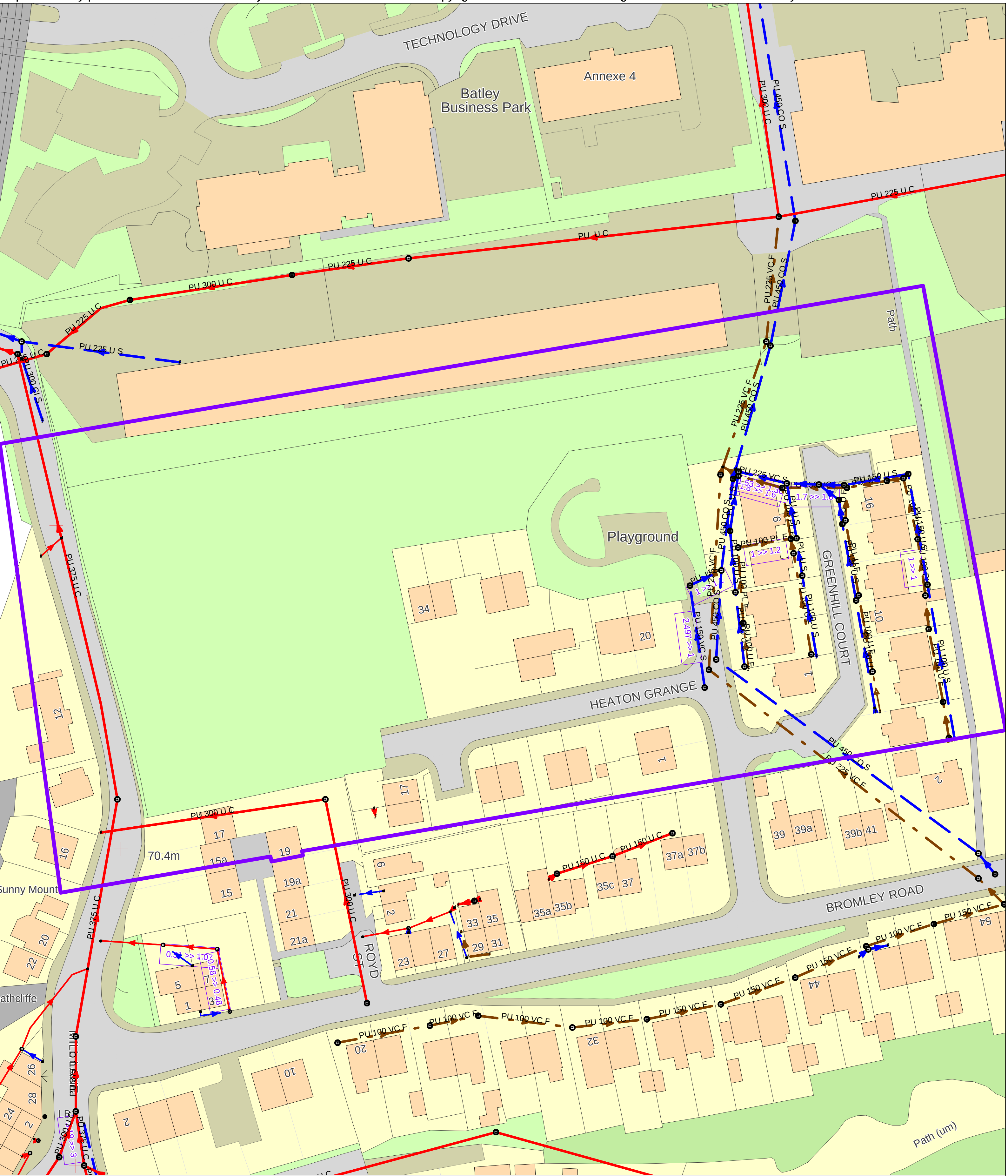
DATE: Nov 2023 | DRAWN: PA | DRG REVISION:

DRAWING NO: L023113 - 101 | -

Appendix B


LEGEND
Survey Station
Sq. Manhole / Inspection Cover
Circular Manhole / Inspection Cover
BT comms Chamber
Comms Cabinet
Bollards
TP - Tel pole
EP - Elec pole
LP - Lamp Column
Gas valve
WM - Water Meter
SV - Water Stop Valve
RS - Road Sign
FH - Fire Hydrant
G - Road Gully
Ticket machine
Pedestrian call button post
PB - Pillar box
Bench seating
Overhead electricity
Planters - PL
Top embankment
Bottom embankment
Tarmac footpath / Surface change
Services Excavation Scar
Tactile paving
Crash barrier fencing
Post & wire fencing
Concrete / paving
Block paving
DAVID
BRIEN
SURVEYING Ltd
57 PARK LEA, SUNDERLAND, SR3 3SZ
Tel: 0191 5202091 email: davidbrien@sky.com
HEATON GRANGE - BATLEY
Scale: 1:1 metric - 1:200 @ A0 - (3D POINTS)
Date: December 2023
Datum: Ordnance Survey Origins

Appendix C



Public Waste Water Network 10/11/2025 09:48:23 OS Grid Coordinates: 424976 : 423326 Map Name : SE2423SE svcGISSafeMovePD

Appendix D

Mr C MacDonald
Haigh Huddleston & Associates Ltd
Firth Buildings
99-101 Leeds Road
Dewsbury
WF12 7BU
Redacted

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax:

Your Ref:
Our Ref: W012049

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on Redacted

27th September 2020

Dear Mr MacDonald,

Heaton Grange, Hanging Heaton, Dewsbury, WF17 6EN - Pre-Planning Sewerage Enquiry for Residential T936860

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul Water

Foul water domestic waste can discharge to the 375 mm diameter public combined sewer recorded in Mill Lane, at a point to the north west of the site.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

As a last resort and subject to providing satisfactory evidence as to why the other methods of surface water disposal have been discounted, curtilage surface water may discharge to the 300 mm diameter public surface water sewer recorded in Mill Lane., at a point to the north west of the site.

The surface water discharge from the site to be restricted to not greater than 3.5 (three point five) litres/second. This permission is not an acceptance in respect to any planning conditions imposed under the Grant of Planning Permission.

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Kind Regards

Chris Roberts
Pre-Development Technician
Developer Services
Tel: Redacted

Appendix E

YorkshireWater

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax:

Email:
planningconsultation@yorkshirewater.co.uk

Mathias Franklin
Head of Planning Services
Kirklees Metropolitan District Council
P.O. Box B93
Civic Centre
Huddersfield
HD1 2JR

Your Ref: 2023/93597
Our Ref: A000519

For telephone enquiries ring:
George Mullaney on 0345 120 8482

2nd December 2024

Dear Sir/Madam,

east of, Mill Lane, and Heaton Grange, Hanging Heaton, Batley, WF17 6EN - Reserved matters application pursuant to outline permission 2020/93777 for erection of residential development (19 dwellings)

Thank you for consulting Yorkshire Water regarding the above proposed development. We have the following comments:

Waste Water

If planning permission is to be granted, the following condition should be attached in order to protect the local aquatic environment and Yorkshire Water infrastructure:

The site shall be developed with separate systems of drainage for foul and surface water on and off site. The separate systems should extend to the points of discharge to be agreed.
(In the interest of satisfactory and sustainable drainage)

There shall be no piped discharge of surface water from the development prior to the completion of surface water drainage works, details of which will have been submitted to

and approved by the Local Planning Authority. If discharge to public sewer is proposed, the information shall include, but not be exclusive to:
i) evidence that other means of surface water drainage have been properly considered and why they have been discounted; and
ii) the means of discharging to the public sewer network at a rate not exceeding 2.5 litres / second
(To ensure that no surface water discharges take place until proper provision has been made for its disposal)

1) The drainage details submitted on drawing 24004-LE-00-ZZ-DR-D-0100 (revision P01) dated 26/06/2024 that has been prepared by Lynas Engineers require amendments. The following point should be addressed:

a) Evidence should be submitted to show that other (than discharge to public sewer) means of surface water disposal have been considered and why they have been discounted

2) The developer is proposing to discharge surface water to public sewer however, sustainable development requires appropriate surface water disposal.

a) Yorkshire Water promote the surface water disposal hierarchy and the developer must provide evidence to demonstrate that surface water disposal via infiltration or watercourse are not reasonably practical before considering disposal to public sewer.
b) The developer and LPA are strongly advised to seek comments on surface water disposal from other drainage bodies as further restrictions may be imposed.
c) As a last resort, The surface water discharge from the proposal to the public surface water sewer network must be restricted so as not to exceed 2.5 (two point five) litres per second.

Yours faithfully

George Mullaney
Town Planning Technician

Microdrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.330	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.188	4-8	0.120

Total Area Contributing (ha) = 0.308

Total Pipe Volume (m³) = 18.440

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	22.998	0.212	108.4	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
1.001	25.940	0.438	59.3	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
2.000	5.529	0.239	23.1	0.039	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.40	68.400	0.020	0.0	0.0	0.0	0.96	17.0	3.6
1.001	50.00	5.73	68.188	0.033	0.0	0.0	0.0	1.31	23.1	5.9
2.000	50.00	5.04	67.989	0.039	0.0	0.0	0.0	2.10	37.2	7.0

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	5.528	0.452	12.2	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	21.676	2.491	8.7	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	5.446	0.113	48.2	0.042	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	12.095	0.124	97.5	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	20.057	0.238	84.3	0.005	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	6.122	0.242	25.3	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	18.145	0.612	29.6	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.000	10.666	0.107	99.8	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	4.830	0.192	25.2	0.066	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	23.328	1.459	16.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.000	4.466	0.100	44.7	0.022	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	30.606	1.425	21.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	50.00	5.03	68.202	0.016	0.0	0.0	0.0	2.90	51.2	2.9
1.002	50.00	5.81	67.675	0.109	0.0	0.0	0.0	4.46	177.5	19.6
4.000	50.00	5.06	65.496	0.042	0.0	0.0	0.0	1.45	25.7	7.6
4.001	50.00	5.26	65.383	0.057	0.0	0.0	0.0	1.02	18.0	10.2
1.003	50.00	6.00	65.109	0.170	0.0	0.0	0.0	1.71	121.1	30.7
5.000	50.00	5.05	65.263	0.013	0.0	0.0	0.0	2.01	35.5	2.3
1.004	50.00	6.11	64.871	0.200	0.0	0.0	0.0	2.90	204.9	36.1
6.000	50.00	5.18	64.516	0.020	0.0	0.0	0.0	1.01	17.8	3.7
7.000	50.00	5.04	64.601	0.066	0.0	0.0	0.0	2.02	35.6	11.9
1.005	50.00	6.21	64.259	0.286	0.0	0.0	0.0	3.95	279.3	51.7
8.000	50.00	5.05	64.000	0.022	0.0	0.0	0.0	1.51	26.7	4.0
1.006	50.00	6.36	62.800	0.308	0.0	0.0	0.0	3.41	240.9	55.7

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.007	28.616	0.377	75.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.008	24.946	0.328	76.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
9.000	24.188	0.098	246.8	0.000	5.00	0.0	0.600	o	375	Pipe/Conduit	
9.001	4.048	0.016	253.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.009	3.456	0.026	132.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.010	7.856	1.424	5.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.007	50.00	6.59	61.300	0.308	0.0	0.0	0.0	2.08	229.9	55.7
1.008	50.00	6.79	60.923	0.308	0.0	0.0	0.0	2.08	229.7	55.7
9.000	50.00	5.35	60.709	0.000	0.0	0.0	0.0	1.15	126.9	0.0
9.001	50.00	5.41	60.611	0.000	0.0	0.0	0.0	1.13	125.3	0.0
1.009	50.00	6.85	60.570	0.308	0.0	0.0	0.0	0.87	15.4«	55.7
1.010	50.00	6.88	60.544	0.308	0.0	0.0	0.0	4.32	76.3	55.7

Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.020	0.020	0.020
1.001	User	-	100	0.013	0.013	0.013
2.000	-	-	100	0.039	0.039	0.039
3.000	-	-	100	0.016	0.016	0.016
1.002	User	-	100	0.021	0.021	0.021
4.000	-	-	100	0.042	0.042	0.042
4.001	User	-	100	0.015	0.015	0.015
1.003	User	-	100	0.005	0.005	0.005
5.000	-	-	100	0.013	0.013	0.013
1.004	User	-	100	0.017	0.017	0.017
6.000	User	-	100	0.020	0.020	0.020
7.000	-	-	100	0.066	0.066	0.066
1.005	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.022	0.022	0.022
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.000	0.000	0.000
9.001	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.308	0.308	0.308

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.010	S21	62.558	59.120	0.000	1200	0

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	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	1
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 Return Period (years) 2

Synthetic Rainfall Details

Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	19.000	Cv (Winter)	0.840
Ratio R	0.330	Storm Duration (mins)	30
Profile Type	Summer		

Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S10, DS/PN: 1.009, Volume (m^3): 6.7

Unit Reference	MD-SHE-0075-2500-1000-2500
Design Head (m)	1.000
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	60.570
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.000	2.5
Flush-Flo™	0.307	2.5
Kick-Flo®	0.627	2.0
Mean Flow over Head Range	-	2.2

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	2.7	3.000	4.1	7.000	6.2
0.200	2.4	1.400	2.9	3.500	4.5	7.500	6.4
0.300	2.5	1.600	3.1	4.000	4.7	8.000	6.6
0.400	2.5	1.800	3.3	4.500	5.0	8.500	6.8
0.500	2.4	2.000	3.4	5.000	5.3	9.000	7.0
0.600	2.1	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.3	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	6.0		

Storage Structures for Surface Network 1

Cellular Storage Manhole: S19, DS/PN: 9.001

Invert Level (m) 60.611 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	306.0	0.0	0.801	0.0	0.0
0.800	306.0	0.0			

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 1
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 Ratio R 0.350
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 19.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 100.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Summer	1	+0%					68.446
1.001	S2	15 Summer	1	+0%	100/15 Summer				68.236
2.000	S13	15 Summer	1	+0%					68.035
3.000	S14	15 Summer	1	+0%					68.226
1.002	S3	15 Summer	1	+0%					67.724
4.000	S11	15 Summer	1	+0%	30/15 Summer				65.554
4.001	S12	15 Summer	1	+0%	30/15 Summer				65.462
1.003	S4	15 Summer	1	+0%	100/15 Summer				65.210
5.000	S16	15 Summer	1	+0%					65.289
1.004	S5	15 Summer	1	+0%					64.955
6.000	S17	15 Summer	1	+0%					64.562
7.000	S15	15 Summer	1	+0%	30/15 Summer				64.666
1.005	S6	15 Summer	1	+0%					64.344
8.000	S18	15 Summer	1	+0%					64.043
1.006	S7	15 Summer	1	+0%	100/15 Summer				62.894
1.007	S8	15 Summer	1	+0%	100/15 Summer				61.423
1.008	S9	15 Summer	1	+0%	30/15 Summer				61.048

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	-0.105	0.000	0.20			3.2	OK	
1.001	S2	-0.102	0.000	0.22			4.9	OK	
2.000	S13	-0.104	0.000	0.21			6.3	OK	
3.000	S14	-0.126	0.000	0.06			2.6	OK	
1.002	S3	-0.177	0.000	0.10			16.3	OK	
4.000	S11	-0.092	0.000	0.32			6.8	OK	
4.001	S12	-0.071	0.000	0.53			8.7	OK	
1.003	S4	-0.199	0.000	0.24			25.6	OK	
5.000	S16	-0.124	0.000	0.07			2.1	OK	
1.004	S5	-0.216	0.000	0.17			30.1	OK	
6.000	S17	-0.104	0.000	0.20			3.3	OK	
7.000	S15	-0.085	0.000	0.39			10.6	OK	
1.005	S6	-0.215	0.000	0.18			43.8	OK	
8.000	S18	-0.107	0.000	0.18			3.5	OK	
1.006	S7	-0.206	0.000	0.22			47.4	OK	
1.007	S8	-0.252	0.000	0.23			47.4	OK	
1.008	S9	-0.250	0.000	0.24			47.1	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
9.000	S22	240 Summer	1	+0%	30/180 Summer				60.720
9.001	S19	240 Summer	1	+0%	30/60 Summer				60.720
1.009	S10	15 Summer	1	+0%	1/15 Summer				60.975
1.010	S20	15 Summer	1	+0%					60.563

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
9.000	S22	-0.364	0.000	0.00			0.0	OK	
9.001	S19	-0.266	0.000	0.04		172	3.2	OK	
1.009	S10	0.255	0.000	0.23			2.5	SURCHARGED	
1.010	S20	-0.131	0.000	0.04			2.5	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 1
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 Ratio R 0.350
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 19.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 100.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Summer	30	+40%					68.492
1.001	S2	15 Summer	30	+40%	100/15 Summer				68.295
2.000	S13	15 Summer	30	+40%					68.083
3.000	S14	15 Summer	30	+40%					68.249
1.002	S3	15 Summer	30	+40%					67.772
4.000	S11	15 Summer	30	+40%	30/15 Summer				66.001
4.001	S12	15 Summer	30	+40%	30/15 Summer				65.864
1.003	S4	15 Summer	30	+40%	100/15 Summer				65.333
5.000	S16	15 Summer	30	+40%					65.313
1.004	S5	15 Summer	30	+40%					65.047
6.000	S17	15 Summer	30	+40%					64.610
7.000	S15	15 Summer	30	+40%	30/15 Summer				64.895
1.005	S6	15 Summer	30	+40%					64.435
8.000	S18	15 Summer	30	+40%					64.085
1.006	S7	15 Summer	30	+40%	100/15 Summer				63.001
1.007	S8	15 Summer	30	+40%	100/15 Summer				61.627
1.008	S9	15 Summer	30	+40%	30/15 Summer				61.369

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	-0.058	0.000	0.67			10.8	OK	
1.001	S2	-0.043	0.000	0.83			18.3	OK	
2.000	S13	-0.056	0.000	0.70			21.5	OK	
3.000	S14	-0.103	0.000	0.21			8.8	OK	
1.002	S3	-0.128	0.000	0.38			61.1	OK	
4.000	S11	0.355	0.000	1.08			22.8	SURCHARGED	
4.001	S12	0.331	0.000	1.90			31.0	SURCHARGED	
1.003	S4	-0.076	0.000	0.89			93.4	OK	
5.000	S16	-0.100	0.000	0.24			7.2	OK	
1.004	S5	-0.124	0.000	0.63			110.5	OK	
6.000	S17	-0.056	0.000	0.70			11.2	OK	
7.000	S15	0.144	0.000	1.32			36.3	SURCHARGED	
1.005	S6	-0.124	0.000	0.64			158.1	OK	
8.000	S18	-0.065	0.000	0.61			12.1	OK	
1.006	S7	-0.099	0.000	0.78			170.6	OK	
1.007	S8	-0.048	0.000	0.83			168.3	OK	
1.008	S9	0.071	0.000	0.84			165.8	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
9.000	S22	600 Winter	30	+40%	30/180 Summer				61.153
9.001	S19	600 Winter	30	+40%	30/60 Summer				61.153
1.009	S10	600 Winter	30	+40%	1/15 Summer				61.180
1.010	S20	5760 Summer	30	+40%					60.563

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
9.000	S22	0.069	0.000	0.00			0.1	SURCHARGED	
9.001	S19	0.167	0.000	0.18		641	14.1	SURCHARGED	
1.009	S10	0.460	0.000	0.23			2.5	SURCHARGED	
1.010	S20	-0.131	0.000	0.04			2.5	OK	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
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	Ratio R	0.350
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	19.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	100.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Summer	100	+45%					68.538
1.001	S2	15 Summer	100	+45%	100/15 Summer				68.377
2.000	S13	15 Summer	100	+45%					68.104
3.000	S14	15 Summer	100	+45%					68.256
1.002	S3	15 Summer	100	+45%					67.788
4.000	S11	15 Summer	100	+45%	30/15 Summer				66.477
4.001	S12	15 Summer	100	+45%	30/15 Summer				66.237
1.003	S4	15 Summer	100	+45%	100/15 Summer				65.484
5.000	S16	15 Summer	100	+45%					65.322
1.004	S5	15 Summer	100	+45%					65.081
6.000	S17	15 Summer	100	+45%					64.631
7.000	S15	15 Summer	100	+45%	30/15 Summer				65.169
1.005	S6	15 Summer	100	+45%					64.472
8.000	S18	15 Summer	100	+45%					64.104
1.006	S7	15 Summer	100	+45%	100/15 Summer				63.419
1.007	S8	15 Summer	100	+45%	100/15 Summer				62.045
1.008	S9	15 Summer	100	+45%	30/15 Summer				61.636

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	-0.012	0.000	0.87			14.1	OK	
1.001	S2	0.039	0.000	1.05			23.1	SURCHARGED	
2.000	S13	-0.035	0.000	0.94			28.8	OK	
3.000	S14	-0.096	0.000	0.28			11.8	OK	
1.002	S3	-0.112	0.000	0.49			79.9	OK	
4.000	S11	0.831	0.000	1.43			30.1	SURCHARGED	
4.001	S12	0.704	0.000	2.47			40.3	SURCHARGED	
1.003	S4	0.075	0.000	1.16			122.2	SURCHARGED	
5.000	S16	-0.091	0.000	0.32			9.6	OK	
1.004	S5	-0.090	0.000	0.82			144.3	OK	
6.000	S17	-0.034	0.000	0.94			15.0	OK	
7.000	S15	0.418	0.000	1.77			48.5	SURCHARGED	
1.005	S6	-0.087	0.000	0.84			207.5	OK	
8.000	S18	-0.046	0.000	0.82			16.3	OK	
1.006	S7	0.319	0.000	0.98			214.3	SURCHARGED	
1.007	S8	0.370	0.000	1.06			213.2	SURCHARGED	
1.008	S9	0.338	0.000	1.06			210.7	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
9.000	S22	600 Winter	100	+45%	30/180 Summer				61.399
9.001	S19	600 Winter	100	+45%	30/60 Summer				61.399
1.009	S10	600 Winter	100	+45%	1/15 Summer				61.440
1.010	S20	8640 Summer	100	+45%					60.563

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
9.000	S22	0.315	0.000	0.00			0.1	SURCHARGED	
9.001	S19	0.413	0.000	0.08		934	6.0	SURCHARGED	
1.009	S10	0.720	0.000	0.23			2.5	SURCHARGED	
1.010	S20	-0.131	0.000	0.04			2.5	OK	

Foul Calculation Settings

Flow per unit per day (l/day): 4000.0

Self Cleansing Velocity (m/s): 0.75

Foul Calculations for Outfall: F7

Manhole Schedule

Manhole	Units	Size (mm)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
F1	9.0	450	Unknown	66.876	65.200	1.576	425019.684	423482.068
F2	0.0	1200	Type B	66.853	65.124	1.629	425024.756	423482.605
F3	0.0	1200	Type B	67.561	64.690	2.771	425027.065	423473.338
F8	1.0	450	Unknown	66.698	64.780	1.818	425046.349	423481.947
F4	0.0	1200	Type B	66.520	64.308	2.062	425050.204	423478.539
F10	9.0	450	Unknown	66.041	64.100	1.841	425064.557	423475.208
F9	0.0	1200	Type B	65.879	63.809	1.920	425063.671	423481.085
F5	2.0	1200	Type B	65.108	62.800	2.158	425087.605	423484.701
F6	0.0	1200	Unknown	61.483	60.400	0.933	425111.289	423505.250
F7	0.0	1200	Type B	62.674	59.895	2.629	425155.617	423511.856

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (mm)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	F1	65.200	F2	65.124	Circ	100	5.100	67.11	1.500	1.576	1.629
1.001	F2	65.124	F3	64.690	Circ	100	9.550	22.01	1.500	1.629	2.771
1.002	F3	64.690	F4	64.358	Circ	100	23.716	71.43	1.500	2.771	2.062
2.000	F8	64.780	F4	64.358	Circ	100	5.145	12.19	1.500	1.818	2.062
1.003	F4	64.308	F9	63.809	Circ	150	13.705	27.47	1.500	2.062	1.920
3.000	F10	64.100	F9	63.859	Circ	100	5.944	24.66	1.500	1.841	1.920
1.004	F9	63.809	F5	62.850	Circ	150	24.206	25.24	1.500	1.920	2.108
1.005	F5	62.800	F6	60.400	Circ	150	31.355	13.06	1.500	2.158	0.933
1.006	F6	60.400	F7	59.895	Circ	150	44.818	88.75	1.500	0.933	2.629

Foul Calculation Results

Pipe Number	Accumulated Units	Flow Capacity (l/s)	Velocity @ Capacity (m/s)	Actual Flow, Q (l/s)	Actual Velocity (m/s)	Actual Depth (mm)	Velocity @ 1/3rd Q (m/s)
1.000	9.0	6.38	0.81	0.42	0.45	18	0.32
1.001	9.0	11.18	1.42	0.42	0.66	14	0.46
1.002	9.0	6.18	0.79	0.42	0.44	18	0.31
2.000	1.0	15.03	1.91	0.05	0.39	4	0.26
1.003	10.0	29.61	1.68	0.46	0.60	13	0.42
3.000	9.0	10.55	1.34	0.42	0.63	14	0.44
1.004	19.0	30.89	1.75	0.88	0.75	18	0.53
1.005	21.0	42.98	2.43	0.97	0.97	16	0.68
1.006	21.0	16.43	0.93	0.97	0.50	25	0.36