PROPOSED HOUSING DEVELOPMENT

PADDOCK ROAD

STAINCROSS

BARNSLEY

S75 6LG

DRAINAGE STRATEGY REPORT

Report 753/DSR1

HM Design, 10 The Green, York, YO26 5LR. Telephone 07919 031289.

1. INTRODUCTION

This Drainage Strategy Report (DSR) has been prepared to accompany a planning application for a housing development on a parcel of land located off Paddock Road, Staincross, Barnsley, S75 6LG.

The site is centred at national grid reference Se 33486 10222 (433486E, 410222N).

This report considers the best way to drain the development site in an economical way, without increasing flood risk and providing maintenance fort eh lifetime of the development.

2. PRE-DEVELOPMENT SITE

The pre-development site is a greenfield site which is located to the south of Paddock Road and immediately north and east of the Mapplewell Recreation Ground.

The site extends to approximately 19 400 sq m (1.94 Hectares) and is shown below in the location plan with the site outlined red.

The site slopes from north to south and towards the recreation ground. Levels vary from about 111.50m to 115.00m on the northern boundary to around 99.50m to 101.00m on the southern boundary.

In terms of drainage, the pre-development site should be considered greenfield.

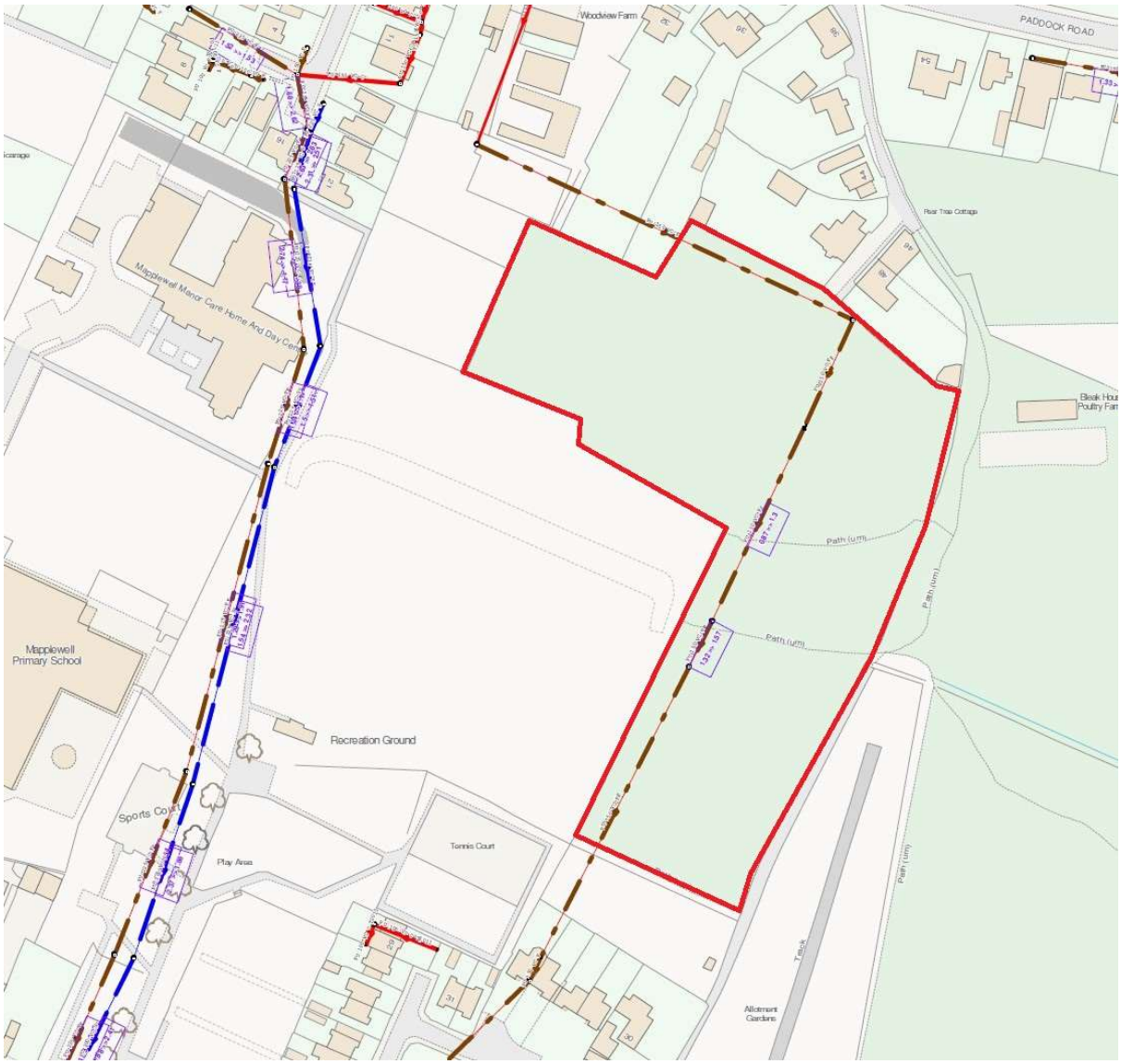
LOCATION PLAN

3. PRE-DEVELOPMENT DRAINAGE

The public sewer records have been obtained and these show that a public foul sewer crosses the site and there are no surface water sewers on site.

There is also a public foul and surface water sewer to the west of the development within the Mapplewell Recreation Ground.

The public sewer records are shown below.



MAP OF PUBLIC SEWERS

A drainage survey was also undertaken and this shows that additional foul drains are on site which connect to the foul sewer on site.

4. POST-DEVELOPMENT FOUL DRAINAGE

The public foul sewer on the development site will need diverting into the proposed new estate road. This will be in agreement with Yorkshire Water under a Section 185 Agreement.

The new sewer will then remain a public sewer and new foul connections from the site made as necessary. These connections have been agreed through a pre-planning

enquiry with Yorkshire Water. This pre-planning enquiry is appended to the end of this report.

The minor drainage connections to the public sewer will remain connected to the public sewer, but be diverted as appropriate through the new development.

The foul drainage system on site will be separate from any surface water system and no surface water from the development will connect into the foul sewerage system.

5. PLANNING PRE-APPLICATION ADVICE

As part of a pre-planning application to Barnsley MBC, the following advice was received.

Drainage CC3 and CC4 The Council has no records of any culverted or open watercourses crossing the site and are not aware of any flooding issues associated with the site. With regards drainage, the developer's attention is drawn to the following: There should be no increase in surface water runoff from the new development. NPPF recognizes that the management of flood risk is not simply restricted to flood plains and that a catchment-wide approach should be employed. Any balancing facility should be designed to accommodate a 1 in 30 year flow from the site below ground and a 1 in 100 year flow retained within the site (including an allowance of 30% for climate change), without causing any flooding to buildings. There are alternatives to conventional storage for the control of surface water run-off that are favoured by the authority where ground conditions are suitable. Sustainable Urban Drainage techniques (SUD's) tackle surface water run-off problems at source using features such as soakaways, permeable pavements, grassed swales, infiltration trenches, ponds and wetlands to attenuate flood peak flows, produce water quality improvements and environmental enhancements. The authority seeks to promote the use of SUD's techniques to this site and the authority expects the developer of the site to submit detailed investigations such that the use of SUD's has been fully explored.

6. SURFACE WATER RUN-OFF

The pre-development site is a greenfield site and existing surface water run-off will be at greenfield run-off rates.

The development site has been assessed for an estimate of greenfield run-off rates using IH124, via the Microdrainage software. The estimate of the rates is shown below.

Date 01/03/2022 18:17	Designed by Hugh Morris	Micro Drainage
File	Checked by	
Innovyze	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	1.940	Urban	0.000
SAAR (mm)	623	Region Number	Region 3

Results	l/s
QBAR Rural	5.8
QBAR Urban	5.8
Q100 years	12.0
Q1 year	5.0
Q30 years	10.1
Q100 years	12.0

Post-development run-off rates will be kept as close to greenfield run-off rates as possible, whilst comply with standards required by the LLFA and Yorkshire Water.

7. SURFACE WATER HIERACHY OF DISPOSAL

Taking into account the hierarchy of required surface water disposal and the Council's pre-planning advice, the point of discharge for surface water has been evaluated.

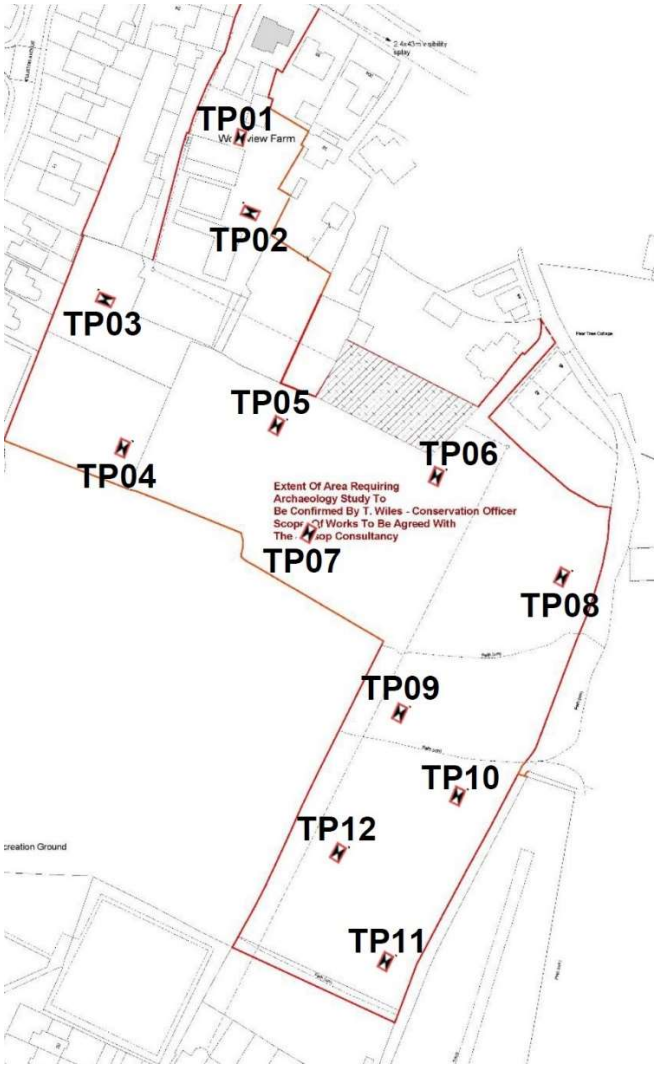
This evaluation has been undertaken in the hierarchy list, as follows:-

- **Discharge to the ground (infiltration).**
- **Discharge to a surface water body.**
- **Discharge to a surface water sewer, highway drain or other drain.**
- **Discharge to a combined sewer.**

8. DISCHARGE TO GROUND.

A comprehensive system of infiltration testing was carried out through the pre-development site. This testing, carried out to BRE Digest 365, found that the underlying strata was Mudstone with little infiltration characteristics. Therefore, infiltration, as a means of surface water disposal, has been ruled out.

The testing and reporting was carried out by G and M Consulting Ltd and the trial pit locations and extracts from the main report are provided below.



Ref: Soakaway Tests on Land off 28 Paddock Road, Staincross, Barnsley.

In accordance with your instruction, a representative of G&M Consulting Ltd (G&M), attended the above site to witness the undertaking of soakaway tests within the superficial soils encountered on the site. The fieldwork was carried out on the 4th and 5th November 2020.

The pits were excavated using a 3 tonne rated tracked 360° excavator under the supervision of G&M, at locations shown in the drawing presented in Attachment A of this report.

In total, twelve trial pits were excavated, the dimension of which are summarised below;

Test Pit No	Length (m)	Width (m)	Depth* (m)
TP1	1.30	0.50	1.60
TP2	1.40	0.50	1.50
TP3	1.70	0.50	1.80
TP4	1.40	0.50	1.60
TP5	1.40	0.50	1.80
TP6	1.50	0.50	1.50
TP7	1.40	0.50	2.10
TP8	1.70	0.50	1.50
TP9	1.60	0.50	1.20
TP10	1.70	0.50	1.80
TP11	1.10	0.50	1.50
TP12	1.30	0.50	1.50

*below ground level (bgl)

However, in summary trial pits TP1 and TP3, towards the north of the site, encountered a thin veneer of made ground. In TP1 this comprised a 200mm thick layer of gravelly clay. The gravel component comprised brick, concrete and rare coal. In TP2 the made ground comprised a 650mm thick layer of very clayey gravelly sand with low cobble content. The gravel was recorded as brick and mudstone, and the cobbles were concrete and sandstone.

A dark brown clay topsoil was encountered in TP3 and TP4 to a thickness of 350mm.

The remainder of the trial pits encountered a cohesive subsoil from surface, which also underlaid the made ground and topsoil described above. This soil comprised a generally firm and stiff gravelly clay, to depths (where fully proven) of between 0.45 m and 1.7 m bgl. The gravel component was recorded as subangular fine to coarse mudstone lithorelicts.

In TP1 and TP7 the full depth of this cohesive soil was not proved, to the base of the pits at 1.6 m bgl and 2.10 m bgl respectively. In both of these pits, a coal was recorded between 0.8 m and 1.50 m bgl in TP1 and 1.35 m and 2.0 m bgl in TP7, and was described as a very weak to weak black vitreous extremely closely fractured coal.

With the exception of TP1 and TP7, bedrock was encountered in all of the trial pits beneath the cohesive subsoils. In TP2, TP4, TP8, and TP9 this comprised a thinly laminated to very thinly bedded sandstone. In TP3, TP5, TP6, TP10, TP11 and TP12 this comprised a stiff to extremely weak thinly to thickly laminated mudstone. In all of the trial pits, the mudstone and sandstone were recovered to surface as gravel and cobbles.

During the excavation work a seepage of groundwater was recorded in TP4 at 1.35 m bgl.

A photographic record of the trial pits is presented in Attachment D of this report.

Based on the findings of the fieldwork, soakaway testing was undertaken in six of the trial pits, TP1, TP3, TP6, TP8, TP9 and TP11. The remaining pits were dug for geological reference only.

The soakaway test procedure was carried out in general accordance with the requirements of BRE Digest DG365 (2016) under the supervision of a representative from G&M.

Clean potable water for the test was supplied from a large bowser provided by the land owner, which was rapidly emptied to fill the test pits.

The tests were abandoned after between 180 and 240 minutes, as the infiltration rates were not sufficiently rapid enough to allow monitoring of the water levels to 25% and 75% effective storage depth. The field data sheets presenting the results are provided in Attachment C of this report. Water levels during the tests fell by the amounts shown below;

Test Pit No	Drop in Water Level (mm)	Notes
TP1	120	Test abandoned after 3 hours
TP3	73	Test abandoned after 3 hours
TP6	37	Test abandoned after 3 hours
TP8	28	Test abandoned after 4 hours
TP9	48	Test abandoned after 3.5 hours
TP11	26	Test abandoned after 3 hours

Based on the above results, it not recommended that consideration be given to the use of a traditional soakaway system within the natural strata encountered at the depths tested on site.

We trust the above and the attachments are acceptable and meet with your current needs.

Yours sincerely

Andrew Swinbourne
For and on behalf of **G&M Consulting Ltd**

9. DISCHARGE TO A SURFACE WATER BODY

Barnsley BMC have advised that no watercourses are present on site. No local watercourse is close enough or adequate to accept flows from the development site and so this option has been discounted.

10. DISCHARGE TO A SURFACE WATER SEWER

A public surface water sewer exists to the east of the site within the Mapplewell Recreation Ground.

The Yorkshire water pre-planning advice is that a connection would be acceptable to the surface water sewer, if infiltration and connection to watercourse were unavailable. This report shows that this is the case and so a connection to the surface water sewer will be required.

Yorkshire water have advised that the discharge to the sewer should not exceed 3.5l/s.

The connection to the sewer in the recreation ground will require an easement and this should be obtained through agreement with Barnsley MBC.

11. POST-DEVELOPMENT SURFACE WATER SYSTEM

The post-development surface water system will be a piped system through the site separate from the foul. It will outfall to the surface water sewer at rates not exceeding 3.5l/s in all storm events.

The attenuated flow of 3.5l/s will be achieved through storage of surface water on site in large storm events by a large concrete tank. The surface Water system and large tank will be designed in accordance with Yorkshire Water's requirements for adoption of sewers. And then adopted through a Section 104 agreement for future maintenance.

12. SURFACE WATER HYDRAULIC CALCULATIONS

The surface water system on this development has been modelled in Microdrainage for all storms to the 1 in 100 year storm + 30% climate change.

The results from the calculations are appended to this report and show that the system proposed is satisfactory. The system works satisfactory for short duration storms and the critical duration for storage is long as the discharge rate is low. The critical duration is 1440 minutes and this Microdrainage output is provided in the appendix.

13. EXCEEDANCE ROUTE

In the unlikely event that the high quality surface water system is exceeded for any reason, then a safe exceedance rout is available for this development that route exceedance flows onto the recreation ground.

14. CONCLUSIONS

- This proposed development site can be drained successfully for foul and surface water flows.
- Separate systems of foul and surface water will be provided on and off site.
- Foul water will discharge to the public sewer on site, after being diverted under a Section 185 Agreement with Yorkshire Water.
- Surface water flows will discharge to the public surface water sewer in the recreation ground to the west of the scheme.
- Sewer easements to cross the recreation ground will be required to be agreed.
- Surface water flows will be limited to 3.5l/s in all storm events.
- Surface water design includes a 30% increase in rainfall to account for climate change.
- A separate high quality surface water drainage system will be used that will be adopted by Yorkshire Water, who will supply the maintenance for the lifetime of the development.

Report by

Hugh Morris
BSc CEng MICE
23th August 2022

APPENDIX

Yorkshire Water Pre-Planning Enquiry

Microdrainage Calculations.

YorkshireWater

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Developer Services
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Bradford
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Tel: 0345 120 8482
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For telephone enquiries ring:
Chris Roberts on 0345 120 8482

Your Ref:
Our Ref: X013531

2nd August 2021

Dear Mr Morris,

Paddock Road, Mapplewell, Barnsley, S75 6LE - Pre-Planning Sewerage Enquiry U308184 (RESIDENTIAL)

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.

YorkshireWater

The separate systems should extend to the points of discharge to be agreed.

Foul Water

Foul water domestic waste can discharge to the 150 mm diameter public foul sewer recorded crossing 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.

It is understood that a watercourse is located to the east of the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable). Please note Yorkshire Water cannot provide plans of culverted watercourses or highway drains. To obtain plans please contact the Lead Local Flood Authority for more details.

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 225 mm diameter public surface water sewer recorded to the 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.

YorkshireWater

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 Codes for Adoption 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.

The site is within an area that may be affected by river, coastal or estuarine flooding. We would advise you to contact the Environment Agency for details.

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.

YorkshireWater

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.

Yours sincerely

Chris Roberts
Development Services Technician

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for PADDOCK SW REV B.SWS

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
1.000	43.715	2.545	17.2	0.070	5.00	0.0	0.600	o	150	Pipe/Conduit
1.001	44.599	2.780	16.0	0.098	0.00	0.0	0.600	o	225	Pipe/Conduit
1.002	17.966	1.800	10.0	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit
1.003	13.359	1.200	11.1	0.056	0.00	0.0	0.600	o	300	Pipe/Conduit
1.004	7.330	0.325	22.6	0.024	0.00	0.0	0.600	o	300	Pipe/Conduit
1.005	54.739	0.500	109.5	0.174	0.00	0.0	0.600	o	375	Pipe/Conduit
1.006	40.178	0.300	133.9	0.103	0.00	0.0	0.600	o	375	Pipe/Conduit
1.007	11.143	0.500	22.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
1.008	15.496	1.100	14.1	0.027	0.00	0.0	0.600	o	375	Pipe/Conduit
2.000	19.535	0.400	48.8	0.112	5.00	0.0	0.600	o	300	Pipe/Conduit
1.009	19.648	1.950	10.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
3.000	23.041	0.650	35.4	0.211	5.00	0.0	0.600	o	300	Pipe/Conduit
1.010	53.687	3.825	14.0	0.183	0.00	0.0	0.600	o	375	Pipe/Conduit
1.011	6.203	0.200	31.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
1.012	33.073	2.545	13.0	0.143	0.00	0.0	0.600	o	450	Pipe/Conduit
4.000	3.599	0.050	72.0	0.000	5.00	0.0	0.600	o	450	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	5.00	5.30	118.600	0.070	0.0	0.0	0.0	2.44	43.2	0.9
1.001	5.00	5.52	115.980	0.168	0.0	0.0	0.0	3.28	130.5	2.3
1.002	5.00	5.60	113.200	0.186	0.0	0.0	0.0	4.17	165.7	2.5
1.003	5.00	5.64	111.325	0.242	0.0	0.0	0.0	4.74	334.9	3.3
1.004	5.00	5.68	110.125	0.266	0.0	0.0	0.0	3.32	235.0	3.6
1.005	5.00	6.21	109.725	0.440	0.0	0.0	0.0	1.73	191.2	6.0
1.006	5.00	6.64	109.225	0.543	0.0	0.0	0.0	1.56	172.7	7.4
1.007	5.00	6.68	108.925	0.543	0.0	0.0	0.0	3.85	425.5	7.4
1.008	5.00	6.74	108.425	0.570	0.0	0.0	0.0	4.85	535.6	7.7
2.000	5.00	5.14	107.800	0.112	0.0	0.0	0.0	2.26	159.4	1.5
1.009	5.00	6.79	107.325	0.682	0.0	0.0	0.0	5.74	633.5	9.2
3.000	5.00	5.14	106.100	0.211	0.0	0.0	0.0	2.65	187.3	2.9
1.010	5.00	6.98	105.375	1.076	0.0	0.0	0.0	4.86	536.5	14.6
1.011	5.00	7.01	101.550	1.076	0.0	0.0	0.0	3.26	360.5	14.6
1.012	5.00	7.11	101.275	1.219	0.0	0.0	0.0	5.66	900.7	16.5
4.000	5.00	5.03	98.780	0.000	0.0	0.0	0.0	2.40	381.5	0.0

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for PADDOCK SW REV B.SWS

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
1.013	18.209	0.120	151.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.014	16.507	0.100	165.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.015	61.407	0.380	161.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.016	61.407	0.380	161.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.017	29.494	0.185	159.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.018	12.503	0.220	56.8	0.000	0.00	0.0	0.600	o	225	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)
1.013	5.00	7.39	98.680	1.219	0.0	0.0	0.0	1.06	42.1	16.5
1.014	5.00	7.66	98.560	1.219	0.0	0.0	0.0	1.01	40.4	16.5
1.015	5.00	8.66	98.460	1.219	0.0	0.0	0.0	1.03	40.8	16.5
1.016	5.00	9.66	98.080	1.219	0.0	0.0	0.0	1.03	40.8	16.5
1.017	5.00	10.14	97.700	1.219	0.0	0.0	0.0	1.03	41.1	16.5
1.018	5.00	10.26	97.515	1.219	0.0	0.0	0.0	1.74	69.1	16.5

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PIPELINE SCHEDULES for PADDOCK SW REV B.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)
1.000	o	150	1	120.410	118.600	1.660	Open Manhole	1200
1.001	o	225	2	117.963	115.980	1.758	Open Manhole	1200
1.002	o	225	3	115.032	113.200	1.607	Open Manhole	1200
1.003	o	300	4	113.540	111.325	1.915	Open Manhole	1200
1.004	o	300	5	112.447	110.125	2.022	Open Manhole	1200
1.005	o	375	6	111.940	109.725	1.840	Open Manhole	1350
1.006	o	375	7	111.690	109.225	2.090	Open Manhole	1350
1.007	o	375	8	111.216	108.925	1.916	Open Manhole	1350
1.008	o	375	9	110.720	108.425	1.920	Open Manhole	1350
2.000	o	300	21	110.072	107.800	1.972	Open Manhole	1200
1.009	o	375	10	109.489	107.325	1.789	Open Manhole	1500
3.000	o	300	22	108.327	106.100	1.927	Open Manhole	1200
1.010	o	375	11	107.920	105.375	2.170	Open Manhole	1500
1.011	o	375	12	103.443	101.550	1.518	Open Manhole	1350
1.012	o	450	13	103.047	101.275	1.322	Open Manhole	1350
4.000	o	450	23	101.800	98.780	2.570	Open Manhole	1350

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)
1.000	43.715	17.2	2	117.963	116.055	1.758	Open Manhole	1200
1.001	44.599	16.0	3	115.032	113.200	1.607	Open Manhole	1200
1.002	17.966	10.0	4	113.540	111.400	1.915	Open Manhole	1200
1.003	13.359	11.1	5	112.447	110.125	2.022	Open Manhole	1200
1.004	7.330	22.6	6	111.940	109.800	1.840	Open Manhole	1350
1.005	54.739	109.5	7	111.690	109.225	2.090	Open Manhole	1350
1.006	40.178	133.9	8	111.216	108.925	1.916	Open Manhole	1350
1.007	11.143	22.3	9	110.720	108.425	1.920	Open Manhole	1350
1.008	15.496	14.1	10	109.489	107.325	1.789	Open Manhole	1500
2.000	19.535	48.8	10	109.489	107.400	1.789	Open Manhole	1500
1.009	19.648	10.1	11	107.920	105.375	2.170	Open Manhole	1500
3.000	23.041	35.4	11	107.920	105.450	2.170	Open Manhole	1500
1.010	53.687	14.0	12	103.443	101.550	1.518	Open Manhole	1350
1.011	6.203	31.0	13	103.047	101.350	1.322	Open Manhole	1350
1.012	33.073	13.0	14	101.800	98.730	2.620	Open Manhole	1800
4.000	3.599	72.0	14	101.800	98.730	2.620	Open Manhole	1800

PIPELINE SCHEDULES for PADDOCK SW REV B.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)
1.013	o	225	14	101.800	98.680	2.895	Open Manhole	1800
1.014	o	225	15	101.500	98.560	2.715	Open Manhole	1200
1.015	o	225	16	102.500	98.460	3.815	Open Manhole	1200
1.016	o	225	17	102.500	98.080	4.195	Open Manhole	1200
1.017	o	225	18	101.300	97.700	3.375	Open Manhole	1200
1.018	o	225	19	99.800	97.515	2.060	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)
1.013	18.209	151.7	15	101.500	98.560	2.715	Open Manhole	1200
1.014	16.507	165.1	16	102.500	98.460	3.815	Open Manhole	1200
1.015	61.407	161.6	17	102.500	98.080	4.195	Open Manhole	1200
1.016	61.407	161.6	18	101.300	97.700	3.375	Open Manhole	1200
1.017	29.494	159.4	19	99.800	97.515	2.060	Open Manhole	1200
1.018	12.503	56.8	20	99.800	97.295	2.280	Open Manhole	2000

Simulation Criteria for PADDOCK SW REV B.SWS

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	2880
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	24

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

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 433436 410323 SE 33436 10323
Data Type	Point
Summer Storms	No
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	1440

Online Controls for PADDOCK SW REV B.SWS

Hydro-Brake® Optimum Manhole: 14, DS/PN: 1.013, Volume (m³): 13.3

Unit Reference	MD-SHE-0076-3500-2000-3500
Design Head (m)	2.000
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	98.680
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	3.5
Flush-Flo™	0.331	2.7
Kick-Flo®	0.679	2.1
Mean Flow over Head Range	-	2.7

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	4.2	7.000	6.3
0.200	2.5	1.400	3.0	3.500	4.5	7.500	6.5
0.300	2.7	1.600	3.2	4.000	4.8	8.000	6.7
0.400	2.6	1.800	3.3	4.500	5.1	8.500	6.9
0.500	2.6	2.000	3.5	5.000	5.4	9.000	7.1
0.600	2.4	2.200	3.7	5.500	5.6	9.500	7.3
0.800	2.3	2.400	3.8	6.000	5.8		
1.000	2.5	2.600	4.0	6.500	6.1		

Storage Structures for PADDOCK SW REV B.SWS

Tank or Pond Manhole: 23, DS/PN: 4.000

Invert Level (m) 98.780

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	546.7	1.800	546.7	1.801	0.0

HM Design		Page 7
10 The Green York YO26 5LR	PADDOCK ROAD BARNSLEY	
Date 23/08/2022 File PADDOCK SW_Rev B.MDX	Designed by HM Checked by	
Micro Drainage	Network 2020.1	

Summary of Results for 1440 minute 100 year Winter (PADDOCK SW REV B.SWS)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	118.621	-0.129	0.000	0.05			2.0	OK
1.001	2	116.009	-0.196	0.000	0.04			4.9	OK
1.002	3	113.228	-0.197	0.000	0.04			5.4	OK
1.003	4	111.357	-0.268	0.000	0.03			7.1	OK
1.004	5	110.170	-0.255	0.000	0.05			7.8	OK
1.005	6	109.791	-0.309	0.000	0.07			12.9	OK
1.006	7	109.304	-0.296	0.000	0.10			15.9	OK
1.007	8	108.983	-0.317	0.000	0.06			15.9	OK
1.008	9	108.473	-0.327	0.000	0.04			16.6	OK
2.000	21	107.831	-0.269	0.000	0.02			3.3	OK
1.009	10	107.372	-0.328	0.000	0.04			19.9	OK
3.000	22	106.137	-0.263	0.000	0.04			6.2	OK
1.010	11	105.436	-0.314	0.000	0.06			31.4	OK
1.011	12	101.656	-0.269	0.000	0.18			31.4	OK
1.012	13	101.336	-0.389	0.000	0.05			35.6	OK
4.000	23	100.555	1.325	0.000	0.02			3.5	SURCHARGED
1.013	14	100.577	1.672	0.000	0.09			3.4	SURCHARGED
1.014	15	98.606	-0.179	0.000	0.09			3.4	OK
1.015	16	98.504	-0.181	0.000	0.09			3.4	OK
1.016	17	98.124	-0.181	0.000	0.09			3.4	OK
1.017	18	97.745	-0.180	0.000	0.09			3.4	OK
1.018	19	97.550	-0.190	0.000	0.06			3.4	OK