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FLOOD RISK & DRAINAGE TECHNICAL NOTE

PROPOSED RESIDENTIAL DEVELOPMENT
LAND AT NOLANDS FARM
PLUMPTON GREEN
BN7 3BT

PREPARED FOR: Elivia Homes
JOB NO: P23-645
DATE: 31st October 2023
ISSUE NO: Issue 1

ELIVIA HOMES

DOCUMENT HISTORY

Issue No.	Description	Date
1	FIRST ISSUE FOR PLANNING	31/10/23

1. INTRODUCTION

1.1 This Flood Risk and Drainage Technical Note has been produced by Simpson TWS on behalf of Elivia Homes Ltd in support of the following development:

'Approval of Reserved Matters following Outline Planning Permission (LW/21/0262) relating to the Layout, Scale, Appearance and Landscaping for 83no. new residential dwellings at Nolands Farm, Station Road, Plumpton Green.'

1.2 Condition 1 of LW/21/0262 which was permitted at Appeal under reference APP/P1425/W/22/3300691 states that 'Details of the appearance, landscaping, layout, and scale (hereinafter called "the reserved matters") shall be submitted to and approved in writing by the local planning authority before any development commences. Application for the approval of the reserved matters shall be made to the local planning authority within 2 years of the date of this permission. The development shall accord with the approved details.'

1.3 This proposed Reserved Matters planning application will seek detailed permission for the aforementioned matters to deliver 83no. dwellings, a lower quantum than the 86no dwellings, allowed by the outline permission (reference APP/P1425/W/22/3300691)

1.4 This report serves as an addendum to a flood risk assessment (FRA) by Hilson Moran (HM), dated March 2021. The principle of the development remains the same, with any changes addressed in this report.

1.5 An updated site plan, to be submitted as part of the reserved matters application can be found in *Appendix A.*

2. SITE DISCRIPTION AND TOPOGRAPHY

2.1 The site is currently comprised of agricultural land totalling 5.51 ha. The site ranges from a level of circa 38.50 mAOD towards the South-East corner, to a level of 33.00 mAOD at the very North of the site.

2.2 The topographical survey for the site is attached in *Appendix B.*

3. FLOOD RISK

3.1 The flood risk assessment conducted by Hilson Moran (HM) indicates that the site is in Flood Zone 1, with a less than a 1 in 1,000 annual probability of river or sea flooding. This information is still current, meaning that the development is still acceptable in terms of fluvial flood risk.

3.2 The majority of the development site is shown to be at very low risk of surface water flooding, as noted in the HM Flood Risk Assessment. There are some localised areas to the North of the site deemed to be at low risk from surface water flooding. These are associated with existing drainage features on the site, such as shallow ditches and ponds.

3.3 The site plan has overlaid with the surface water flooding maps taken from the Environment Agency website, as shown in Figure 1. This confirms that the surface water flooding to the North of the site will not impact any proposed residential units. Surface water flooding is also shown to the West of the site, however no development is proposed in this area so this is not considered a risk. There is a small amount of surface water flooding within the site boundary

to the North East of the site, which is close to a proposed garage. The garage will need to be raised marginally above the surrounding levels to ensure it is not at risk of surface water flooding. The surface water flooding does not pose a risk to the nearest residential plot, it is therefore considered that the proposed development is not at risk from surface water flooding.

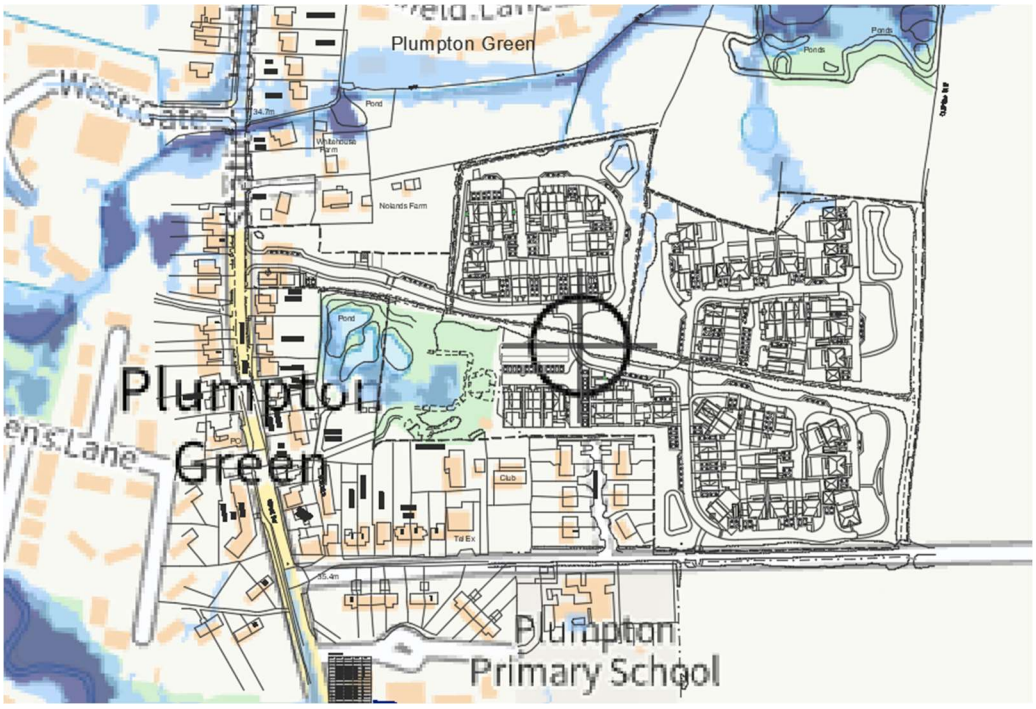

Figure 1: Risk of Surface Water Flooding

3.4 The risk of flooding from all sources was identified to be negligible in the HM Flood Risk Assessment. The development principles remain the same, meaning that this is still the case.

4. SURFACE WATER DRAINAGE STRATEGY

4.1 The approach of the previous FRA for surface water management was to restrict the surface water discharge from the site for the 1 in 1 and 1 in 100 year storm events, to their respective equivalent greenfield runoff rates (including 40% allowance for climate change for the 1 in 100 year storm event). A consistent approach has been proposed for the development of the surface water drainage strategy to accompany this planning application.

4.2 The developed area for the site used in the previous FRA was 3.54 ha, this has increased/decreased to 3.32ha for the updated site plan accompanying this application. As a result of the change in developed area, the relevant greenfield run-off rates have been reassessed based on the pro-rata figures in the HM Flood Risk Assessment, shown below in Figure 2.

Table 5-1- ICP SuDS Greenfield Run-off Rates

Return Period (Years)	Peak Greenfield Run-off Rate (l/s)	Peak Greenfield Run-off Rate (l/s/ha)
$QBAR_{rural}$	29.9	8.4
1	19.0	5.4
30	67.6	19.1
100	95.4	26.9

Figure 2: Greenfield Run-off Rates from HM Flood Risk Assessment

4.3 Using the pro rata figures above with the updated developed area, the new greenfield runoff rates are presented in the table below. As there will be 2 surface water connections from the site, the equivalent greenfield run off rates for each catchment have also been presented in the table below.

Return Period (Year)	**Pro-rata Greenfield Run-off Rate (l/s/ha)**	**Catchment A Greenfield Run-off Rate – 2.85ha (l/s)**	**Catchment B Greenfield Run-off Rate – 0.47ha (l/s)**	**Total Development Area Greenfield Run-off Rate – 3.32ha (l/s)**
QBAR	8.4	23.9	4.0	27.9
1	5.4	15.4	2.5	17.9
30	19.1	54.4	9.0	63.4
100	26.9	76.7	12.6	89.3

Table 1: Greenfield Run-off Rates

4.4 The drainage strategy has been progressed based on limiting surface water discharge at each connection location to the greenfield run-off rates for the 1 in 1 and 1 in 100 year storm event (including 40% allowance for climate change for the 1 in 100 year storm event).

4.5 In accordance with the NPPG, surface water will be discharged as high up the drainage hierarchy as reasonably practicable. The hierarchy for discharge of surface water drainage is as follows;

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer.

4.6 Surface water discharge into the ground (infiltration) was discounted in the HM FRA due to high groundwater levels. As such it is proposed to discharge surface water to drainage ditches/watercourses in the vicinity of the site. This will be achieved by a direct connection to a drainage ditch to the north of the site and a connection to an existing on site sewer, which eventually discharges to an existing drainage ditch to the South of the site.

4.7 The surface water outfalls from the site are located at the North and South of the development, as shown on the drainage strategy drawing, attached in *Appendix C*. The

connection to the North-East as indicated in the HM FRA has been discounted due to the very shallow nature of the ditch in this location. This meant that attenuation structures in this area were also very shallow, leading to a very large footprint being required to provide sufficient surface water attenuation volume.

4.8 SuDS has been provided for the development in the form of attenuation basins, below ground attenuation tanks, hydrobrake vortex flow controls and permeable paving. Water butts are also being provided for all plots, as per the recommendations of the HM Flood Risk Assessment, although these have been conservatively excluded from any surface water attenuation calculations.

4.9 Calculations for the proposed surface water drainage networks have been undertaken in MicroDrainage and the results are attached in *Appendix D.* The calculations confirm that the surface water flow rates for the 1 in 1 and 1 in 100 year storm events (including 40% allowance for climate change for the 1 in 100 year storm event) are being restricted to their respective greenfield run-off rates.

Return Period (Year)	**Catchment A Greenfield Run-off Rate – 2.85ha (l/s)**		**Catchment B Greenfield Run-off Rate – 0.47ha (l/s)**		**Total Development Area Greenfield Run-off Rate – 3.32ha (l/s)**	
	Greenfield Run-off Rate (l/s)	Proposed Post-development Run-off Rate (l/s)	Greenfield Run-off Rate (l/s)	Proposed Post-development Run-off Rate (l/s)	Greenfield Run-off Rate (l/s)	Proposed Post-development Run-off Rate (l/s)
1	15.4	15.4	2.5	2.5	17.9	17.9
100	76.7	76.5	12.6	12.4	89.3	88.9

Table 2: Comparison between greenfield and post development run-off rates

4.10 The table above confirms that the proposed surface water drainage network is in accordance with the proposals in the previous Flood Risk Assessment by Hilson Moran and as such is deemed acceptable in terms of surface water management.

4.11 The majority of the foul water from the plots will be conveyed to a private foul water pumping station located to the North-West corner of the site, opposite plots 25-27. The pumping station will then pump via rising main to a break chamber near the site entrance onto Station Road before making a gravity connection to the Southern Water sewer in Station Road. A previous Level 1 Capacity Check Enquiry with Southern Water advised that capacity existed within the network to accommodate a foul flow of 0.9 l/s, which is low for a pumped discharge. An updated Capacity Check Enquiry has been made with Southern Water and the results will be incorporated into this report in due course.

4.12 Plots 51-59 will be conveyed towards an existing foul water manhole located at the South of the site. This manhole is understood to be an unrecorded Southern Water sewer. The gravity connection to this manhole has been included in the Capacity Check with Southern Water.

4.13 The foul water drainage strategy can be seen on the drawing attached in *Appendix C*.

5. CONCLUSION

5.1 This report has been prepared to serve as an addendum to the Flood Risk Assessment prepared by Hilson Moran in 2021. This report seeks to confirm compliance with the approaches outlined in the previous report and confirm any updates required as part of the development of proposals.

5.2 The previous report by Hilson Moran concluded that the site was at negligible risk from flooding from all sources, this report has demonstrated that this is still the case and as such the proposed development is acceptable from a flood risk point of view.

5.3 Additionally, a foul and surface water drainage strategy has been progressed in accordance with the surface water management requirements of the previous Flood Risk Assessment, ensuring that the site can be adequately served in terms of foul and surface water drainage.

APPENDIX A
REVISED SITE LAYOUT

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

N

Accommodation Schedule

Affordable Dwellings	(33no. - 39.8%)	Type
6no.	1-Bedroom Maisonettes	A-A1
2no.	1-Bedroom Maisonettes	A-A2
4no.	2-Bedroom Maisonettes	A-B1
1no.	2-Bedroom FOG	A-B2
12no.	2-Bedroom Houses	A-B3
7no.	3-Bedroom Houses	A-C1
1no.	4-Bedroom House	A-D1

Open Market Dwellings	(50no. - 60.2%)	Type
2no.	1-Bedroom Maisonettes	O-A1
11no.	2-Bedroom Houses	O-B1
8no.	3-Bedroom Houses	O-C1
1no.	3-Bedroom Houses	O-C2
2no.	3-Bedroom Houses	O-C3
4no.	3-Bedroom Houses	O-C4
4no.	3-Bedroom Houses	O-C5
1no.	3-Bedroom Houses	O-C6
2no.	3-Bedroom Houses	O-C7
1no.	3-Bedroom House	O-C8
8no.	4-Bedroom Houses	O-D1
6no.	4-Bedroom Houses	O-D2
Total;	**83 Dwellings**	**[5.42 Ha approx. to Red Line - 15.3 Dw/Ha]**

Rev	Date	Revision Details	Dr	Ch
D	24.10.23	Updated levels, Pumping station, minor porch/path adjustments due to new levels/housetype development.	NK	AK
C	20.10.23	Updated Drainage and tree information, Plot 35 amended and general site amendments.	NK	AK
B	13.10.23	Updated Layout following Consultant feedback.	NK	AK
A	06.10.23	Updated Layout		

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ECE Architecture
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Client's Name
Elivia Homes

Job Title
Land at Nolands Farm, Plumpton Green

Drawing Title
Proposed Site Plan

Scale
1:500 @ A0 / 1:1000 @ A2

metres 10 20 30 40 50

Drawn	Checked	Date
NK	NF	04.09.2023

Job No	Drawing No	Rev
7366	PL-04	D

Status
PRELIMINARY

CAD Plot date: 31/10/2023 - 12:31:52 7366 - site layout - planning.dwg

APPENDIX B
TOPOGRAPHICAL SURVEY

Surveyed by: S Smith

Plotted by: S Brown

Drawn by: Acad

Legend

ACU	Air Conditioning Unit
AV	Air Valve
BC	Barrier Control
BOL	Bollard
BTB	British Telecom Junction Box
BTMH	British Telecom Manhole
CL	Cover Level
CTV	Cable TV
ELCP	Electricity Cable Pit
EM	Electricity Cable Marker
EP	Electricity Pole
ER	Earth Rod
FH	Fire Hydrant
FP	Flag Pole
G	Gully
GV	Gas Valve
IB	Illuminated Bollard
IL	Invert Level
JB	Junction Box
LB	Letter Box
LC	Lamp Column
MH	Manhole
MRK	Concrete Marker
O/F	Outfall
PM	Parking Meter
RE	Rodding Eye
RWP	Rainwater Pipe
SC	Stop Cock
SP	Sign Post
SV	Sluice Valve
TCB	Telephone Kiosk
TL	Traffic Light
TLC	Traffic Light Cover
TM	Ticket Machine
TP	Telegraph Pole
UTR	Unable To Raise
UTS	Unable To Survey
VC	Vent Column
WM	Water Meter
WO	Wash Out
WWP	Waste Water Pipe

Data

i) Trees shown thus 9/6/200 indicates Ht. in metres/Span. dia in metres Trunk dia. in millimetres

ii) Trees shown thus 9/6x6/200 indicates Ht. in metres/Span. dia in metres Trunk dia. in millimetres

iii) Grid : Metric and oriented to north

iv) Levels : Metric and based on OS GPS DATA

Situated on Survey station 1

Value: 34.940m

Client

FAIRFAX

Site

NOLANDS FARM
PLUMPTON GREEN

Marvin & Partners Limited

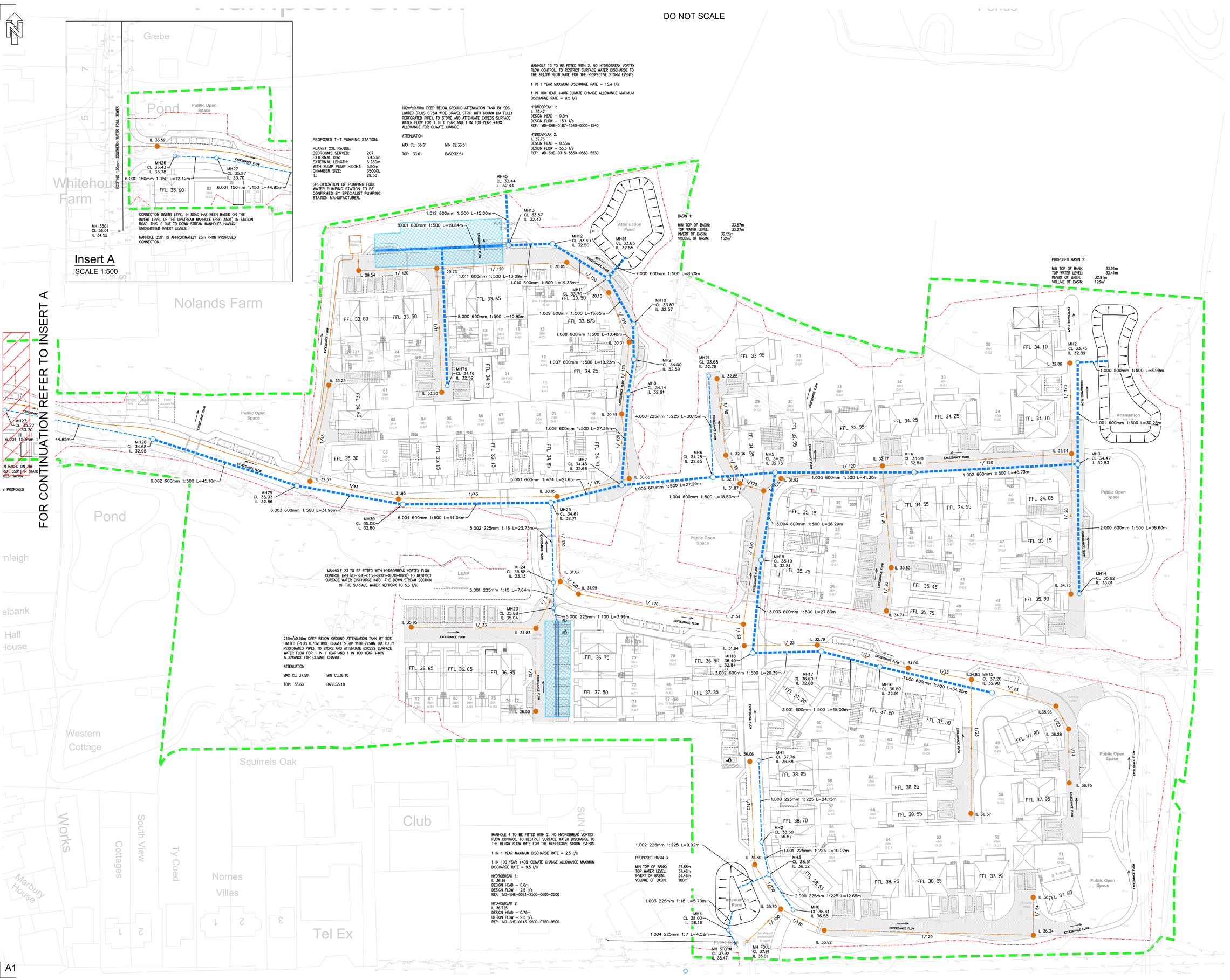
Plestor House
Farnham Road
West Liss
Hampshire GU33 6JQ

Tel : 01428 751888
Email: paul@maplimited.com

Date	DEC 2019
Scale	1/200 @ A0
Dwg/Job No.	19_5369
Checked By	

APPENDIX C
DRAINAGE STRATEGY

DO NOT SCALE



DRAINAGE LEGEND

- Site Boundary.
- 1/100 Surface water drain
- 1/100 Foul water drain
- Foul water rising main
- Surface water flow control chamber
- Surface water manhole
- Foul water manhole
- Flow direction of water within permeable paving.
- Permeable paving
- Tree root protection area.
- EXCEEDANCE FLOW Denotes the Exceedance flow routes.
- FFL 34.50 Finished Floor Levels

DRAINAGE STRATEGY NOTES

1. Due to this site having high ground water, it is understood that the use of infiltration and as such soakaways are not viable for the disposal of surface water.
2. In line with the SuDS hierarchy it is proposed that all surface water will be discharged to drainage ditches / watercourses in the vicinity of the site. This will be achieved by direct connections to drainage ditches to the north of the site and a connection to an existing on site sewer, which eventually discharges to an existing drainage ditch to the South of the site. It is proposed to restrict the discharge of surface water to a rate equivalent to green field run off rates for a 1 in 1 year and a 1 in 100 year +40% allowance for climate change events.
3. The greenfield run-off rates for the northern portion of the site have been calculated and are as follows:
   - 1 in 1 year = 15.4 l/s
   - 1 in 100 year +40% = 76.7 l/s

   The greenfield run-off rates for the southern portion of the site have been calculated and are as follows:
   - 1 in 1 year = 2.5 l/s
   - 1 in 100 year +40% = 12.6 l/s
4. The surface water will therefore be restricted in the northern portion of the site as follows:
   - 1 in 1 year = 15.4 l/s
   - 1 in 100 year +40% = 76.5 l/s

   The run off rates for the southern portion of the site have been calculated and are as follows:
   - 1 in 1 year = 2.5 l/s
   - 1 in 100 year +40% = 12.4 l/s

   This will be accomplished by the use of attenuation basins, Geocellular attenuation tanks and Hydrobreak vortex flow controls.
5. Water quality improvements are provided by conveying the surface water flows through the porous sub base of the permeable block paving. Also by the use of attenuation basins.
6. The foul water from plots 1–50 & 60–83 will be conveyed to a private foul water pumping station located to the North-West corner of the site. The pumping station will then pump via a rising main to a break chamber near the site entrance onto Station road before making a gravity connection to the Southern Water Sewer in Station Road. plots 51–59 will drain via gravity to existing on-site manhole.
7. All proposed connections to existing sewerage infrastructure are subject to S106 approval with Southern water.

MK	REVISION	BY	DATE
P01	FIRST ISSUE	HGAE	31/10/23

DRAWING STATUS

PRELIMINARY

DRAWING TITLE

DRAINAGE STRATEGY

PROJECT

NOLANDS FARM, STATION ROAD, PLUMPTON GREEN.

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Drawn	Ch'kd	Scales	Date
HGAE	LJK	1:500	OCT. 2023

Purpose of Issue

Project Number	Drawing Number	Revision
P23-655	SK100	P01

A1

APPENDIX D
MICRODRAINAGE CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for NETWORK 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	40	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for 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
1.000	8.989	0.018	500.0	0.000	5.00	0.0	0.600	o	600	Pipe/Conduit	
1.001	30.247	0.060	500.0	0.048	0.00	0.0	0.600	o	600	Pipe/Conduit	
2.000	38.595	0.077	500.0	0.043	5.00	0.0	0.600	o	600	Pipe/Conduit	
1.002	48.734	0.097	500.0	0.064	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.003	41.304	0.083	500.0	0.167	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.000	34.279	0.069	500.0	0.000	5.00	0.0	0.600	o	600	Pipe/Conduit	
3.001	17.999	0.036	500.0	0.077	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.002	20.392	0.041	500.0	0.036	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.003	27.825	0.056	500.0	0.126	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.004	26.286	0.053	500.0	0.000	0.00	0.0	0.600	o	600	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	5.14	32.912	0.000	0.0	0.0	0.0	1.08	306.0	0.0
1.001	50.00	5.60	32.894	0.048	0.0	0.0	0.0	1.08	306.0	6.5
2.000	50.00	5.59	33.011	0.043	0.0	0.0	0.0	1.08	306.0	5.8
1.002	50.00	6.35	32.934	0.155	0.0	0.0	0.0	1.08	306.0	21.0
1.003	50.00	6.99	32.837	0.322	0.0	0.0	0.0	1.08	306.0	43.6
3.000	50.00	5.53	32.982	0.000	0.0	0.0	0.0	1.08	306.0	0.0
3.001	50.00	5.81	32.913	0.077	0.0	0.0	0.0	1.08	306.0	10.4
3.002	50.00	6.12	32.877	0.113	0.0	0.0	0.0	1.08	306.0	15.3
3.003	50.00	6.55	32.836	0.239	0.0	0.0	0.0	1.08	306.0	32.4
3.004	50.00	6.95	32.807	0.239	0.0	0.0	0.0	1.08	306.0	32.4

Network Design Table for 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
1.004	18.525	0.037	500.0	0.065	0.00	0.0	0.600	o	600	Pipe/Conduit	
4.000	30.149	0.134	225.0	0.035	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	27.286	0.055	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
5.000	3.990	0.040	100.0	0.144	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	7.644	0.510	15.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.002	23.728	1.483	16.0	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.000	12.417	0.083	150.0	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit	
6.001	44.850	0.299	150.0	0.024	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.002	45.098	0.090	500.0	0.095	0.00	0.0	0.600	o	600	Pipe/Conduit	
6.003	31.963	0.064	500.0	0.054	0.00	0.0	0.600	o	600	Pipe/Conduit	
6.004	44.042	0.088	500.5	0.010	0.00	0.0	0.600	o	600	Pipe/Conduit	
5.003	21.645	0.043	500.0	0.028	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.006	27.387	0.055	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.007	10.228	0.020	500.0	0.021	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.008	10.480	0.021	500.0	0.000	0.00	0.0	0.600	o	600	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)
1.004	50.00	7.28	32.754	0.626	0.0	0.0	0.0	1.08	306.0	84.8
4.000	50.00	5.58	32.780	0.035	0.0	0.0	0.0	0.87	34.5	4.7
1.005	50.00	7.70	32.717	0.661	0.0	0.0	0.0	1.08	306.0	89.5
5.000	50.00	5.05	35.100	0.144	0.0	0.0	0.0	1.31	52.0	19.5
5.001	50.00	5.09	35.060	0.144	0.0	0.0	0.0	3.40	135.0	19.5
5.002	50.00	5.21	34.566	0.163	0.0	0.0	0.0	3.29	130.7	22.1
6.000	50.00	5.25	33.782	0.016	0.0	0.0	0.0	0.82	14.5	2.2
6.001	50.00	6.17	33.699	0.040	0.0	0.0	0.0	0.82	14.5	5.4
6.002	50.00	6.86	32.950	0.135	0.0	0.0	0.0	1.08	306.0	18.3
6.003	50.00	7.35	32.860	0.189	0.0	0.0	0.0	1.08	306.0	25.6
6.004	50.00	8.03	32.796	0.199	0.0	0.0	0.0	1.08	305.8	26.9
5.003	50.00	8.37	32.708	0.390	0.0	0.0	0.0	1.08	306.0	52.8
1.006	50.00	8.79	32.662	1.051	0.0	0.0	0.0	1.08	306.0	142.3
1.007	50.00	8.94	32.607	1.072	0.0	0.0	0.0	1.08	306.0	145.2
1.008	50.00	9.11	32.587	1.072	0.0	0.0	0.0	1.08	306.0	145.2

Network Design Table for 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
1.009	15.654	0.031	500.0	0.030	0.00	0.0	0.600	o	600	Pipe/Conduit	
7.000	8.197	0.016	500.0	0.000	5.00	0.0	0.600	o	600	Pipe/Conduit	
1.010	19.329	0.039	500.0	0.023	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.011	13.091	0.026	500.0	0.051	0.00	0.0	0.600	o	600	Pipe/Conduit	
8.000	40.955	0.082	500.0	0.042	5.00	0.0	0.600	o	600	Pipe/Conduit	
8.001	19.840	0.040	500.0	0.058	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.012	15.000	0.030	500.0	0.000	0.00	0.0	0.600	o	600	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)
1.009	50.00	9.35	32.566	1.102	0.0	0.0	0.0	1.08	306.0	149.2
7.000	50.00	5.13	32.551	0.000	0.0	0.0	0.0	1.08	306.0	0.0
1.010	50.00	9.64	32.535	1.125	0.0	0.0	0.0	1.08	306.0	152.3
1.011	50.00	9.85	32.496	1.176	0.0	0.0	0.0	1.08	306.0	159.2
8.000	50.00	5.63	32.592	0.042	0.0	0.0	0.0	1.08	306.0	5.7
8.001	50.00	5.94	32.510	0.100	0.0	0.0	0.0	1.08	306.0	13.5
1.012	50.00	10.08	32.470	1.276	0.0	0.0	0.0	1.08	306.0	172.8

Manhole Schedules for NETWORK 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
MH1	33.910	0.998	Open Manhole	1500	1.000	32.912	600				
MH2	33.747	0.853	Open Manhole	1500	1.001	32.894	600	1.000	32.894	600	
MH14	35.815	2.804	Open Manhole	1500	2.000	33.011	600				
MH3	34.469	1.635	Open Manhole	1500	1.002	32.934	600	1.001	32.834	600	
								2.000	32.934	600	
MH4	33.903	1.066	Open Manhole	1500	1.003	32.837	600	1.002	32.837	600	
MH15	37.200	4.218	Open Manhole	1500	3.000	32.982	600				
MH16	36.800	3.887	Open Manhole	1500	3.001	32.913	600	3.000	32.913	600	
MH17	36.600	3.723	Open Manhole	1500	3.002	32.877	600	3.001	32.877	600	
MH18	36.400	3.564	Open Manhole	1500	3.003	32.836	600	3.002	32.836	600	
MH19	35.193	2.413	Open Manhole	1500	3.004	32.807	600	3.003	32.780	600	
MH5	34.250	1.496	Open Manhole	1500	1.004	32.754	600	1.003	32.754	600	
								3.004	32.754	600	
MH21	33.682	0.902	Open Manhole	1200	4.000	32.780	225				
MH6	34.280	1.634	Open Manhole	1500	1.005	32.717	600	1.004	32.717	600	
								4.000	32.646	225	
MH22	36.107	1.007	Open Manhole	1200	5.000	35.100	225				
MH23	35.881	0.821	Open Manhole	1200	5.001	35.060	225	5.000	35.060	225	
MH24	35.680	1.130	Open Manhole	1200	5.002	34.566	225	5.001	34.550	225	
MH26	35.426	1.644	Open Manhole	1200	6.000	33.782	150				
MH27	35.266	1.567	Open Manhole	1200	6.001	33.699	150	6.000	33.699	150	
MH28	34.681	1.731	Open Manhole	1500	6.002	32.950	600	6.001	33.400	150	
MH29	35.030	2.170	Open Manhole	1500	6.003	32.860	600	6.002	32.860	600	
MH30	35.081	2.285	Open Manhole	1500	6.004	32.796	600	6.003	32.796	600	
MH25	34.610	1.902	Open Manhole	1500	5.003	32.708	600	5.002	33.083	225	
								6.004	32.708	600	
MH7	34.481	1.819	Open Manhole	1500	1.006	32.662	600	1.005	32.662	600	
								5.003	32.665	600	3
MH8	34.138	1.531	Open Manhole	1500	1.007	32.607	600	1.006	32.607	600	
MH9	33.996	1.409	Open Manhole	1500	1.008	32.587	600	1.007	32.587	600	
MH10	33.870	1.304	Open Manhole	1500	1.009	32.566	600	1.008	32.566	600	
MH31	33.651	1.100	Open Manhole	1500	7.000	32.551	600				
MH11	33.703	1.168	Open Manhole	1500	1.010	32.535	600	1.009	32.535	600	
								7.000	32.535	600	
MH12	33.600	1.104	Open Manhole	1500	1.011	32.496	600	1.010	32.496	600	
MH79	34.162	1.570	Open Manhole	1500	8.000	32.592	600				
MH32	33.140	0.630	Open Manhole	1500	8.001	32.510	600	8.000	32.510	600	
MH13	33.570	1.100	Open Manhole	1500	1.012	32.470	600	1.011	32.470	600	

Manhole Schedules for NETWORK 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								8.001	32.470	600	
MH45	33.440	1.000	Open Manhole	1200		OUTFALL		1.012	32.440	600	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH1	536714.317	116599.699	536714.317	116599.699	Required	
MH2	536705.336	116599.304	536705.336	116599.304	Required	
MH14	536705.775	116530.464	536705.775	116530.464	Required	
MH3	536705.330	116569.057	536705.330	116569.057	Required	
MH4	536656.657	116566.611	536656.657	116566.611	Required	
MH15	536679.859	116501.067	536679.859	116501.067	Required	
MH16	536646.455	116508.763	536646.455	116508.763	Required	
MH17	536629.052	116513.353	536629.052	116513.353	Required	
MH18	536608.665	116512.885	536608.665	116512.885	Required	
MH19	536611.206	116540.594	536611.206	116540.594	Required	
MH5	536615.353	116566.550	536615.353	116566.550	Required	
MH21	536595.619	116595.301	536595.619	116595.301	Required	

Manhole Schedules for NETWORK 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH6	536596.879	116565.178	536596.879	116565.178	Required	
MH22	536550.507	116522.375	536550.507	116522.375	Required	
MH23	536549.477	116526.229	536549.477	116526.229	Required	
MH24	536549.404	116533.872	536549.404	116533.872	Required	
MH26	536373.853	116585.726	536373.853	116585.726	Required	
MH27	536386.258	116585.173	536386.258	116585.173	Required	
MH28	536430.261	116576.497	536430.261	116576.497	Required	
MH29	536473.166	116562.605	536473.166	116562.605	Required	
MH30	536504.645	116557.068	536504.645	116557.068	Required	
MH25	536548.684	116557.589	536548.684	116557.589	Required	
MH7	536569.700	116562.772	536569.700	116562.772	Required	
MH8	536571.694	116590.087	536571.694	116590.087	Required	
MH9	536573.323	116600.184	536573.323	116600.184	Required	
MH10	536573.142	116610.663	536573.142	116610.663	Required	
MH31	536570.868	116630.632	536570.868	116630.632	Required	

Manhole Schedules for NETWORK 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH11	536565.580	116624.369	536565.580	116624.369	Required	
MH12	536549.166	116634.576	536549.166	116634.576	Required	
MH79	536517.839	116592.340	536517.839	116592.340	Required	
MH32	536516.262	116633.265	536516.262	116633.265	Required	
MH13	536536.083	116634.139	536536.083	116634.139	Required	
MH45	536535.379	116649.122			No Entry	

PIPELINE SCHEDULES for NETWORK 1

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	600	MH1	33.910	32.912	0.398	Open Manhole	1500
1.001	o	600	MH2	33.747	32.894	0.253	Open Manhole	1500
2.000	o	600	MH14	35.815	33.011	2.204	Open Manhole	1500
1.002	o	600	MH3	34.469	32.934	0.935	Open Manhole	1500
1.003	o	600	MH4	33.903	32.837	0.466	Open Manhole	1500
3.000	o	600	MH15	37.200	32.982	3.618	Open Manhole	1500
3.001	o	600	MH16	36.800	32.913	3.287	Open Manhole	1500
3.002	o	600	MH17	36.600	32.877	3.123	Open Manhole	1500
3.003	o	600	MH18	36.400	32.836	2.964	Open Manhole	1500
3.004	o	600	MH19	35.193	32.807	1.786	Open Manhole	1500
1.004	o	600	MH5	34.250	32.754	0.896	Open Manhole	1500
4.000	o	225	MH21	33.682	32.780	0.677	Open Manhole	1200
1.005	o	600	MH6	34.280	32.717	0.963	Open Manhole	1500
5.000	o	225	MH22	36.107	35.100	0.782	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)
1.000	8.989	500.0	MH2	33.747	32.894	0.253	Open Manhole	1500
1.001	30.247	500.0	MH3	34.469	32.834	1.035	Open Manhole	1500
2.000	38.595	500.0	MH3	34.469	32.934	0.935	Open Manhole	1500
1.002	48.734	500.0	MH4	33.903	32.837	0.466	Open Manhole	1500
1.003	41.304	500.0	MH5	34.250	32.754	0.896	Open Manhole	1500
3.000	34.279	500.0	MH16	36.800	32.913	3.287	Open Manhole	1500
3.001	17.999	500.0	MH17	36.600	32.877	3.123	Open Manhole	1500
3.002	20.392	500.0	MH18	36.400	32.836	2.964	Open Manhole	1500
3.003	27.825	500.0	MH19	35.193	32.780	1.813	Open Manhole	1500
3.004	26.286	500.0	MH5	34.250	32.754	0.896	Open Manhole	1500
1.004	18.525	500.0	MH6	34.280	32.717	0.963	Open Manhole	1500
4.000	30.149	225.0	MH6	34.280	32.646	1.409	Open Manhole	1500
1.005	27.286	500.0	MH7	34.481	32.662	1.219	Open Manhole	1500
5.000	3.990	100.0	MH23	35.881	35.060	0.596	Open Manhole	1200

PIPELINE SCHEDULES for NETWORK 1

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)
5.001	o	225	MH23	35.881	35.060	0.596	Open Manhole	1200
5.002	o	225	MH24	35.680	34.566	0.889	Open Manhole	1200
6.000	o	150	MH26	35.426	33.782	1.494	Open Manhole	1200
6.001	o	150	MH27	35.266	33.699	1.417	Open Manhole	1200
6.002	o	600	MH28	34.681	32.950	1.131	Open Manhole	1500
6.003	o	600	MH29	35.030	32.860	1.570	Open Manhole	1500
6.004	o	600	MH30	35.081	32.796	1.685	Open Manhole	1500
5.003	o	600	MH25	34.610	32.708	1.302	Open Manhole	1500
1.006	o	600	MH7	34.481	32.662	1.219	Open Manhole	1500
1.007	o	600	MH8	34.138	32.607	0.931	Open Manhole	1500
1.008	o	600	MH9	33.996	32.587	0.809	Open Manhole	1500
1.009	o	600	MH10	33.870	32.566	0.704	Open Manhole	1500
7.000	o	600	MH31	33.651	32.551	0.500	Open Manhole	1500
1.010	o	600	MH11	33.703	32.535	0.568	Open Manhole	1500
1.011	o	600	MH12	33.600	32.496	0.504	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)
5.001	7.644	15.0	MH24	35.680	34.550	0.905	Open Manhole	1200
5.002	23.728	16.0	MH25	34.610	33.083	1.302	Open Manhole	1500
6.000	12.417	150.0	MH27	35.266	33.699	1.417	Open Manhole	1200
6.001	44.850	150.0	MH28	34.681	33.400	1.131	Open Manhole	1500
6.002	45.098	500.0	MH29	35.030	32.860	1.570	Open Manhole	1500
6.003	31.963	500.0	MH30	35.081	32.796	1.685	Open Manhole	1500
6.004	44.042	500.5	MH25	34.610	32.708	1.302	Open Manhole	1500
5.003	21.645	500.0	MH7	34.481	32.665	1.216	Open Manhole	1500
1.006	27.387	500.0	MH8	34.138	32.607	0.931	Open Manhole	1500
1.007	10.228	500.0	MH9	33.996	32.587	0.809	Open Manhole	1500
1.008	10.480	500.0	MH10	33.870	32.566	0.704	Open Manhole	1500
1.009	15.654	500.0	MH11	33.703	32.535	0.568	Open Manhole	1500
7.000	8.197	500.0	MH11	33.703	32.535	0.568	Open Manhole	1500
1.010	19.329	500.0	MH12	33.600	32.496	0.504	Open Manhole	1500
1.011	13.091	500.0	MH13	33.570	32.470	0.500	Open Manhole	1500

PIPELINE SCHEDULES for NETWORK 1

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)
8.000	o	600	MH79	34.162	32.592	0.970	Open Manhole	1500
8.001	o	600	MH32	33.140	32.510	0.030	Open Manhole	1500
1.012	o	600	MH13	33.570	32.470	0.500	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)
8.000	40.955	500.0	MH32	33.140	32.510	0.030	Open Manhole	1500
8.001	19.840	500.0	MH13	33.570	32.470	0.500	Open Manhole	1500
1.012	15.000	500.0	MH45	33.440	32.440	0.400	Open Manhole	1200

TAKE OFF DETAILS for NETWORK 1

Length Calculations based on 'Centre-Centre'

Warning - The following pipes have not been classified:

1.000
1.001
2.000
1.002
1.003
3.000
3.001
3.002
3.003
3.004
1.004
4.000
1.005
5.000
5.001
5.002
6.000
6.001
6.002
6.003
6.004
5.003
1.006
1.007
1.008
1.009
7.000
1.010
1.011
8.000
8.001
1.012

Warning - The following manholes have not been classified:

MH1
MH2
MH14
MH3
MH4
MH15
MH16
MH17
MH18
MH19
MH5
MH21
MH6
MH22
MH23
MH24
MH26
MH27

TAKE OFF DETAILS for NETWORK 1

MH28
MH29
MH30
MH25
MH7
MH8
MH9
MH10
MH31
MH11
MH12
MH79
MH32
MH13

Pipes

Number	32
Total Length (m)	786.148
Volume (m³)	191.1802

Manholes

Number	32
True Depth (m)	56.186
Volume (m³)	94.4207

Outfalls

Number	1
True Depth (m)	1.000
Volume (m³)	1.1310

Flow Controls

Number 3

Storage Structures

Number	4
Volume (m³)	976.6012

TOTALS FOR MANHOLES

Diameter (mm)	Width (mm)	Manhole Class	Number	Ring Depth (m)	Cost ()	Add Cost ()	Total Cost ()
1200		Unclassified	6	5.855	?.??	?.??	?.??
1500		Unclassified	26	33.316	?.??	?.??	?.??
TOTALS			32	39.171	0.00	0.00	0.00

TOTALS FOR PIPES

Diameter (mm)	Pipe Class	Number	Length (m)	Cost ()
150	Unclassified	2	57.267	?.??
225	Unclassified	4	65.511	?.??
600	Unclassified	26	663.370	?.??
TOTALS		32	786.148	0.00

TOTALS FOR MATERIALS

No materials are used

GROUND WORKS - Pipe Excavation by Depth

Depth <= (m)	Length (m)	Volume (m^3)	Cost ()
TOTALS	0.000	0.0000	0.00

GROUND WORKS - Totals

Item	Volume / Area (m^3)	(m^2)	Cost ()
MH Excavation		0.0000	0.00
Pipe Excavation		0.0000	0.00
Pipe Replacement		0.0000	0.00
Pipe Reinstatement		0.0000	0.00
Removal		0.0000	0.00
TOTALS			0.00

TOTALS FOR FLOW CONTROLS

Name	Number	Cost ()
Hydro-Brake®	3	0.00
TOTALS	3	0.00

TOTALS FOR STORAGE STRUCTURES

Name	Number	Volume (m^3)	Cost ()
Tank or Pond	4	976.6012	0.00
TOTALS	4	976.6012	0.00

TOTAL COSTS

Item	Cost ()
Manholes	0.00
Pipes	0.00
Materials	0.00
Ground Works	0.00
Flow Controls	0.00
Storage Structures	0.00
TOTAL	0.00

BREAKDOWN FOR MANHOLES

USMH Name	PN	MH Class	Diameter (mm)	Width (mm)	Ring Depth (m)	Cost ()	Add Cost ()	Total ()
MH1	1.000	Unclassified	1500		0.398	?.??	?.??	?.??
MH2	1.001	Unclassified	1500		0.253	?.??	?.??	?.??
MH14	2.000	Unclassified	1500		2.204	?.??	?.??	?.??
MH3	1.002	Unclassified	1500		0.935	?.??	?.??	?.??
MH4	1.003	Unclassified	1500		0.466	?.??	?.??	?.??
MH15	3.000	Unclassified	1500		3.618	?.??	?.??	?.??
MH16	3.001	Unclassified	1500		3.287	?.??	?.??	?.??
MH17	3.002	Unclassified	1500		3.123	?.??	?.??	?.??
MH18	3.003	Unclassified	1500		2.964	?.??	?.??	?.??
MH19	3.004	Unclassified	1500		1.786	?.??	?.??	?.??
MH5	1.004	Unclassified	1500		0.896	?.??	?.??	?.??
MH21	4.000	Unclassified	1200		0.677	?.??	?.??	?.??
MH6	1.005	Unclassified	1500		0.963	?.??	?.??	?.??
MH22	5.000	Unclassified	1200		0.782	?.??	?.??	?.??
MH23	5.001	Unclassified	1200		0.596	?.??	?.??	?.??
MH24	5.002	Unclassified	1200		0.889	?.??	?.??	?.??
MH26	6.000	Unclassified	1200		1.494	?.??	?.??	?.??
MH27	6.001	Unclassified	1200		1.417	?.??	?.??	?.??
MH28	6.002	Unclassified	1500		1.131	?.??	?.??	?.??
MH29	6.003	Unclassified	1500		1.570	?.??	?.??	?.??
MH30	6.004	Unclassified	1500		1.685	?.??	?.??	?.??
MH25	5.003	Unclassified	1500		1.302	?.??	?.??	?.??
MH7	1.006	Unclassified	1500		1.219	?.??	?.??	?.??
MH8	1.007	Unclassified	1500		0.931	?.??	?.??	?.??
MH9	1.008	Unclassified	1500		0.809	?.??	?.??	?.??
MH10	1.009	Unclassified	1500		0.704	?.??	?.??	?.??
MH31	7.000	Unclassified	1500		0.500	?.??	?.??	?.??
MH11	1.010	Unclassified	1500		0.568	?.??	?.??	?.??
MH12	1.011	Unclassified	1500		0.504	?.??	?.??	?.??
MH79	8.000	Unclassified	1500		0.970	?.??	?.??	?.??
MH32	8.001	Unclassified	1500		0.030	?.??	?.??	?.??
MH13	1.012	Unclassified	1500		0.500	?.??	?.??	?.??
TOTALS					39.171	0.00	0.00	0.00

BREAKDOWN FOR PIPES

PN	Pipe Class	Diameter (mm)	Min Cover D (m)	Max Cover D (m)	Length (m)	Cost / m ()	Total Cost ()
1.000	Unclassified	600	0.253	0.398	8.989	?.??	?.??
1.001	Unclassified	600	0.253	1.035	30.247	?.??	?.??
2.000	Unclassified	600	0.935	2.204	38.595	?.??	?.??
1.002	Unclassified	600	0.466	0.935	48.734	?.??	?.??
1.003	Unclassified	600	0.466	0.896	41.304	?.??	?.??
3.000	Unclassified	600	3.287	3.618	34.279	?.??	?.??
3.001	Unclassified	600	3.123	3.287	17.999	?.??	?.??
3.002	Unclassified	600	2.964	3.123	20.392	?.??	?.??
3.003	Unclassified	600	1.813	2.964	27.825	?.??	?.??
3.004	Unclassified	600	0.896	1.786	26.286	?.??	?.??
1.004	Unclassified	600	0.896	0.963	18.525	?.??	?.??
4.000	Unclassified	225	0.677	1.409	30.149	?.??	?.??
1.005	Unclassified	600	0.963	1.219	27.286	?.??	?.??
5.000	Unclassified	225	0.596	0.782	3.990	?.??	?.??
5.001	Unclassified	225	0.596	0.905	7.644	?.??	?.??
5.002	Unclassified	225	0.889	1.302	23.728	?.??	?.??
6.000	Unclassified	150	1.417	1.494	12.417	?.??	?.??
6.001	Unclassified	150	1.131	1.417	44.850	?.??	?.??
6.002	Unclassified	600	1.131	1.570	45.098	?.??	?.??
6.003	Unclassified	600	1.570	1.685	31.963	?.??	?.??
6.004	Unclassified	600	1.302	1.685	44.042	?.??	?.??
5.003	Unclassified	600	1.216	1.302	21.645	?.??	?.??
1.006	Unclassified	600	0.931	1.219	27.387	?.??	?.??
1.007	Unclassified	600	0.809	0.931	10.228	?.??	?.??
1.008	Unclassified	600	0.704	0.809	10.480	?.??	?.??
1.009	Unclassified	600	0.568	0.704	15.654	?.??	?.??
7.000	Unclassified	600	0.500	0.568	8.197	?.??	?.??
1.010	Unclassified	600	0.504	0.568	19.329	?.??	?.??
1.011	Unclassified	600	0.500	0.504	13.091	?.??	?.??
8.000	Unclassified	600	0.030	0.970	40.955	?.??	?.??
8.001	Unclassified	600	0.030	0.500	19.840	?.??	?.??
1.012	Unclassified	600	0.400	0.500	15.000	?.??	?.??
TOTALS					786.148		0.00

BREAKDOWN FOR MANHOLE BLINDING (0.00/m³)

USMH Name	PN	Diameter (mm)	Width (mm)	Height (m)	Volume (m³)	Cost ()
MH1	1.000	1500		?.???	?.????	?.??
MH2	1.001	1500		?.???	?.????	?.??
MH14	2.000	1500		?.???	?.????	?.??
MH3	1.002	1500		?.???	?.????	?.??
MH4	1.003	1500		?.???	?.????	?.??
MH15	3.000	1500		?.???	?.????	?.??
MH16	3.001	1500		?.???	?.????	?.??
MH17	3.002	1500		?.???	?.????	?.??
MH18	3.003	1500		?.???	?.????	?.??
MH19	3.004	1500		?.???	?.????	?.??
MH5	1.004	1500		?.???	?.????	?.??
MH21	4.000	1200		?.???	?.????	?.??
MH6	1.005	1500		?.???	?.????	?.??
MH22	5.000	1200		?.???	?.????	?.??
MH23	5.001	1200		?.???	?.????	?.??
MH24	5.002	1200		?.???	?.????	?.??
MH26	6.000	1200		?.???	?.????	?.??
MH27	6.001	1200		?.???	?.????	?.??
MH28	6.002	1500		?.???	?.????	?.??
MH29	6.003	1500		?.???	?.????	?.??
MH30	6.004	1500		?.???	?.????	?.??
MH25	5.003	1500		?.???	?.????	?.??
MH7	1.006	1500		?.???	?.????	?.??
MH8	1.007	1500		?.???	?.????	?.??
MH9	1.008	1500		?.???	?.????	?.??
MH10	1.009	1500		?.???	?.????	?.??
MH31	7.000	1500		?.???	?.????	?.??
MH11	1.010	1500		?.???	?.????	?.??
MH12	1.011	1500		?.???	?.????	?.??
MH79	8.000	1500		?.???	?.????	?.??
MH32	8.001	1500		?.???	?.????	?.??
MH13	1.012	1500		?.???	?.????	?.??
TOTALS				0.000	0.0000	0.00

BREAKDOWN FOR PIPE SURROUND

PN	Length (m)	Diameter (mm)	Surround	Volume (m³)	Cost / m³ ()	Cost ()
1.000	8.989	600	Unclassified	?.????	?.??	?.??
1.001	30.247	600	Unclassified	?.????	?.??	?.??
2.000	38.595	600	Unclassified	?.????	?.??	?.??
1.002	48.734	600	Unclassified	?.????	?.??	?.??
1.003	41.304	600	Unclassified	?.????	?.??	?.??
3.000	34.279	600	Unclassified	?.????	?.??	?.??
3.001	17.999	600	Unclassified	?.????	?.??	?.??
3.002	20.392	600	Unclassified	?.????	?.??	?.??
3.003	27.825	600	Unclassified	?.????	?.??	?.??
3.004	26.286	600	Unclassified	?.????	?.??	?.??
1.004	18.525	600	Unclassified	?.????	?.??	?.??
4.000	30.149	225	Unclassified	?.????	?.??	?.??
1.005	27.286	600	Unclassified	?.????	?.??	?.??
5.000	3.990	225	Unclassified	?.????	?.??	?.??
5.001	7.644	225	Unclassified	?.????	?.??	?.??
5.002	23.728	225	Unclassified	?.????	?.??	?.??
6.000	12.417	150	Unclassified	?.????	?.??	?.??
6.001	44.850	150	Unclassified	?.????	?.??	?.??
6.002	45.098	600	Unclassified	?.????	?.??	?.??
6.003	31.963	600	Unclassified	?.????	?.??	?.??
6.004	44.042	600	Unclassified	?.????	?.??	?.??
5.003	21.645	600	Unclassified	?.????	?.??	?.??
1.006	27.387	600	Unclassified	?.????	?.??	?.??
1.007	10.228	600	Unclassified	?.????	?.??	?.??
1.008	10.480	600	Unclassified	?.????	?.??	?.??
1.009	15.654	600	Unclassified	?.????	?.??	?.??
7.000	8.197	600	Unclassified	?.????	?.??	?.??
1.010	19.329	600	Unclassified	?.????	?.??	?.??
1.011	13.091	600	Unclassified	?.????	?.??	?.??
8.000	40.955	600	Unclassified	?.????	?.??	?.??
8.001	19.840	600	Unclassified	?.????	?.??	?.??
1.012	15.000	600	Unclassified	?.????	?.??	?.??
TOTALS	786.148			0.0000		0.00

BREAKDOWN FOR MANHOLE SURROUND

USMH Name	PN	Diameter (mm)	Width (mm)	Depth (m)	Surround	Volume (m^3)	Cost / m^3 ()	Cost ()
MH1	1.000	1500		0.998	Unclassified	?.????	?.??	?.??
MH2	1.001	1500		0.853	Unclassified	?.????	?.??	?.??
MH14	2.000	1500		2.804	Unclassified	?.????	?.??	?.??
MH3	1.002	1500		1.535	Unclassified	?.????	?.??	?.??
MH4	1.003	1500		1.066	Unclassified	?.????	?.??	?.??
MH15	3.000	1500		4.218	Unclassified	?.????	?.??	?.??
MH16	3.001	1500		3.887	Unclassified	?.????	?.??	?.??
MH17	3.002	1500		3.723	Unclassified	?.????	?.??	?.??
MH18	3.003	1500		3.564	Unclassified	?.????	?.??	?.??
MH19	3.004	1500		2.386	Unclassified	?.????	?.??	?.??
MH5	1.004	1500		1.496	Unclassified	?.????	?.??	?.??
MH21	4.000	1200		0.902	Unclassified	?.????	?.??	?.??
MH6	1.005	1500		1.563	Unclassified	?.????	?.??	?.??
MH22	5.000	1200		1.007	Unclassified	?.????	?.??	?.??
MH23	5.001	1200		0.821	Unclassified	?.????	?.??	?.??
MH24	5.002	1200		1.114	Unclassified	?.????	?.??	?.??
MH26	6.000	1200		1.644	Unclassified	?.????	?.??	?.??
MH27	6.001	1200		1.567	Unclassified	?.????	?.??	?.??
MH28	6.002	1500		1.731	Unclassified	?.????	?.??	?.??
MH29	6.003	1500		2.170	Unclassified	?.????	?.??	?.??
MH30	6.004	1500		2.285	Unclassified	?.????	?.??	?.??
MH25	5.003	1500		1.902	Unclassified	?.????	?.??	?.??
MH7	1.006	1500		1.819	Unclassified	?.????	?.??	?.??
MH8	1.007	1500		1.531	Unclassified	?.????	?.??	?.??
MH9	1.008	1500		1.409	Unclassified	?.????	?.??	?.??
MH10	1.009	1500		1.304	Unclassified	?.????	?.??	?.??
MH31	7.000	1500		1.100	Unclassified	?.????	?.??	?.??
MH11	1.010	1500		1.168	Unclassified	?.????	?.??	?.??
MH12	1.011	1500		1.104	Unclassified	?.????	?.??	?.??
MH79	8.000	1500		1.570	Unclassified	?.????	?.??	?.??
MH32	8.001	1500		0.630	Unclassified	?.????	?.??	?.??
MH13	1.012	1500		1.100	Unclassified	?.????	?.??	?.??
TOTALS				55.971		0.0000		0.00

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for NETWORK 2

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	40	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for NETWORK 2

- Indicates pipe length does not match coordinates

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	24.150	0.107	225.0	0.040	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	10.022	0.045	225.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	12.647	0.056	225.0	0.142	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	9.925#	0.044	225.0	0.022	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	5.702#	0.317	18.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	4.577#	0.654	7.0	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)
1.000	50.00	5.46	36.676	0.040	0.0	0.0	0.0	0.87	34.5	5.4
1.001	50.00	5.66	36.569	0.040	0.0	0.0	0.0	0.87	34.5	5.4
2.000	50.00	5.24	36.580	0.142	0.0	0.0	0.0	0.87	34.5	19.2
1.002	50.00	5.85	36.524	0.204	0.0	0.0	0.0	0.87	34.5	27.6
1.003	50.00	5.88	36.480	0.204	0.0	0.0	0.0	3.10	123.2	27.6
1.004	50.00	5.89	36.165	0.204	0.0	0.0	0.0	4.98	197.9	27.6

Manhole Schedules for NETWORK 2

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)	Backdrop (mm)
MH1	37.764	1.088	Open Manhole	1200	1.000	36.676	225				
MH2	38.501	1.932	Open Manhole	1200	1.001	36.569	225	1.000	36.569	225	
MH6	38.405	1.825	Open Manhole	1200	2.000	36.580	225				
MH3	38.510	1.986	Open Manhole	1200	1.002	36.524	225	1.001	36.524	225	
								2.000	36.524	225	
MH	37.480	1.000	Open Manhole	1200	1.003	36.480	225	1.002	36.480	225	
MH4	38.000	1.837	Open Manhole	1200	1.004	36.165	225	1.003	36.163	225	
MH5	37.920	2.409	Open Manhole	1200		OUTFALL		1.004	35.511	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
MH1	536610.518	116480.823	536610.518	116480.823	Required	
MH2	536611.336	116456.688	536611.336	116456.688	Required	
MH6	536620.680	116436.513	536620.680	116436.513	Required	
MH3	536613.453	116446.891	536613.453	116446.891	Required	
MH	536601.242	116430.793	536601.242	116430.793	Required	
MH4	536601.207	116428.986	536601.207	116428.986	Required	
MH5	536603.568	116426.438			No Entry	

PIPELINE SCHEDULES for NETWORK 2

Upstream Manhole

- Indicates pipe length does not match coordinates

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	225	MH1	37.764	36.676	0.863	Open Manhole	1200
1.001	o	225	MH2	38.501	36.569	1.707	Open Manhole	1200
2.000	o	225	MH6	38.405	36.580	1.600	Open Manhole	1200
1.002	o	225	MH3	38.510	36.524	1.761	Open Manhole	1200
1.003	o	225	MH	37.480	36.480	0.775	Open Manhole	1200
1.004	o	225	MH4	38.000	36.165	1.610	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)
1.000	24.150	225.0	MH2	38.501	36.569	1.707	Open Manhole	1200
1.001	10.022	225.0	MH3	38.510	36.524	1.761	Open Manhole	1200
2.000	12.647	225.0	MH3	38.510	36.524	1.761	Open Manhole	1200
1.002	9.925#	225.0	MH	37.480	36.480	0.775	Open Manhole	1200
1.003	5.702#	18.0	MH4	38.000	36.163	1.612	Open Manhole	1200
1.004	4.577#	7.0	MH5	37.920	35.511	2.184	Open Manhole	1200

Free Flowing Outfall Details for NETWORK 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	MH5	37.920	35.511	0.000	1200	0

Simulation Criteria for NETWORK 2

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
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

Simulation Criteria for NETWORK 2

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	40	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.350		

Online Controls for NETWORK 2

Complex Manhole: MH4, DS/PN: 1.004, Volume (m³): 2.3

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0081-2500-0600-2500
Design Head (m)	0.600
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	81
Invert Level (m)	36.165
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	2.5
Flush-Flo™	0.179	2.5
Kick-Flo®	0.404	2.1
Mean Flow over Head Range	-	2.1

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	2.4	1.200	3.4	3.000	5.3	7.000	7.9
0.200	2.5	1.400	3.7	3.500	5.7	7.500	8.1
0.300	2.4	1.600	3.9	4.000	6.0	8.000	8.4
0.400	2.1	1.800	4.1	4.500	6.4	8.500	8.7
0.500	2.3	2.000	4.4	5.000	6.7	9.000	8.9
0.600	2.5	2.200	4.5	5.500	7.0	9.500	9.2
0.800	2.9	2.400	4.7	6.000	7.3		
1.000	3.2	2.600	4.9	6.500	7.6		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0146-9500-0750-9500
Design Head (m)	0.750
Design Flow (l/s)	9.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	146
Invert Level (m)	36.730

Hydro-Brake® Optimum

Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	9.5
Flush-Flo™	0.251	9.5
Kick-Flo®	0.541	8.2
Mean Flow over Head Range	-	8.0

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	5.3	1.200	11.9	3.000	18.3	7.000	27.5
0.200	9.4	1.400	12.7	3.500	19.7	7.500	28.5
0.300	9.4	1.600	13.6	4.000	21.0	8.000	29.3
0.400	9.2	1.800	14.4	4.500	22.3	8.500	30.2
0.500	8.7	2.000	15.1	5.000	23.4	9.000	31.1
0.600	8.6	2.200	15.8	5.500	24.5	9.500	31.9
0.800	9.8	2.400	16.5	6.000	25.6		
1.000	10.9	2.600	17.1	6.500	26.6		

Storage Structures for NETWORK 2

Tank or Pond Manhole: MH, DS/PN: 1.003

Invert Level (m) 36.480

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	30.0	1.400	194.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 2

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.740

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
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, 100
Climate Change (%) 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	MH1	15 Summer	1	+0%	100/15 Summer				36.736
1.001	MH2	120 Summer	1	+0%	100/15 Summer				36.729
2.000	MH6	120 Summer	1	+0%	100/15 Summer				36.731
1.002	MH3	120 Summer	1	+0%	100/15 Summer				36.728
1.003	MH	120 Summer	1	+0%	1/30 Summer				36.725
1.004	MH4	120 Summer	1	+0%	1/15 Summer				36.725

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	MH1	-0.165	0.000	0.16			5.0	OK	
1.001	MH2	-0.065	0.000	0.08			2.2	OK	
2.000	MH6	-0.074	0.000	0.29			8.8	OK	
1.002	MH3	-0.021	0.000	0.40			11.5	OK	
1.003	MH	0.020	0.000	0.05			4.2	SURCHARGED	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 2

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
1.004	MH4	0.335	0.000	0.02			2.5	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 2

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.740

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
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, 100
Climate Change (%) 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	MH1	30 Summer	100	+40%	100/15 Summer				37.532
1.001	MH2	30 Summer	100	+40%	100/15 Summer				37.493
2.000	MH6	15 Summer	100	+40%	100/15 Summer				37.751
1.002	MH3	30 Summer	100	+40%	100/15 Summer				37.471
1.003	MH	120 Summer	100	+40%	1/30 Summer				37.290
1.004	MH4	120 Summer	100	+40%	1/15 Summer				37.294

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	MH1	0.631	0.000	0.54			17.1	FLOOD RISK	
1.001	MH2	0.699	0.000	0.60			17.4	SURCHARGED	
2.000	MH6	0.946	0.000	2.41			71.6	SURCHARGED	
1.002	MH3	0.722	0.000	3.19			91.6	SURCHARGED	
1.003	MH	0.585	0.000	0.16			13.0	FLOOD RISK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 2

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
1.004	MH4	0.904	0.000	0.11			12.4	SURCHARGED	