Partington & Associates Limited
Structural Design Consultants
13 Gillibrand Street
Chorley
Lancashire
PR7 2EJ
Tel: (01257) 249863
Fax: (01257) 231915

19TH May 2017

Drainage design, Barrow Brook Enterprise Park, New Nursery Building Site.

The attached design has been prepared to comply with the requirements of Condition No8 of Planning Application 2016/1168.

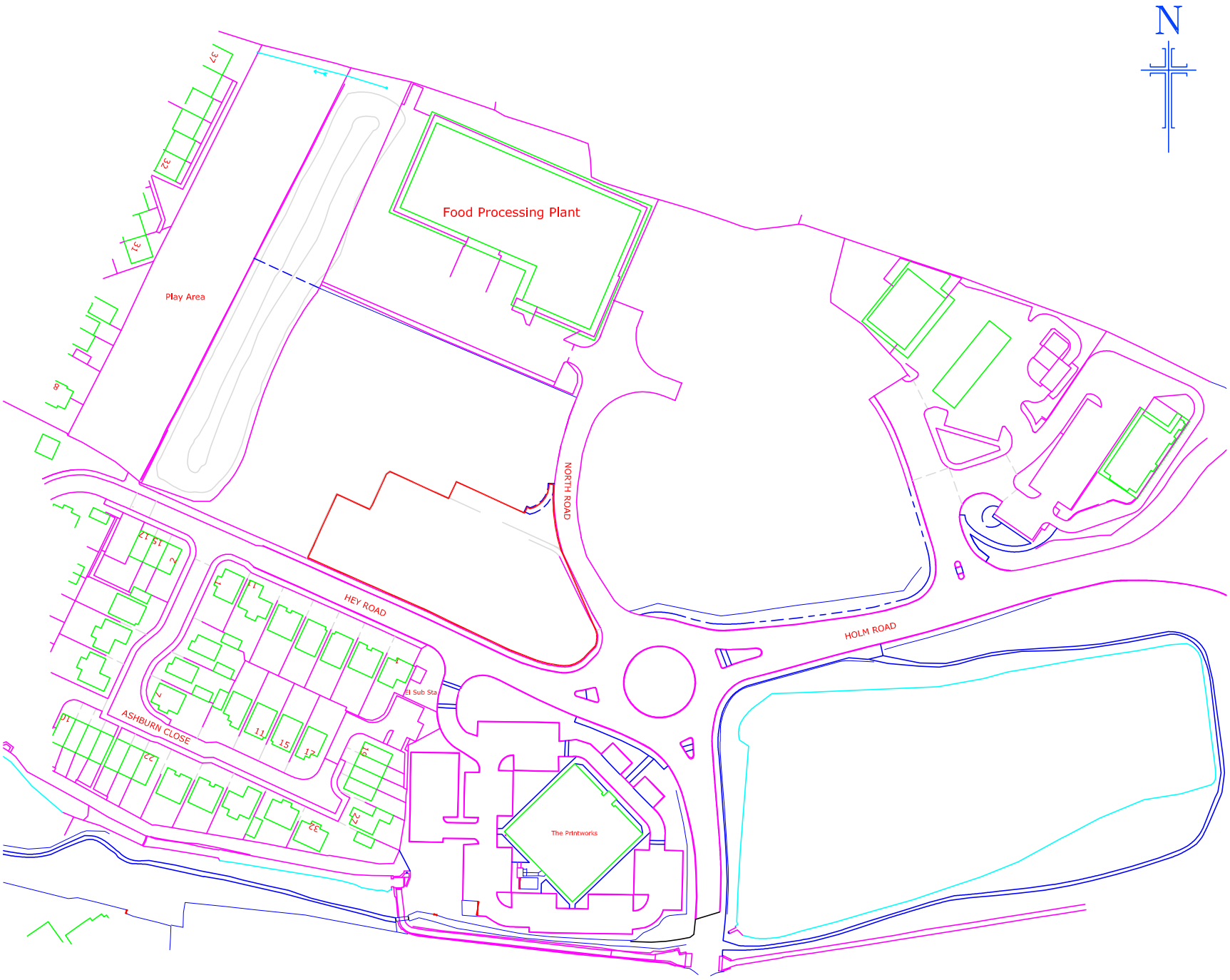
The site drainage will outfall to existing foul and surface water drainage systems, situated in the adjacent development site, as shown on the proposed drainage plan. These existing drains in turn outfall to the public foul and surface water sewers located in Hey Road.

The surface water drainage for the nursery site also makes provision for the westerly portion of the site which will be developed in the future. This area has been assigned an impermeability factor of 100% as has the vast majority of the nursery area.

The condition for surface water discharge indicates a maximum outflow from the site of 6.5 l/s. The design as submitted will restrict outflow to a maximum of 5.0 l/s and will provide sufficient attenuation to accommodate storms up to a 1 in 100 Yr 600 minute event, inclusive of climate change allowances, without any surface flooding.

A series of calculations are appended to illustrate the system operation during storms from 1 in 2 Yr to 1 in 100 Yr return periods.

RGH/ DPT



NOTES

Do not scale from this drawing. All dimensions are approximate and must be checked and verified by the contractor prior to works commencing on site.

REVISIONS

REV	DESCRIPTION	DATE	AMENDED
A	Revised red/blue site edges to incorporate site access	07-02-17	GM

LeaHough
CHARTERED SURVEYORS
Survey Valuation Design Planning Sales

Blakewater House
Phoenix Business Park
Blakewater Road
Blackburn
Lancashire
BB1 5RW
Tel: 01254 260196

8 Eaton Avenue
Matrix Office Park
Buckshaw Village
Preston
Lancashire
PR7 7NA
Tel: 01772 458866

Email: Info@leahough.co.uk
Web: www.leahough.co.uk

RICS

CLIENT:
Mr J Hindle
Hindle & Schofield LLP.

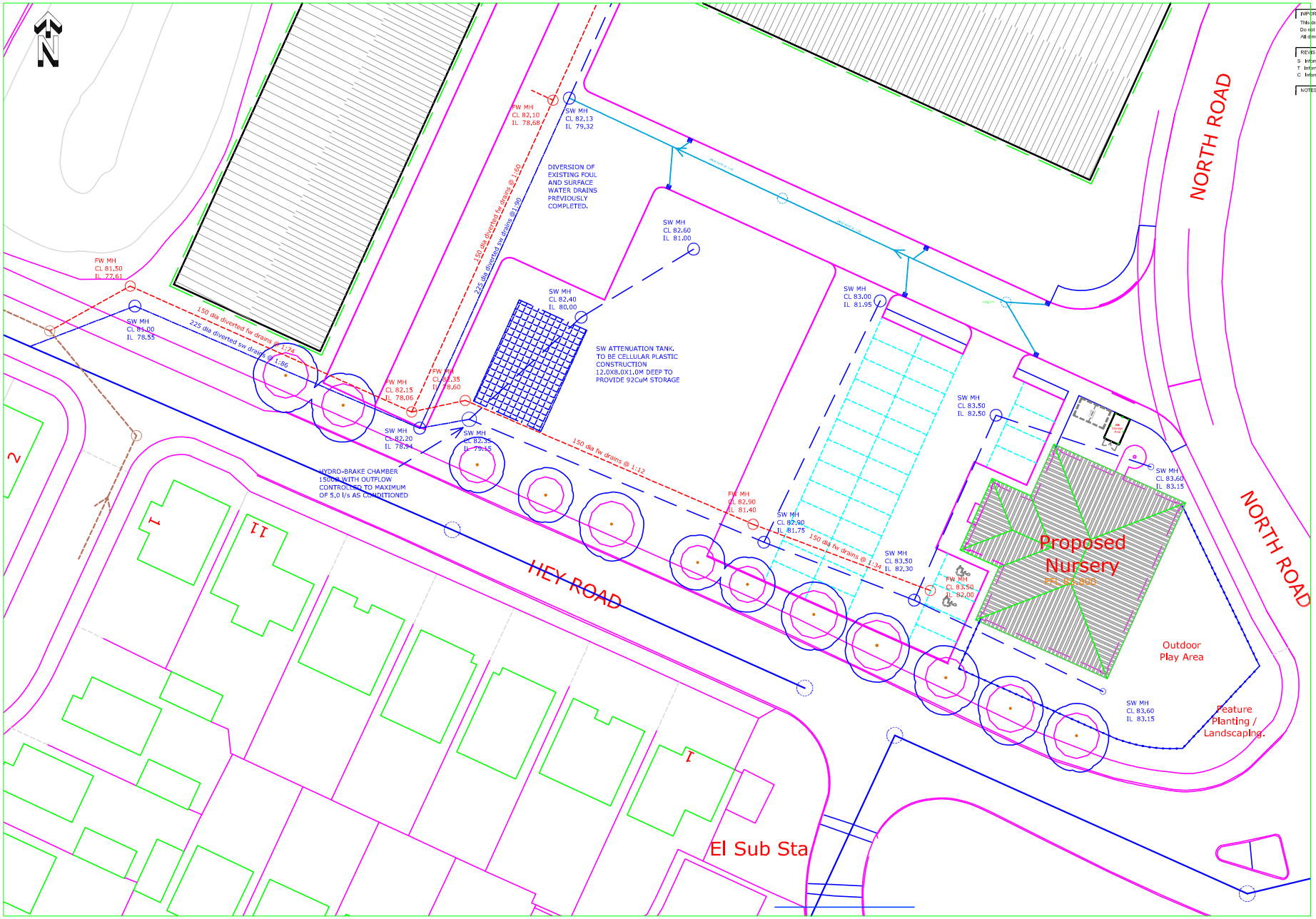
PROJECT ADDRESS:
Barrow Brook Enterprise Park,
Barrow,
Clitheroe,
BB7 9QZ.

PROJECT TITLE:
Proposed New Nursery Building

DRAWING TITLE:
Location Plan

PAPER SIZE:	DRAWING NUMBER:	REV
A3	BS.16-160/01	A

SCALE:	DATE:	DRAWN BY
1:1250	December 2016	GM



IMPORTANT

This drawing is copyright and remains the property of this practice
Do not scale this drawing
All dimensions to be checked on site

REVISION STATUS

S Information issued for feasibility or scheme design
T Information issued for tender purposes only
C Information issued for Construction

NOTES

PROVISIONAL ONLY

REVISION	DATE	DESCRIPTION
-	-	-

CLIENT
HINDLE & SCHOFIELD LLP.

PROJECT
BARROW BROOK ENTERPRISE PARK
BARROW, CLITHEROE, BB7 9QZ

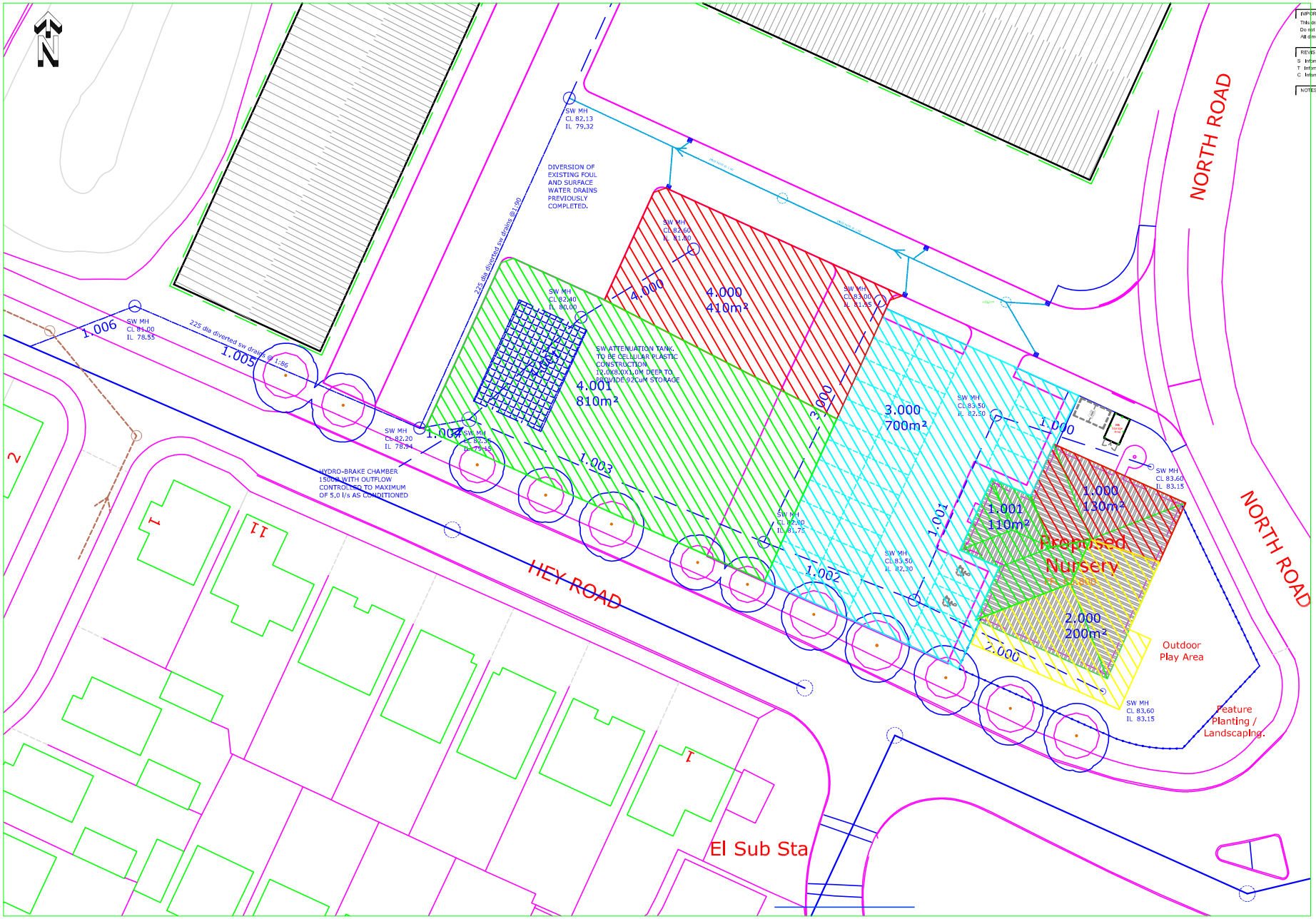
DRAWING TITLE
PROPOSED SITE DRAINAGE
NEW NURSERY SITE

SCALE	DATE	DRAWN	CHECKED
1:200@A1	MAY 2017	RGH	DGT

DRG NO.	REVISION
2	-

13 Gillibrand Street
Chorley PR7 2EJ
Tel: (01257) 249882
Fax: (01257) 231915
e-mail: info@parrington-associates.com
www.parrington-associates.com

Parrington & Associates Limited



IMPORTANT

This drawing is copyright and remains the property of this practice
Do not scale this drawing
All dimensions to be checked on site

REVISION STATUS

S Information issued for feasibility or scheme design
T Information issued for tender purposes only
C Information issued for Construction

NOTES

PROVISIONAL ONLY

REVISION	DATE	DESCRIPTION
-	-	-

CLIENT
HINDLE & SCHOFIELD LLP.

PROJECT
BARROW BROOK ENTERPRISE PARK
BARROW, CLITHEROE, BB7 9QZ

DRAWING TITLE
PROPOSED SW DRAINAGE CATCHMENT AREAS
NEW NURSERY SITE

SCALE	DATE	DRAWN	CHECKED
1:200@A1	MAY 2017	RGH	DGT

DRG NO.	REVISION
3	-

13 Gillibrand Street
Chorley PR7 2EJ
Tel: (01257) 249882
Fax: (01257) 231915
e-mail: info@partington-associates.com
www.partington-associates.com

Partington & Associates Limited

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m^3) = 5.631

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	17.670	0.650	27.2	0.013	4.00	0.0	0.600	o	150
1.001	21.880	0.200	109.4	0.011	0.00	0.0	0.600	o	150
2.000	22.670	0.850	26.7	0.020	4.00	0.0	0.600	o	150
1.002	17.430	0.550	31.7	0.000	0.00	0.0	0.600	o	225
3.000	28.980	0.200	144.9	0.070	4.00	0.0	0.600	o	225
1.003	34.540	0.800	43.2	0.000	0.00	0.0	0.600	o	225
4.000	14.220	1.000	14.2	0.041	4.00	0.0	0.600	o	225
4.001	16.380	0.850	19.3	0.081	0.00	0.0	0.600	o	225
1.004	5.450	0.136	40.0	0.000	0.00	0.0	0.600	o	150

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	0.00	4.15	83.150	0.013	0.0	0.0	0.0	1.94	34.3	0.0
1.001	0.00	4.53	82.500	0.024	0.0	0.0	0.0	0.96	17.0	0.0
2.000	0.00	4.19	83.150	0.020	0.0	0.0	0.0	1.96	34.6	0.0
1.002	0.00	4.66	82.225	0.044	0.0	0.0	0.0	2.33	92.7	0.0
3.000	0.00	4.45	81.950	0.070	0.0	0.0	0.0	1.08	43.1	0.0
1.003	0.00	4.94	81.675	0.114	0.0	0.0	0.0	2.00	79.4	0.0
4.000	0.00	4.07	81.000	0.041	0.0	0.0	0.0	3.49	138.7	0.0
4.001	0.00	4.16	80.000	0.122	0.0	0.0	0.0	2.99	119.1	0.0
1.004	0.00	5.00	79.150	0.236	0.0	0.0	0.0	1.60	28.2	0.0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
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	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 15 minute 2 year Summer (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.175	-0.125	0.000	0.07	0.0	2.1	OK
1.001	2	82.547	-0.103	0.000	0.21	0.0	3.4	OK
2.000	3	83.181	-0.119	0.000	0.10	0.0	3.2	OK
1.002	4	82.267	-0.183	0.000	0.08	0.0	6.6	OK
3.000	5	82.031	-0.144	0.000	0.28	0.0	11.3	OK
1.003	6	81.749	-0.151	0.000	0.24	0.0	17.7	OK
4.000	7	81.034	-0.191	0.000	0.05	0.0	6.6	OK
4.001	8	80.059	-0.166	0.000	0.16	0.0	16.5	OK
1.004	9	79.290	-0.010	0.000	0.14	0.0	3.3	OK

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
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	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 15 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.175	-0.125	0.000	0.07	0.0	2.1	OK
1.001	2	82.547	-0.103	0.000	0.22	0.0	3.5	OK
2.000	3	83.181	-0.119	0.000	0.10	0.0	3.2	OK
1.002	4	82.268	-0.182	0.000	0.08	0.0	6.7	OK
3.000	5	82.031	-0.144	0.000	0.28	0.0	11.3	OK
1.003	6	81.750	-0.150	0.000	0.24	0.0	17.8	OK
4.000	7	81.034	-0.191	0.000	0.05	0.0	6.6	OK
4.001	8	80.060	-0.165	0.000	0.16	0.0	17.0	OK
1.004	9	79.307	0.007	0.000	0.15	0.0	3.4	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
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	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 30 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.172	-0.128	0.000	0.05	0.0	1.6	OK
1.001	2	82.543	-0.107	0.000	0.18	0.0	2.9	OK
2.000	3	83.178	-0.122	0.000	0.08	0.0	2.5	OK
1.002	4	82.262	-0.188	0.000	0.07	0.0	5.4	OK
3.000	5	82.022	-0.153	0.000	0.22	0.0	8.9	OK
1.003	6	81.741	-0.159	0.000	0.19	0.0	14.3	OK
4.000	7	81.030	-0.195	0.000	0.04	0.0	5.2	OK
4.001	8	80.055	-0.170	0.000	0.14	0.0	14.4	OK
1.004	9	79.354	0.054	0.000	0.15	0.0	3.6	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
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	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	60
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 60 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.168	-0.132	0.000	0.04	0.0	1.2	OK
1.001	2	82.536	-0.114	0.000	0.13	0.0	2.1	OK
2.000	3	83.172	-0.128	0.000	0.05	0.0	1.8	OK
1.002	4	82.256	-0.194	0.000	0.05	0.0	3.9	OK
3.000	5	82.009	-0.166	0.000	0.15	0.0	6.2	OK
1.003	6	81.730	-0.170	0.000	0.13	0.0	10.1	OK
4.000	7	81.025	-0.200	0.000	0.03	0.0	3.6	OK
4.001	8	80.047	-0.178	0.000	0.10	0.0	10.5	OK
1.004	9	79.392	0.092	0.000	0.16	0.0	3.7	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 15 minute 30 year Summer (Storm)

Margin for Flood Risk Warning (mm) 200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.190	-0.110	0.000	0.16	0.0	5.1	OK
1.001	2	82.583	-0.067	0.000	0.59	0.0	9.5	OK
2.000	3	83.200	-0.100	0.000	0.24	0.0	7.9	OK
1.002	4	82.295	-0.155	0.000	0.21	0.0	17.4	OK
3.000	5	82.088	-0.087	0.000	0.68	0.0	27.5	OK
1.003	6	81.801	-0.099	0.000	0.59	0.0	44.1	OK
4.000	7	81.054	-0.171	0.000	0.13	0.0	16.2	OK
4.001	8	80.107	-0.118	0.000	0.46	0.0	48.3	OK
1.004	9	79.513	0.213	0.000	0.17	0.0	3.8	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 15 minute 30 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.190	-0.110	0.000	0.16	0.0	5.1	OK
1.001	2	82.583	-0.067	0.000	0.59	0.0	9.5	OK
2.000	3	83.200	-0.100	0.000	0.24	0.0	7.9	OK
1.002	4	82.295	-0.155	0.000	0.21	0.0	17.4	OK
3.000	5	82.088	-0.087	0.000	0.68	0.0	27.5	OK
1.003	6	81.801	-0.099	0.000	0.59	0.0	44.3	OK
4.000	7	81.054	-0.171	0.000	0.13	0.0	16.2	OK
4.001	8	80.107	-0.118	0.000	0.46	0.0	48.3	OK
1.004	9	79.559	0.259	0.000	0.17	0.0	3.8	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 30 minute 30 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.186	-0.114	0.000	0.13	0.0	4.1	OK
1.001	2	82.573	-0.077	0.000	0.47	0.0	7.5	OK
2.000	3	83.195	-0.105	0.000	0.19	0.0	6.3	OK
1.002	4	82.287	-0.163	0.000	0.17	0.0	13.8	OK
3.000	5	82.069	-0.106	0.000	0.54	0.0	21.8	OK
1.003	6	81.785	-0.115	0.000	0.48	0.0	35.8	OK
4.000	7	81.049	-0.176	0.000	0.11	0.0	12.9	OK
4.001	8	80.094	-0.131	0.000	0.36	0.0	38.3	OK
1.004	9	79.703	0.403	0.000	0.17	0.0	3.8	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	60
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 60 minute 30 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.180	-0.120	0.000	0.09	0.0	2.9	OK
1.001	2	82.559	-0.091	0.000	0.33	0.0	5.3	OK
2.000	3	83.186	-0.114	0.000	0.13	0.0	4.4	OK
1.002	4	82.276	-0.174	0.000	0.12	0.0	9.6	OK
3.000	5	82.046	-0.129	0.000	0.38	0.0	15.3	OK
1.003	6	81.765	-0.135	0.000	0.33	0.0	25.0	OK
4.000	7	81.040	-0.185	0.000	0.07	0.0	9.0	OK
4.001	8	80.077	-0.148	0.000	0.25	0.0	26.8	OK
1.004	9	79.856	0.556	0.000	0.17	0.0	3.8	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 15 minute 100 year Summer (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.196	-0.104	0.000	0.21	0.0	6.6	OK
1.001	2	82.599	-0.051	0.000	0.76	0.0	12.3	OK
2.000	3	83.207	-0.093	0.000	0.31	0.0	10.2	OK
1.002	4	82.305	-0.145	0.000	0.27	0.0	22.4	OK
3.000	5	82.115	-0.060	0.000	0.88	0.0	35.4	OK
1.003	6	81.825	-0.075	0.000	0.76	0.0	56.8	OK
4.000	7	81.062	-0.163	0.000	0.17	0.0	20.9	OK
4.001	8	80.124	-0.101	0.000	0.59	0.0	62.3	OK
1.004	9	79.624	0.324	0.000	0.17	0.0	3.8	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.196	-0.104	0.000	0.21	0.0	6.6	OK
1.001	2	82.599	-0.051	0.000	0.76	0.0	12.3	OK
2.000	3	83.207	-0.093	0.000	0.31	0.0	10.2	OK
1.002	4	82.305	-0.145	0.000	0.27	0.0	22.5	OK
3.000	5	82.115	-0.060	0.000	0.88	0.0	35.4	OK
1.003	6	81.825	-0.075	0.000	0.76	0.0	57.0	OK
4.000	7	81.062	-0.163	0.000	0.17	0.0	20.9	OK
4.001	8	80.124	-0.101	0.000	0.59	0.0	62.3	OK
1.004	9	79.684	0.384	0.000	0.17	0.0	3.8	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.191	-0.109	0.000	0.17	0.0	5.3	OK
1.001	2	82.585	-0.065	0.000	0.61	0.0	9.8	OK
2.000	3	83.201	-0.099	0.000	0.25	0.0	8.2	OK
1.002	4	82.296	-0.154	0.000	0.22	0.0	18.0	OK
3.000	5	82.092	-0.083	0.000	0.71	0.0	28.5	OK
1.003	6	81.804	-0.096	0.000	0.62	0.0	46.7	OK
4.000	7	81.056	-0.169	0.000	0.14	0.0	16.8	OK
4.001	8	80.109	-0.116	0.000	0.47	0.0	50.0	OK
1.004	9	79.888	0.588	0.000	0.17	0.0	3.8	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	60
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.184	-0.116	0.000	0.12	0.0	3.7	OK
1.001	2	82.569	-0.081	0.000	0.43	0.0	6.9	OK
2.000	3	83.192	-0.108	0.000	0.18	0.0	5.8	OK
1.002	4	82.283	-0.167	0.000	0.15	0.0	12.7	OK
3.000	5	82.063	-0.112	0.000	0.50	0.0	20.1	OK
1.003	6	81.779	-0.121	0.000	0.44	0.0	32.8	OK
4.000	7	81.047	-0.178	0.000	0.10	0.0	11.8	OK
4.001	8	80.108	-0.117	0.000	0.33	0.0	35.2	OK
1.004	9	80.104	0.804	0.000	0.17	0.0	3.8	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	120
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 120 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.177	-0.123	0.000	0.08	0.0	2.5	OK
1.001	2	82.554	-0.096	0.000	0.28	0.0	4.5	OK
2.000	3	83.184	-0.116	0.000	0.12	0.0	3.8	OK
1.002	4	82.273	-0.177	0.000	0.10	0.0	8.3	OK
3.000	5	82.039	-0.136	0.000	0.33	0.0	13.2	OK
1.003	6	81.757	-0.143	0.000	0.29	0.0	21.6	OK
4.000	7	81.598	0.373	0.000	0.06	0.0	7.8	SURCHARGED
4.001	8	81.597	1.372	0.000	0.22	0.0	23.1	SURCHARGED
1.004	9	81.592	2.292	0.000	0.22	0.0	5.1	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	240
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 240 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.171	-0.129	0.000	0.05	0.0	1.5	OK
1.001	2	82.542	-0.108	0.000	0.18	0.0	2.8	OK
2.000	3	83.176	-0.124	0.000	0.07	0.0	2.4	OK
1.002	4	82.261	-0.189	0.000	0.06	0.0	5.2	OK
3.000	5	82.082	-0.093	0.000	0.21	0.0	8.3	OK
1.003	6	82.078	0.178	0.000	0.18	0.0	13.4	SURCHARGED
4.000	7	82.078	0.853	0.000	0.04	0.0	4.8	SURCHARGED
4.001	8	82.076	1.851	0.000	0.14	0.0	14.4	SURCHARGED
1.004	9	82.071	2.771	0.000	0.24	0.0	5.6	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	360
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 360 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.168	-0.132	0.000	0.04	0.0	1.2	OK
1.001	2	82.536	-0.114	0.000	0.13	0.0	2.1	OK
2.000	3	83.172	-0.128	0.000	0.05	0.0	1.8	OK
1.002	4	82.256	-0.194	0.000	0.05	0.0	3.9	OK
3.000	5	82.121	-0.054	0.000	0.15	0.0	6.2	OK
1.003	6	82.117	0.217	0.000	0.14	0.0	10.1	SURCHARGED
4.000	7	82.116	0.891	0.000	0.03	0.0	3.6	SURCHARGED
4.001	8	82.115	1.890	0.000	0.10	0.0	10.8	SURCHARGED
1.004	9	82.109	2.809	0.000	0.24	0.0	5.6	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	480
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 480 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.167	-0.133	0.000	0.03	0.0	0.9	OK
1.001	2	82.533	-0.117	0.000	0.11	0.0	1.7	OK
2.000	3	83.170	-0.130	0.000	0.04	0.0	1.4	OK
1.002	4	82.253	-0.197	0.000	0.04	0.0	3.2	OK
3.000	5	82.003	-0.172	0.000	0.13	0.0	5.1	OK
1.003	6	81.987	0.087	0.000	0.11	0.0	8.2	SURCHARGED
4.000	7	81.987	0.762	0.000	0.02	0.0	3.0	SURCHARGED
4.001	8	81.985	1.760	0.000	0.08	0.0	8.8	SURCHARGED
1.004	9	81.980	2.680	0.000	0.24	0.0	5.5	SURCHARGED

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.208	4-8	0.028

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 5.631

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EXSW	82.200	79.014	79.000	1200	0

Simulation Criteria for Storm

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)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	600
Ratio R	0.273		

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	89
Invert Level (m)	79.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0
Flush-Flo™	0.384	3.8
Kick-Flo®	0.790	3.1
Mean Flow over Head Range	-	3.8

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.6	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.8	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.8	1.800	4.5	4.500	6.8	8.500	9.3
0.500	3.8	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.7	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.8		
1.000	3.4	2.600	5.3	6.500	8.1		

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 79.150 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	96.0	0.0	1.050	96.0	0.0
0.500	96.0	0.0	1.051	0.0	0.0

Summary of Results for 600 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	200.0
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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	83.166	-0.134	0.000	0.03	0.0	0.8	OK
1.001	2	82.531	-0.119	0.000	0.09	0.0	1.5	OK
2.000	3	83.169	-0.131	0.000	0.04	0.0	1.2	OK
1.002	4	82.251	-0.199	0.000	0.03	0.0	2.7	OK
3.000	5	81.999	-0.176	0.000	0.11	0.0	4.3	OK
1.003	6	81.766	-0.134	0.000	0.09	0.0	7.0	OK
4.000	7	81.766	0.541	0.000	0.02	0.0	2.5	SURCHARGED
4.001	8	81.764	1.539	0.000	0.07	0.0	7.5	SURCHARGED
1.004	9	81.759	2.459	0.000	0.23	0.0	5.3	SURCHARGED

REVISION STATUS
S Information issued for feasibilty or scheme design
T Information issued for tender purposes only
C Information issued for Construction

NOTES

SW MH
CL 82.13
IL 79.32

DIVERSION OF EXISTING FOUL AND SURFACE WATER DRAINS PREVIOUSLY COMPLETED.

225 dia diverted sw drains @1:90

SW MH
CL 82.60
IL 81.00

4.000
4.000
410m²

SW MH
CL 82.40
IL 80.00

4.001
4.001
810m²

SW ATTENUATION TANK TO BE CELLULAR PLASTIC CONSTRUCTION 12.0X8.0X1.0M DEEP TO PROVIDE 92CuM STORAGE

SW MH
CL 83.00
IL 81.95

3.000
3.000
700m²

SW MH
CL 83.50
IL 82.50

1.000
1.000
130m²

SW MH
CL 83.60
IL 83.15

1.001
1.001
110m²

SW MH
CL 83.50
IL 82.30

1.002

SW MH
CL 82.90
IL 81.75

1.003

SW MH
CL 82.20
IL 78.94

1.004

SW MH
CL 82.35
IL 79.15

HYDRO-BRAKE CHAMBER
150DB WITH OUTFLOW
CONTROLLED TO MAXIMUM
OF 5.0 l/s AS CONDITIONED

SW MH
CL 84.00
IL 78.55

1.006

225 dia diverted sw drains @1:86

1.005

2.000
2.000
200m²

Outdoor
Play Area

Feature
Planting /
Landscaping.

Proposed
Nursery
FFL 85.800

NORTH ROAD

HEY ROAD

El Sub Sta

PROVISIONAL ONLY

REVISION	DATE	DESCRIPTION
-	-	-

CLIENT
HINDLE & SCHOFIELD LLP.

PROJECT
BARROW BROOK ENTERPRISE PARK
BARROW, CLITHEROE, BB7 9QZ

DRAWING TITLE
PROPOSED SW DRAINAGE CATCHMENT AREAS
NEW NURSERY SITE

SCALE	DATE	DRAWN	CHECKED
1:200@A1	MAY 2017	RGH	DGT

DRG NO.	REVISION
3043-17 D02	-

13 Gillibrand Street
Chorley PR7 2EJ
Tel: (01257) 249882
Fax: (01257) 231915
e-mail: info@partington-associates.com
www.partington-associates.com

Partington & Associates Limited