1 – Scope of Work

The following calculation covers the design of surface water drainage and sizing of below ground attenuation for Turner Rise Retail Park

2 – Design Criteria

Design events –	*1:1yr* – No Surcharge
	1:1yr – No Flooding
	1:100yr + 30% climate change. – Controlled flooding contained onsite posing no risks to buildings
Min cover –	1200mm to pipework
Min gradients –	100Ø @ 1:60
	150Ø @ 1:100
	225Ø @ 1:167

SuDS Hierachy Compliance:

1 Store rainwater for later use
There is no rainwater harvesting planned/shown for the project.
2 Use infiltration techniques, such as porous surfaces in non-clay areas
The site is not deemed to be suitable for infiltration drainage and the preliminary findings of the site investigation confirmed that the site is underlain by London Clay. The main parking area driveway to the site is to be constructed using a porous paved surface. The free draining sub base material can be used to attenuate water in during the 1:100yr storm.
3 Attenuate rainwater in ponds or open water features for gradual release
The layout and size of the site does not lend itself to ponds. It is suggested that rain gardens are positioned at least 3m away from buildings in areas of good permeability. We have previously stated that infiltration drainage is not a viable option due to the underlying strata. The landscape architect will be providing a planter rain garden at the base of the RWP. In these above ground planters, an overflow pipe, set at the height of the rim of the planter allows water to run straight to the base of the planter when the planter is saturated and then on to a gully into the proposed drainage system

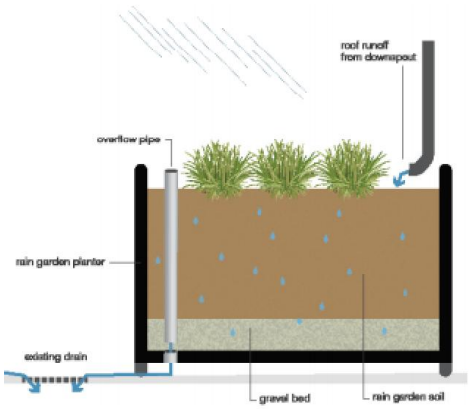


Figure 1 - Planter Rain Garden

4 Attenuate rainwater by storing in tanks or sealed water features for gradual release
Our proposal for the drainage is to restrict the flow to 5l/s and use the volume in the below ground pipework and manholes along with the voids in the permeable sub base to allow a slow release to the existing combined public demarcation manhole on site thus retarding the peak discharge and alleviating the load on the sewer during critical flow conditions.
5 Discharge rainwater direct to a watercourse
There are no watercourses in the vicinity of the site. This cannot be used for this site.
6 Discharge rainwater to a surface water sewer/drain
There are no surface water sewers or drains in the vicinity.
7 Discharge rainwater to the combined sewer.
The attenuated flow will be discharged to the existing public combined sewer on site.

3 – Design Inputs / Key Assumptions

Drainage catchments:

The existing areas were taken from Survey Solutions topographical survey carried out Feb 2013 refernece 12480SE-01.
The proposed catchment areas were taken from WCEC proposed site layouts

		Area (m²)	Runoff Coefficient	Factored Area (m²)	Total (m²)	Total Factored
Existing D'velpmnt	Roof	234	0.95	222.3	878	591.6
	Green Roof	0	0.4	0		
	Hardstanding	370	0.85	314.5		
	Soft Landscaping	274	0.2	54.8		
Proposed D'velpmnt	Roof	230	0.95	218.5	878	535.95
	Green Roof	156	0.4	62.4		
	Hardstanding	241	0.85	204.85		
	Soft Landscaping	251	0.2	50.2		

Interfaces with above ground drainage:

Location of rainwater pipes and foul stacks taken from WCEC sketches issued 30th October 2015

Receiving system:

Discharge from proposed drainage to existing ublic combined water sewer in Finchley Road is to be via the existing public demarcation chamber and lateral connection on site. Connection to be made into existing brick manhole manhole (size TBC). Outfall from this manhole is 150Ø. Cover level 73.790, Invert Level 72.050

Peak discharge:

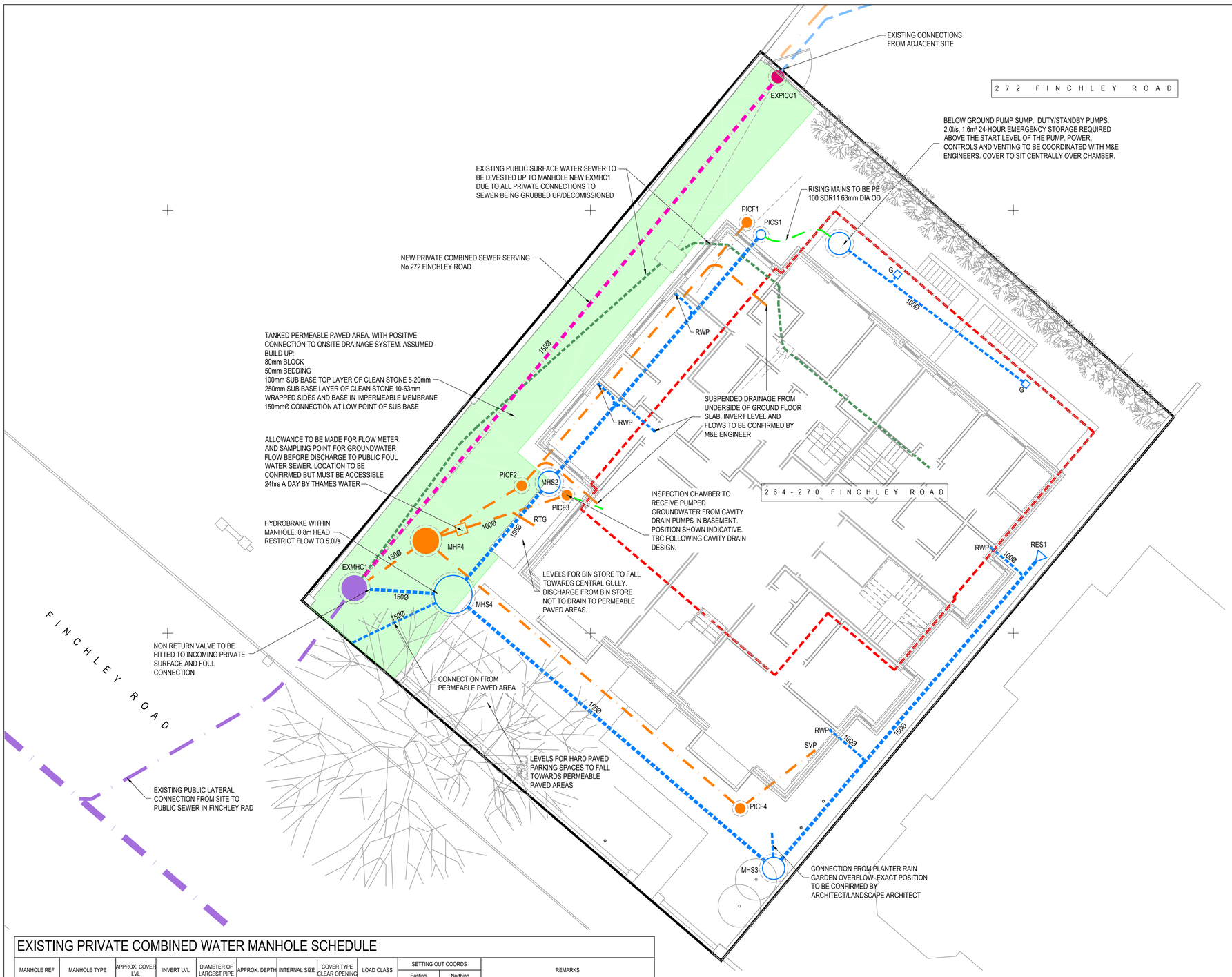
The peak discharge rate from the site for all storms up to and including the 1:100yr + 30% climate change have been reduced to greenfield run-off rate. This has been set at 5l/s due to the size of the catchment.

4 – Modelling Results

Refer to MicroDrainage calculations in the appendix.

Consideration of exceedance of design event / or failure of the system:

Should the design event be exceeded the new development is not at risk of flooding due to the levels being higher than the drainage system. The flood water would emerge from the cover of EXMHC1 and flow offsite to Finchley road where it would be picked up ny the existing highway drainage. The surface and foul water systems are protected from surcharge with the use of non return valves at the outfall.



DRAINAGE KEY

	EXISTING PRIVATE SURFACE WATER SEWER
	PROPOSED PRIVATE SURFACE WATER SEWER
	EXISTING PRIVATE FOUL WATER SEWER
	PROPOSED PRIVATE FOUL WATER SEWER
	EXISTING PRIVATE COMBINED WATER SEWER
	PROPOSED PRIVATE COMBINED WATER SEWER
	EXISTING PUBLIC COMBINED WATER SEWER
	PROPOSED PUBLIC COMBINED WATER SEWER
	PROPOSED PUBLIC COMBINED WATER SEWER
	ABANDONED DRAINAGE
MH	PROPOSED PRIVATE SURFACE WATER PRECAST CONCRETE RING MANHOLE
PIC	PROPOSED PRIVATE SURFACE WATER MDPE INSPECTION CHAMBER
RE	PROPOSED PRIVATE SURFACE WATER RODDING EYE
MH	EXISTING PRIVATE SURFACE WATER PRECAST CONCRETE RING MANHOLE
MH	PROPOSED PRIVATE FOUL WATER PRECAST CONCRETE RING MANHOLE
PIC	PROPOSED PRIVATE FOUL WATER MDPE INSPECTION CHAMBER
MH	EXISTING PRIVATE FOUL WATER PRECAST CONCRETE RING MANHOLE
MH	PROPOSED PUBLIC COMBINED WATER PRECAST CONCRETE RING MANHOLE
MH	EXISTING PUBLIC COMBINED WATER PRECAST CONCRETE RING MANHOLE
	PROPOSED CHANNEL DRAIN
G	GULLY
RTG	RODDABLE TRAPPED GULLY
CO	CHANNEL OUTLET
SS	STUB STACK
SVP	SOIL VENT PIPE
PIC	POLYPROPYLENE INSPECTION CHAMBER
MH	MANHOLE
BD	BACKDROP

- RESPONSE TO PRE-DEVELOPMENT ENQUIRY WITH THAMES WATER REQUESTS GREENFIELD RUN-OFF RATES FOR THE SURFACE WATER DISCHARGE LEAVING THE SITE. THEREFORE 5l/s FOR ALL STORM RETURN PERIODS UP TO AND INCLUDING THE 1:100YR + 30% HAS BEEN USED TO SIZE THE ATTENUATION.
- FORMAL APPLICATIONS TO THAMES WATER AND CAMDEN LLFA ARE IN PROGRESS .THIS DESIGN IS DEPENDENT ON APPROVAL OF DRAINAGE PROPOSAL AND SUITABILITY OF CONNECTION TO THE PUBLIC SEWER. NO WORKS ARE TO COMMENCE UNTIL PLANNING APPROVAL OF THE DRAINAGE STRATEGY IS OBTAINED & FINAL CONNECTION TO PUBLIC SEWER IS CONSENTED BY THAMES WATER.
- APPROVAL FOR THE PREDICTED FOUL FLOWS OF 4.0l/s HAVE BEEN RECEIVED FROM THAMES WATER.
- FURTHER TALKS WITH THAMES WATER REQUIRED FOR DIVESTION OF EXISTING PUBLIC SEWER UP TO EXMHC1
- DESIGN BASED ON A GREEN ROOF AREA OF 156m² AND A POROUS PAVED AREA OF 190m².

GENERAL NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE EVOLVE DESIGN STATEMENT.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES & SPECIALIST MANUFACTURERS DETAILS, DRAWINGS AND SPECIFICATIONS.
3. DO NOT SCALE THIS DRAWING. IF IN DOUBT ASK. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL DIMENSIONS TO EXISTING ELEMENTS ARE TO BE CHECKED AND CONFIRMED ON SITE BY CONTRACTOR.

NOTES

1. ALL LEVELS ARE RELATIVE TO ORDNANCE DATUM (OD).
2. EXISTING DRAINAGE DEPTHS AND LOCATIONS ARE BASED ON CCTV SURVEY BY SURVEY SOLUTIONS DATED OCT 15 REF: 12480UG-01. TO BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO ANY WORKS COMMENCING. CONTRACTOR TO CONTACT RELEVANT SERVICE AUTHORITIES FOR DETAILS OF SERVICES TREATMENT IF SERVICES EXPOSED
3. REFER TO ARCHITECT'S /M&E CONSULTANTS INFORMATION FOR SETTING-OUT OF DRAINAGE ABOVE GROUND FLOOR SLAB.
4. NO PRIVATE DRAINAGE SHALL DRAIN ONTO THE HIGHWAY. ADEQUATE PROVISION (I.E. GULLIES, CHANNEL DRAINS), SHALL BE MADE ON THE PRIVATE SITES TO PREVENT THIS.
5. ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH PART H OF THE CURRENT BUILDING REGULATIONS AND BS 8301
6. ALL EXTERNAL DRAINAGE SHOWN ON THIS DRAWING HAS BEEN BASED UPON CLAY/CONCRETE (VITRIFIED CLAYWARE TO BS 65 AND BS EN 295 OR CONCRETE TO BS 5911-1 & BS EN 1916 AND FLEXIBLY JOINTED)
7. ALL DRAIN RUNS BELOW STRUCTURAL SLAB ARE TO BE CAST IRON TIMESAVER BY ST-GOBAIN OR SIMILAR APPROVED. ROCKER PIPES TO BE FITTED TO ALL CAST IRON DRAINAGE AT THE POINT WHERE THE PIPE EMERGES FROM BENEATH THE SLAB
8. ALL PIPE CONNECTIONS TO FOUL STACKS TO BE 100Ø UNLESS NOTED OTHERWISE.
9. ALL EXISTING REDUNDANT DRAINS TO BE EITHER REMOVED AND REPLACED WITH TYPE 1 BACKFILL OR FILLED WITH MASS CONCRETE
10. ALL PROPOSED SERVICES TO BE COORDINATED WITH PROPOSED UNDERGROUND DRAINAGE
11. ALL FOUL MANHOLES, INSPECTION CHAMBERS, RODDING EYES & PUMP CHAMBER TO HAVE DOUBLE SEALED COVERS.
12. HYDROBRAKE, PUMPS AND ASSOCIATED CHAMBERS TO BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS DETAILS.
13. ATTENUATION UNITS TO BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS DETAILS.
14. WHERE INVERT LEVELS ARE SPECIFIED FOR INTERNAL DRAIN CONNECTIONS, PIPES ARE TO BE LAID TO MATCH THESE INVERTS. OTHERWISE PIPES ARE TO BE LAID TO THE GRADIENTS SHOWN BELOW:

    INTERNAL FOUL PIPES
    100Ø = GRADIENT 1:40
    150Ø = GRADIENT 1:80

    INTERNAL SURFACE WATER PIPES
    100Ø = GRADIENT 1:80

15. WHERE FOUL AND SURFACE WATER SEWERS CROSS AND THERE IS LESS THAN 100MM CLEARANCE SHORT LENGTHS OF BOTH RUNS ARE TO BE ENCASED IN CONCRETE.
16. INTERNAL FOUL DRAINAGE POSITIONS AND RAINWATER PIPE ARE ALL ASSUMED
17. THIS DESIGN IS DEPENDANT ON THAMES WATER APPROVAL OF DRAINAGE PROPOSAL AND SUITABILITY OF CONNECTION TO THE PUBLIC SEWER. NO WORKS ARE TO COMMENCE UNTIL CONSENT TO CONNECT IS RECEIVED FROM THEM.
18. FOR DRAINAGE DETAILS REFER TO EVOLVE DRAWINGS 1973-01-505 - 507
19. FOR SETTING OUT OF INTERFACES WITH ABOVE GROUND VENTING ROUTES, POWER AND COMMS DUCTING REFER TO M&E ENGINEER
20. M&E ENGINEER TO CONFIRM AND COORDINATE BELOW GROUND DUCTING AND CONTROL PANEL POSITIONS FOR PUMPS

EXISTING PRIVATE COMBINED WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
EXPIC	C1	INSPECTION	74.850	73.800	150Ø	1.050	EXISTING	EXISTING	EXISTING	-	-	

PROPOSED PUBLIC COMBINED WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
MH	C1	PCC RING	74.850	TBC	100Ø	TBC	1050Ø	600 x 600	D400	-	-	

PROPOSED FOUL WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
PIC	F1	MDPE INSPECTION	74.580	73.930	100Ø	0.650	450Ø	450Ø	C250	-	-	
PIC	F2	MDPE INSPECTION	73.910	72.410	100Ø	1.500	450Ø	450Ø	C250	-	-	
PIC	F3	MDPE INSPECTION	73.910	73.010	100Ø	0.900	450Ø	450Ø	C250	-	-	
PIC	F4	MDPE INSPECTION	74.900	74.000	100Ø	0.900	450Ø	450Ø	C250	-	-	
MH	F1	PCC RING	73.755	72.455	100Ø	1.300	1050Ø	600 x 600	D400	-	-	

EXISTING PUBLIC COMBINED WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
EXMH	C1	BRICK	73.790	72.050	150Ø	1.740	TBC	EXISTING	EXISTING	-	-	

PROPOSED SURFACE WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
MH	S1	PUMP CHAMBER	72.900	71.315	100Ø	1.585	1200Ø	600 x 600	A15	-	-	
PIC	S1	MDPE INSPECTION	74.580	73.930	100Ø	0.650	450Ø	450Ø	B125	-	-	
MH	S2	PCC RING	73.910	72.550	150Ø	1.360	1050Ø	600 x 600	C250	-	-	
RE	S1	RODDING EYE	74.900	74.250	150Ø	0.650	N/A	N/A	A15	-	-	
MH	S3	PCC RING	74.800	74.060	150Ø	0.740	1050Ø	600 x 600	C250	-	-	
MH	S4	PCC RING	73.900	72.430	150Ø	1.470	1800Ø	600 x 600	C250	-	-	Hydrobrake Chamebr. 5l/s restriction.

Rev.	Date	Revision	By	Chk
C	06.11.15	ISSUED FOR APPROVAL	PW	PW
B	10.09.15	ISSUED FOR PLANNING	PW	PW
A	01.09.15	ISSUED FOR INFORMATION	PW	PW

FOR APPROVAL

Client
ASHBURY & BLOOM

Project
264-270 FINCHLEY ROAD

Drawing Title
PROPOSED DRAINAGE
GENERAL ARRANGEMENT

Drawn by	Checked by	Scale @ A1
PW	PW	1:100

Drawing No. 1973-01-500 | Revision C

evolve
www.evolveuk.biz
info@evolveuk.biz
020 7251 6888
LONDON
140 Old Street
London.
EC1V 9BJ
GLASGOW
South Block/Studio 104,
60-64 Osborne Street
Glasgow, G1 5QH

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.039	4-8	0.004

Total Area Contributing (ha) = 0.043

Total Pipe Volume (m³) = 1.284

Existing Network Details 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	10.892	0.135	80.7	0.005	5.00	0.0	0.600	o	100
1.001	3.725	-1.615	-2.3	0.000	0.00	0.0	0.600	o	100
1.002	15.412	1.380	11.2	0.018	0.00	0.0	0.600	o	150
1.003	6.986	0.120	58.2	0.000	0.00	0.0	0.600	o	150
2.000	19.065	0.190	100.3	0.004	5.00	0.0	0.600	o	150
2.001	20.000	1.630	12.3	0.000	0.00	0.0	0.600	o	150
1.004	4.690	0.380	12.3	0.016	0.00	0.0	0.600	o	150

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	72.450	0.005	0.0	0.86	6.7
1.001	72.315	0.005	0.0	0.00	0.0
1.002	73.930	0.023	0.0	3.03	53.6
1.003	72.550	0.023	0.0	1.32	23.3
2.000	74.250	0.004	0.0	1.00	17.7
2.001	74.060	0.004	0.0	2.89	51.1
1.004	72.430	0.043	0.0	2.88	51.0

Manhole Schedules for Storm

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)
Gully	72.900	0.450	Open Manhole	10	1.000	72.450	100				
MHS1	72.900	0.585	Open Manhole	1200	1.001	72.315	100	1.000	72.315	100	
PICS1	74.580	0.650	Open Manhole	1200	1.002	73.930	150	1.001	73.930	100	
MHS2	73.910	1.360	Open Manhole	1050	1.003	72.550	150	1.002	72.550	150	
RES1	74.900	0.650	Open Manhole	10	2.000	74.250	150				
MHS2	74.800	0.740	Open Manhole	1050	2.001	74.060	150	2.000	74.060	150	
MHS4	73.900	1.470	Open Manhole	1800	1.004	72.430	150	1.003	72.430	150	
								2.001	72.430	150	
Outfall	73.590	1.540	Open Manhole	0		OUTFALL		1.004	72.050	150	

PIPELINE SCHEDULES for Storm

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	100	Gully	72.900	72.450	0.350	Open Manhole	10
1.001	o	100	MHS1	72.900	72.315	0.485	Open Manhole	1200
1.002	o	150	PICS1	74.580	73.930	0.500	Open Manhole	1200
1.003	o	150	MHS2	73.910	72.550	1.210	Open Manhole	1050
2.000	o	150	RES1	74.900	74.250	0.500	Open Manhole	10
2.001	o	150	MHS2	74.800	74.060	0.590	Open Manhole	1050
1.004	o	150	MHS4	73.900	72.430	1.320	Open Manhole	1800

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	10.892	80.7	MHS1	72.900	72.315	0.485	Open Manhole	1200
1.001	3.725	-2.3	PICS1	74.580	73.930	0.550	Open Manhole	1200
1.002	15.412	11.2	MHS2	73.910	72.550	1.210	Open Manhole	1050
1.003	6.986	58.2	MHS4	73.900	72.430	1.320	Open Manhole	1800
2.000	19.065	100.3	MHS2	74.800	74.060	0.590	Open Manhole	1050
2.001	20.000	12.3	MHS4	73.900	72.430	1.320	Open Manhole	1800
1.004	4.690	12.3	Outfall	73.590	72.050	1.390	Open Manhole	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	Outfall	73.590	72.050	72.050	0	0

Simulation Criteria for Storm

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	2	Number of Time/Area Diagrams	1
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

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)	20.700	Storm Duration (mins)	30
Ratio R	0.438		

Online Controls for Storm

Pump Manhole: MHS1, DS/PN: 1.001, Volume (m³): 0.7

Invert Level (m) 72.315

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

Hydro-Brake Optimum® Manhole: MHS4, DS/PN: 1.004, Volume (m³): 4.2

Unit Reference	MD-SCU-0063-5000-1450-5000
Design Head (m)	1.450
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Diameter (mm)	63
Invert Level (m)	72.430
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.450	5.0
Flush-Flo™	0.082	1.5
Kick-Flo®	0.094	1.4
Mean Flow over Head Range	-	3.4

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	1.5	1.200	4.6	3.000	7.0	7.000	10.5
0.200	2.0	1.400	4.9	3.500	7.6	7.500	10.9
0.300	2.4	1.600	5.2	4.000	8.1	8.000	11.2
0.400	2.8	1.800	5.5	4.500	8.5	8.500	11.6
0.500	3.0	2.000	5.8	5.000	9.0	9.000	11.9
0.600	3.3	2.200	6.1	5.500	9.4	9.500	12.2
0.800	3.8	2.400	6.3	6.000	9.8		
1.000	4.2	2.600	6.6	6.500	10.2		

Storage Structures for Storm

Porous Car Park Manhole: MHS4, DS/PN: 1.004

Infiltration Coefficient Base (m/hr)	0.00000
Membrane Percolation (mm/hr)	1000
Max Percolation (l/s)	51.9
Safety Factor	2.0
Porosity	0.30
Invert Level (m)	73.110
Width (m)	5.5
Length (m)	34.0
Slope (1:X)	35.0
Depression Storage (mm)	5
Evaporation (mm/day)	3
Cap Volume Depth (m)	0.250

Time Area Diagram for Green Roof at Pipe Number 1.003 (Storm)

Area (m^3) 156 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.002835	32	36	0.000572	64	68	0.000116	96	100	0.000023
4	8	0.002321	36	40	0.000469	68	72	0.000095	100	104	0.000019
8	12	0.001900	40	44	0.000384	72	76	0.000077	104	108	0.000016
12	16	0.001556	44	48	0.000314	76	80	0.000063	108	112	0.000013
16	20	0.001274	48	52	0.000257	80	84	0.000052	112	116	0.000010
20	24	0.001043	52	56	0.000211	84	88	0.000043	116	120	0.000009
24	28	0.000854	56	60	0.000172	88	92	0.000035			
28	32	0.000699	60	64	0.000141	92	96	0.000028			

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

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	2	Number of Time/Area Diagrams	1
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.437
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.600	Cv (Winter)	1.000

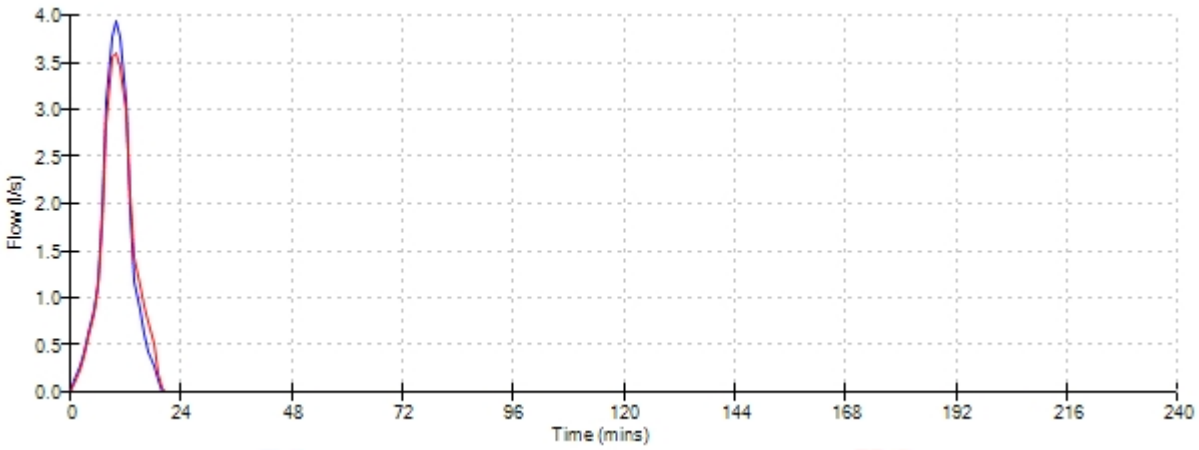
Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

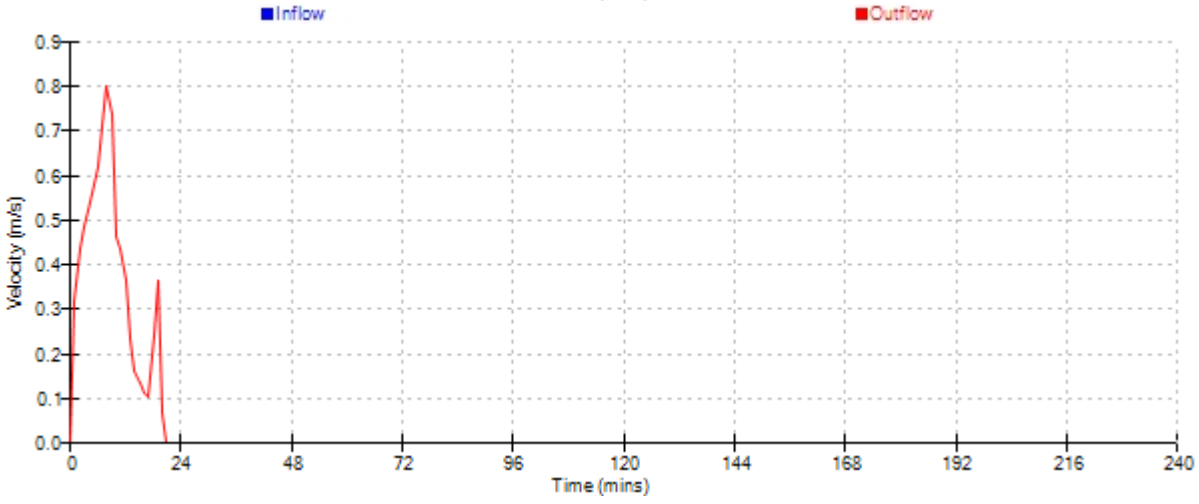
Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	30

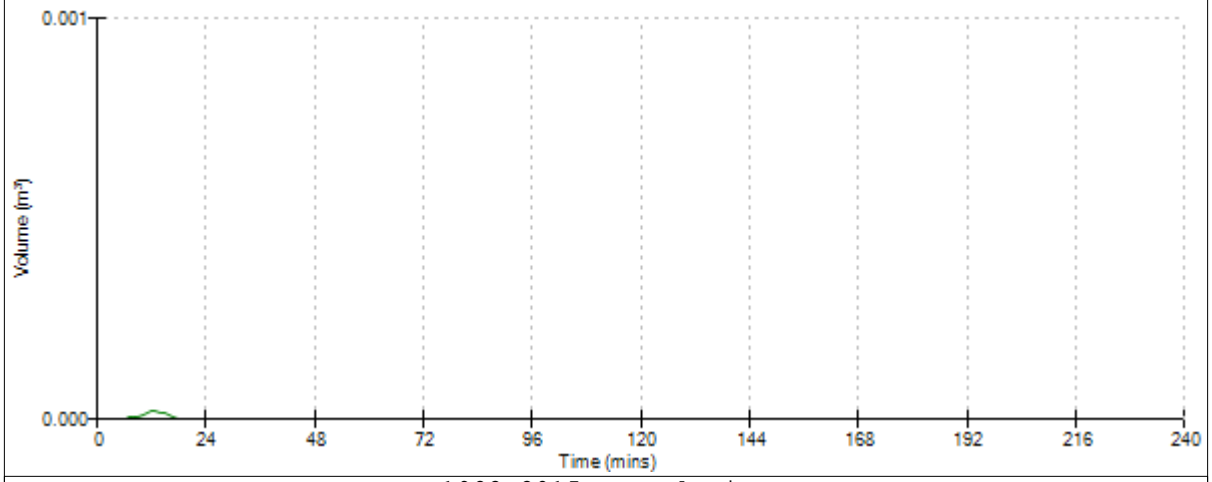
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Gully	15 Summer	100	+30%	100/15 Summer			
1.001	MHS1	15 Summer	100	+30%	100/15 Summer			
1.002	PICS1	15 Summer	100	+30%				
1.003	MHS2	60 Summer	100	+30%	100/15 Summer	100/60 Summer		
2.000	RES1	15 Summer	100	+30%				
2.001	MHS2	15 Summer	100	+30%				
1.004	MHS4	60 Summer	100	+30%	100/15 Summer	100/60 Summer		

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Gully	72.714	0.164	0.000	0.57		3.6	FLOOD RISK	
1.001	MHS1	72.691	0.276	0.000	0.54		2.0	FLOOD RISK	
1.002	PICS1	73.992	-0.088	0.000	0.36		17.8	OK	
1.003	MHS2	73.910	1.210	0.071	0.64		12.7	FLOOD	1
2.000	RES1	74.294	-0.106	0.000	0.19		3.1	OK	
2.001	MHS2	74.085	-0.125	0.000	0.06		3.1	OK	
1.004	MHS4	73.900	1.320	0.021	0.13		5.0	FLOOD	1

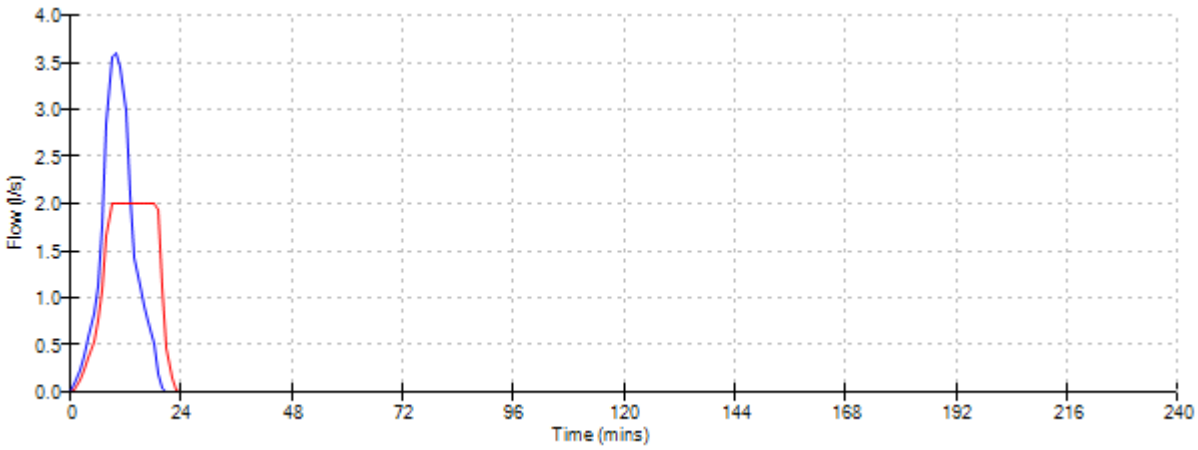
Graphs for Pipe 1.000 US/MH Gully (Storm)
15 minute 100 year Summer I+30%
Status: FLOOD RISK

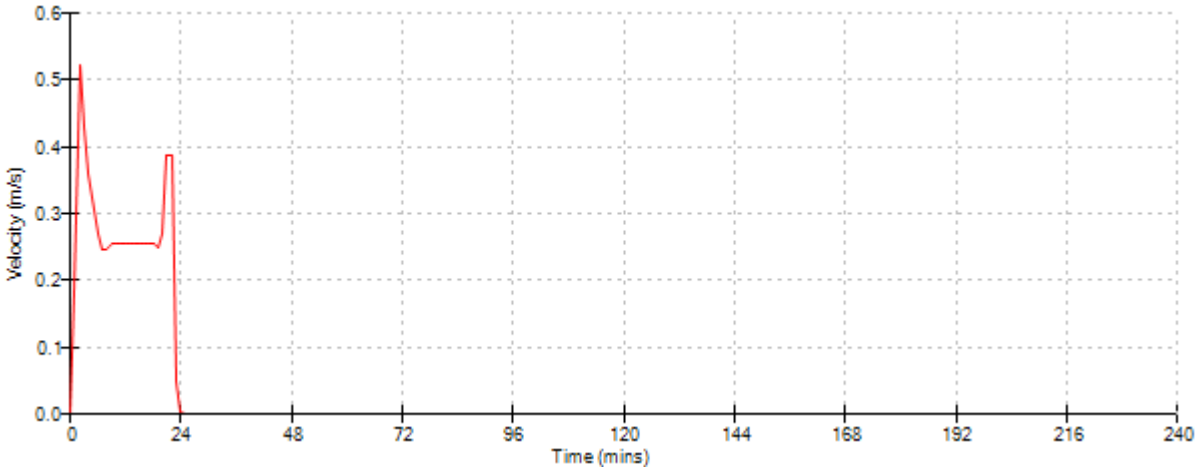


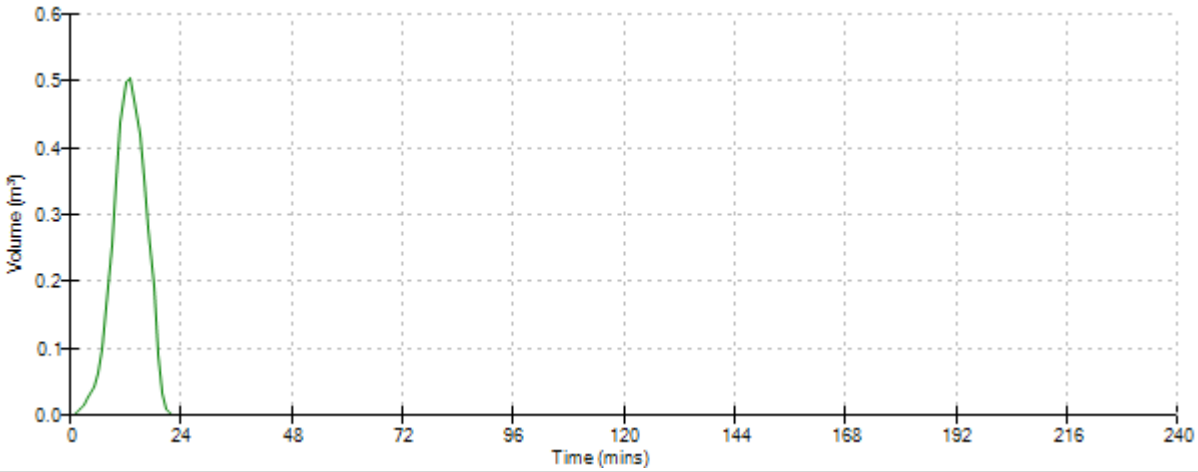




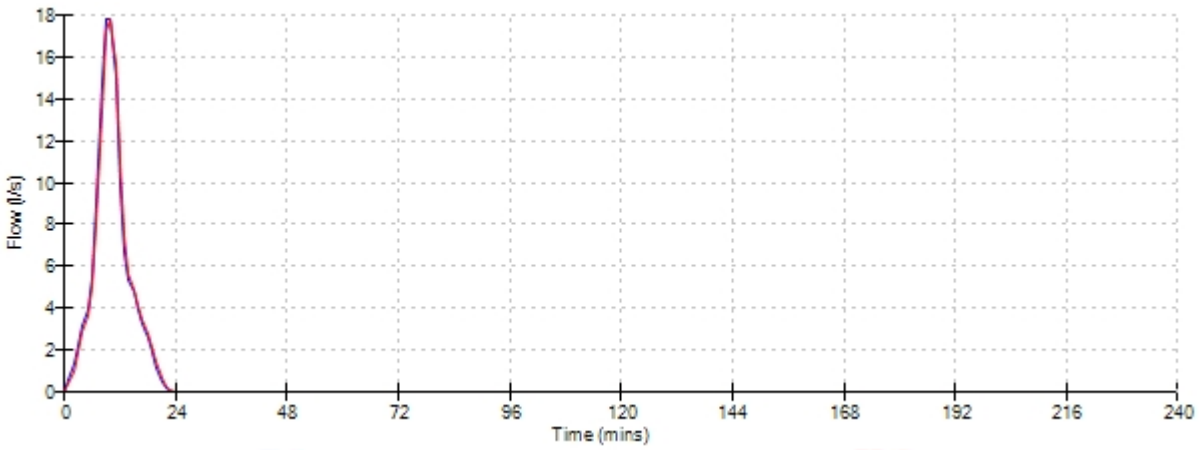
Graphs for Pipe 1.001 US/MH MHS1 (Storm)
15 minute 100 year Summer I+30%
Status: FLOOD RISK

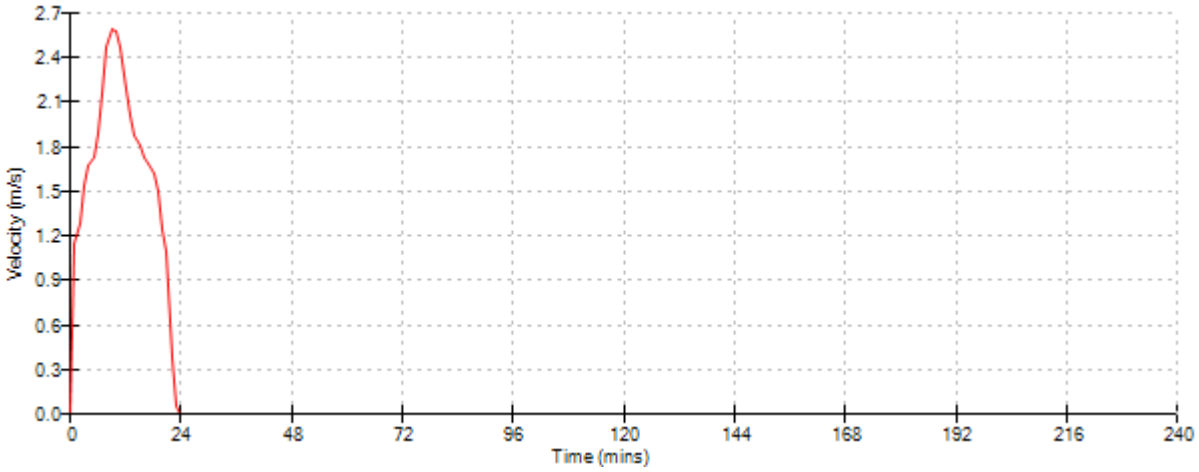


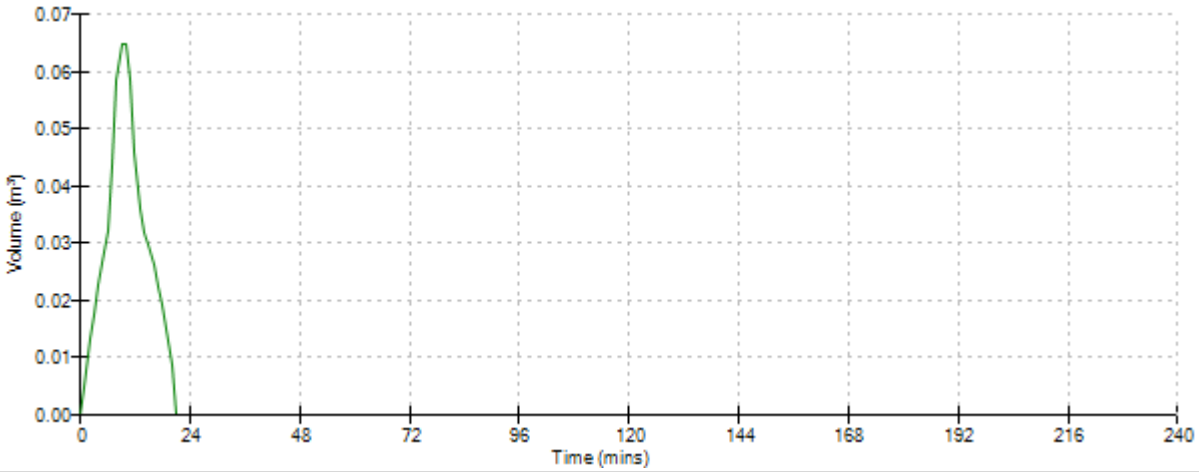




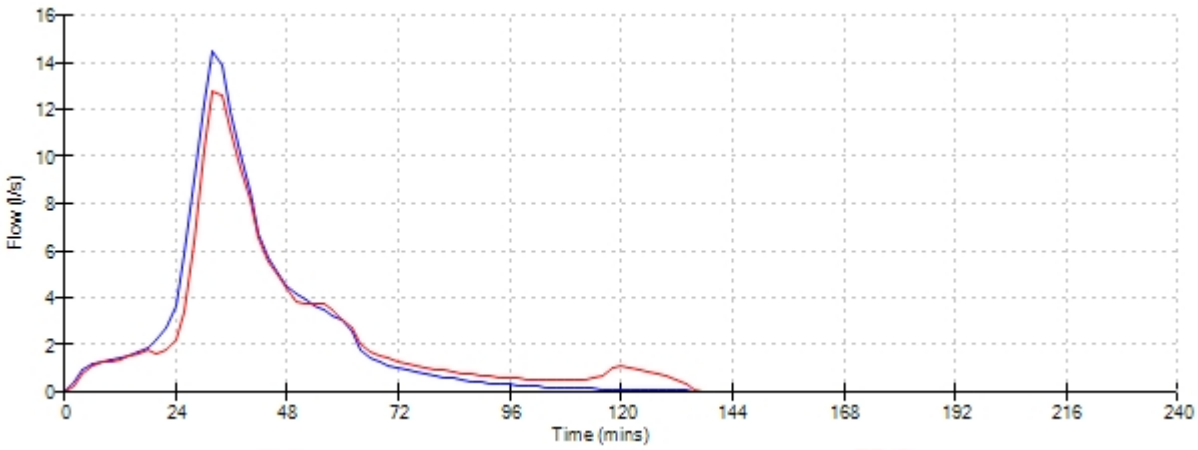
Graphs for Pipe 1.002 US/MH PICS1 (Storm)
15 minute 100 year Summer I+30%
Status: OK

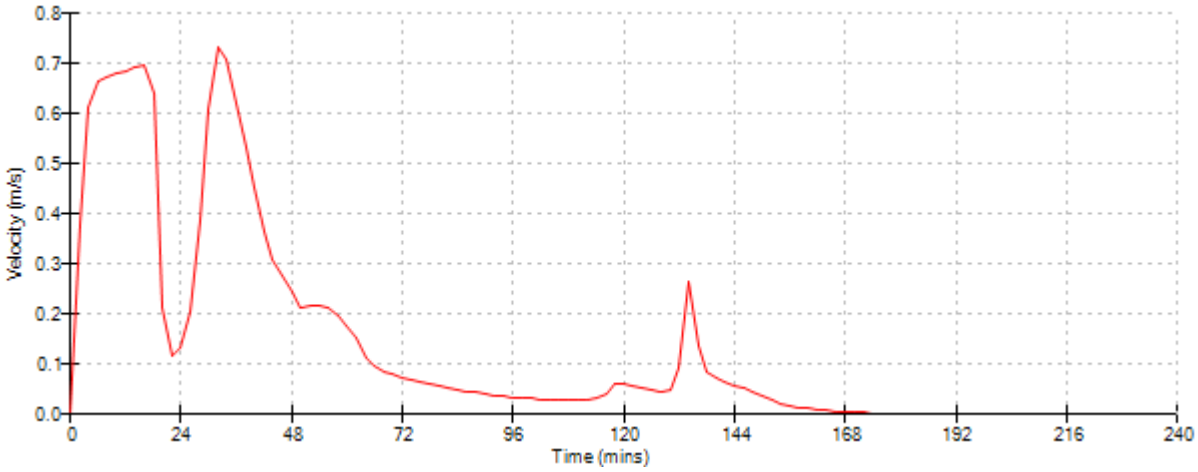


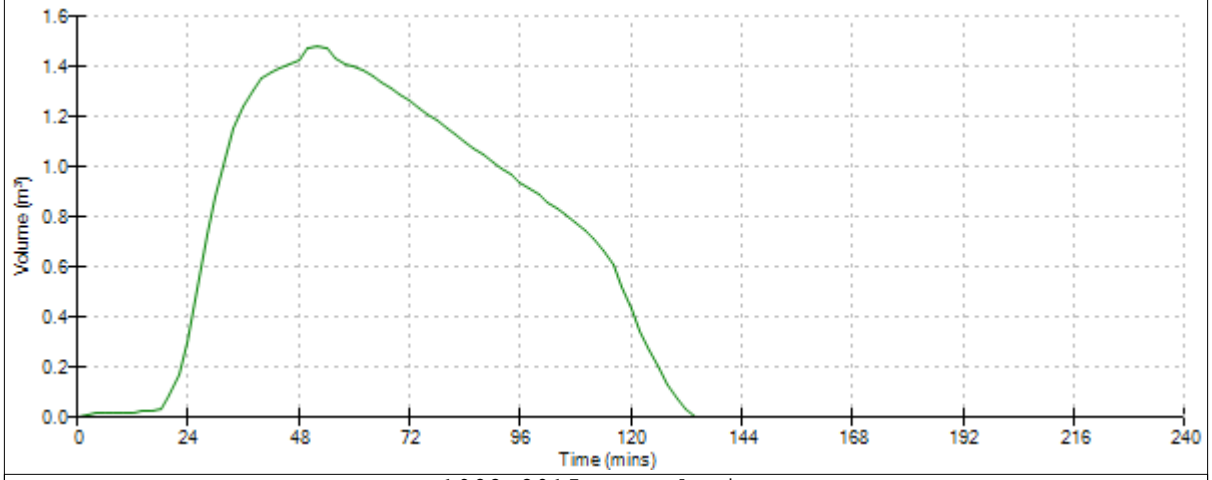




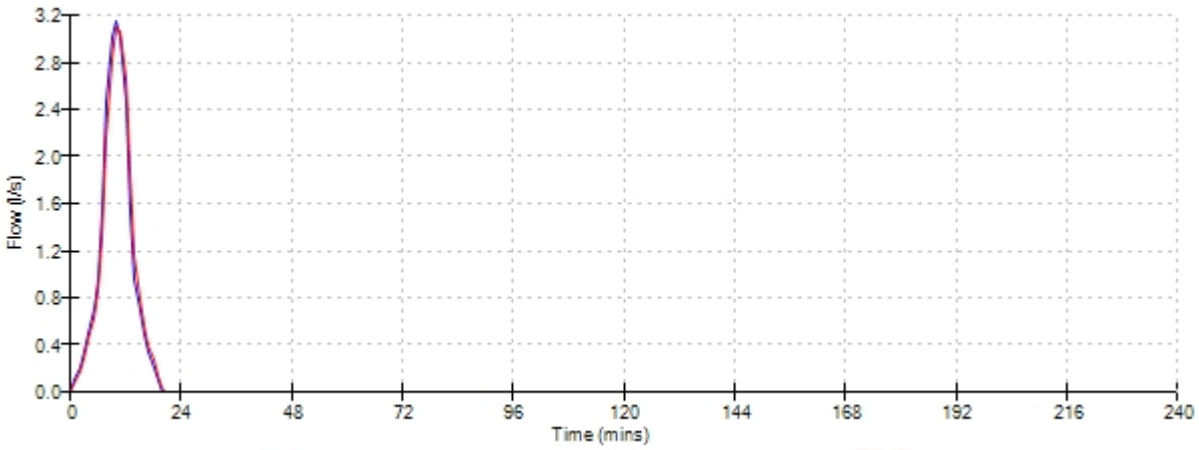
Graphs for Pipe 1.003 US/MH MHS2 (Storm)
60 minute 100 year Summer I+30%
Status: FLOOD

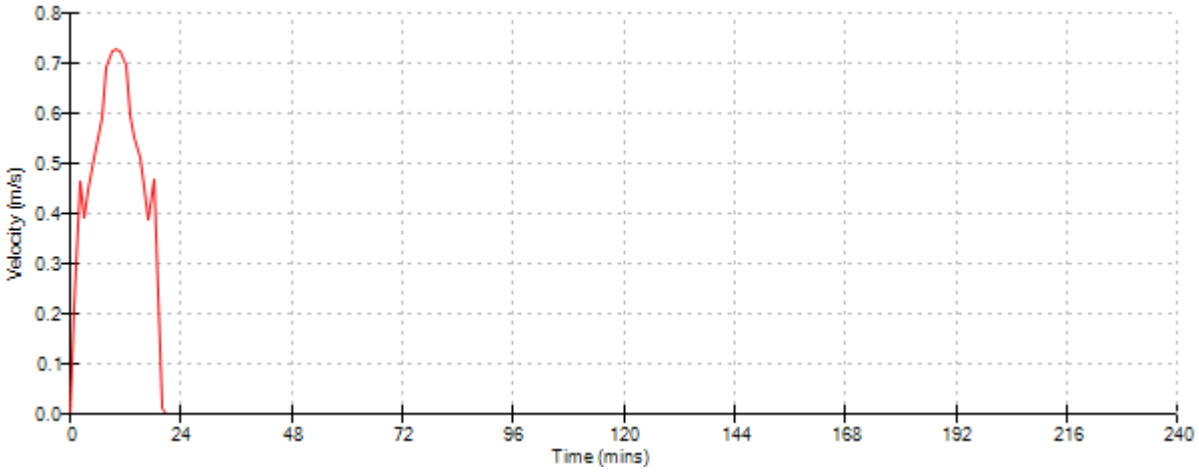


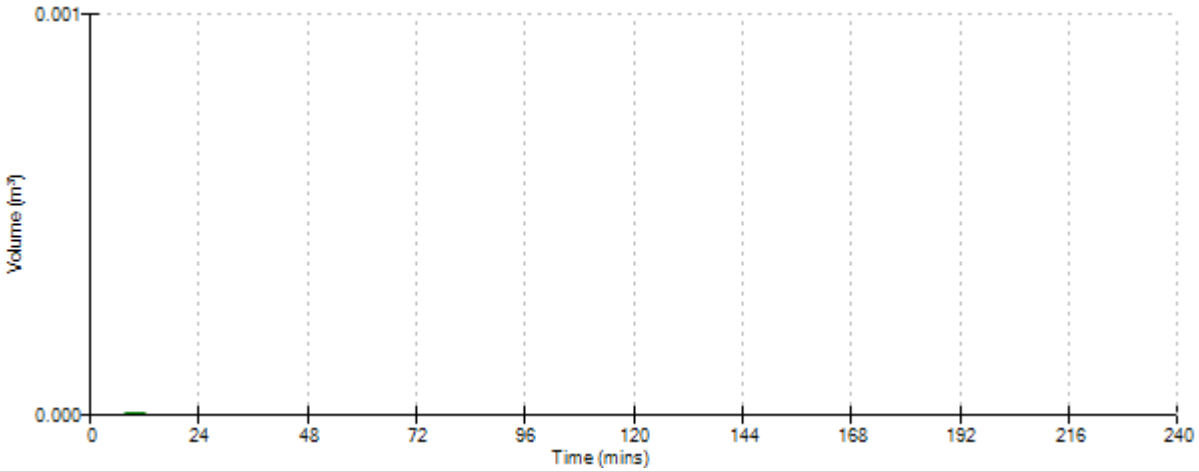




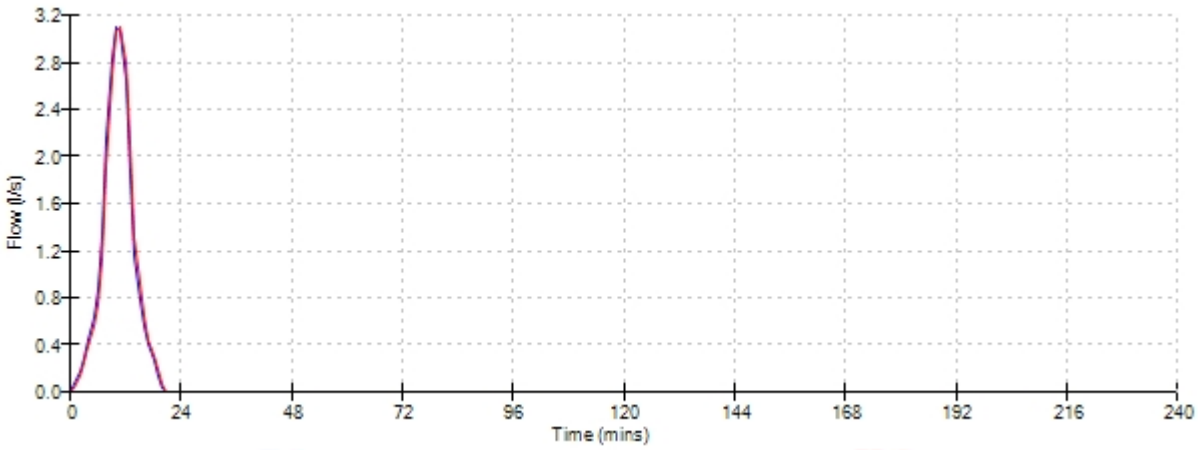
Graphs for Pipe 2.000 US/MH RES1 (Storm)
15 minute 100 year Summer I+30%
Status: OK

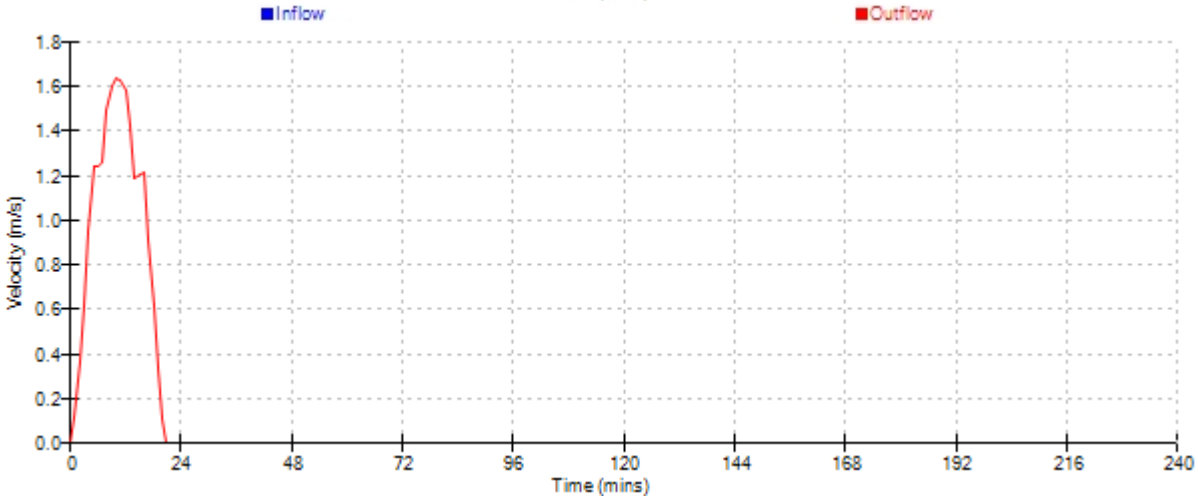


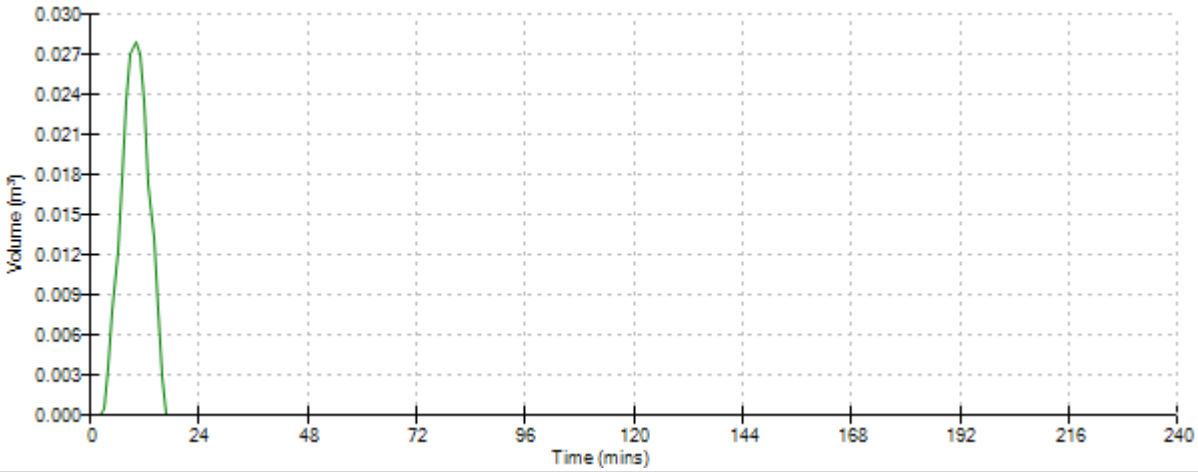




Graphs for Pipe 2.001 US/MH MHS2 (Storm)
15 minute 100 year Summer I+30%
Status: OK







Graphs for Pipe 1.004 US/MH MHS4 (Storm)
60 minute 100 year Summer I+30%
Status: FLOOD