



SEPARATE OUTFALLS FROM THE PRINCES LOCH AND THE BASIN SYSTEMS WILL ENTER THE MILL LADE BURN.

3 BASIN SYSTEM WILL PROVIDE TREATMENT VIA A FILTERED LOW FLOW CHANNEL. IT WILL ALSO PROVIDE ATTENUATION FOR ALL FLOWS UP TO AND INCLUDING THE 30 YEAR +35% CC STORM EVENTS). THESE BASINS ARE PROPOSED TO BE ADOPTED AND MAINTAINED BY SCOTTISH WATER

**IMPERMEABLE AREA NOTE:**  
 1. COMMERCIAL PLOTS ASSUMED TO HAVE 100% IMPERMEABLE AREA.  
 2. RESIDENTIAL PLOTS ASSUMED TO HAVE 60% IMPERMEABLE AREA WITH AN ADDITIONAL 10% TO ACCOUNT FOR POSSIBLE URBAN CREEP.  
 3. ROADS ASSUMED TO HAVE 100% IMPERMEABLE AREA.

**IMPERMEABLE AREA NOTE:**  
 1. COMMERCIAL PLOTS ASSUMED TO HAVE 100% IMPERMEABLE AREA.  
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 3. ROADS ASSUMED TO HAVE 100% IMPERMEABLE AREA.

**SURFACE WATER TREATMENT NOTE:**  
 1. ALL RESIDENTIAL PLOTS TO PROVIDE RELEVANT TREATMENT AT SOURCE TO ALIGN WITH THE POLLUTION MITIGATION INDICES REQUIRED AS IS BEST PRACTICE. A SECOND TREATMENT FEATURE WILL BE PROVIDED VIA THE FILTERED LOW FLOW CHANNEL THROUGHOUT THE BASIN SYSTEM.  
 2. THE ROAD NETWORK OUTWITH THE PLOT BOUNDARIES WILL BE TREATED VIA ROAD SIDE FILTER TRENCHES AND THE FILTER MEDIA IN THE BASIN SYSTEM.

**SURFACE WATER ATTENUATION NOTE:**  
 1. ALL RESIDENTIAL PLOTS AND ROADS WITHIN PHASE 2 WILL BE ATTENUATED TO THE AGREED DISCHARGE RATE OF 2.6 l/s/ha.  
 2. ALL NECESSARY ATTENUATION WILL BE PROVIDED WITHIN THE 3 BASINS AND PRINCES LOCH UP TO THE 200 YEAR +35% CC.

Only figured dimensions to be used. Dimensions to be verified on site.  
 Any discrepancies should be referred to the Engineer prior to work being put in hand.  
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 Pickfords Wharf, Clink Street, London SE1 9DG | 020 7928 7888 | 020 7902 0992

### GENERAL NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
- ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
- THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
- ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
- ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.
- PLEASE REFER TO DRAWING 17684-WIE-92-ZZ-DR-C-00001 FOR THE DRAINAGE STRATEGY.

### LEGEND

- DENOTES PROPOSED FOUL WATER PIPE
- DENOTES PROPOSED SURFACE WATER PIPE
- DENOTES PROPOSED PHASE 1 DRAINAGE
- DENOTES PROPOSED FOUL WATER RISING MAIN
- DENOTES PROPOSED ADOPTED BASIN

**ROAD NETWORK**  
 TOTAL AREA: 0.30Ha  
 IMPERMEABLE AREA: 0.30Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 101m<sup>3</sup>  
 200 YEAR + 35% CC = 191m<sup>3</sup>

**COMMERCIAL AREAS NOTE:**  
 1. ALL COMMERCIAL PLOTS WILL PROVIDE APPROPRIATE SURFACE WATER TREATMENT AND ATTENUATION WITHIN THE THE RESPECTIVE PLOTS.  
 2. A SITE WIDE DISCHARGE RATE BASED ON THE GREENFIELD RUNOFF HAS BEEN AGREED AS 2.6 l/s/ha. THIS WILL ALSO APPLY TO THE COMMERCIAL PLOTS  
 3. THE COMMERCIAL PLOTS WILL HAVE A SEPARATE DISCHARGE POINT FROM THE REST OF THE DEVELOPMENT, CONNECTING TO THE MILL LADE BURN NORTH OF PLOT C1

PRINCES LOCH (SERVING AS ATTENUATION FOR ALL FLOWS FROM 30 YEAR STORM UP TO 200 YEAR +35% CC STORM EVENTS) FLOW FROM BASINS ENTER VIA OVERLAND DEPRESSIONS.  
 THE LOCH IS A LANDSCAPE FEATURE THAT WILL HAVE A PERMANENT POOL OF WATER UNAFFECTED BY THE DRAINAGE SYSTEM. THIS LOCH AREA WILL BE PRIVATELY MAINTAINED.  
 ATTENUATION VOLUME ABOVE PERMANENT WATER LEVEL: 5824m<sup>3</sup>  
 APPROXIMATE DEPTH INCREASE DURING 200 YEAR EVENT: 0.30m

**BASINS NOTE:**  
 1. TOTAL ATTENUATION VOLUME REQUIRED: 5615m<sup>3</sup>  
 2. TOTAL IMPERMEABLE AREA DRAINING TO BASIN: 17.39Ha  
 3. ALLOWABLE DISCHARGE RATE - 145.60 l/s

**WWPS NO.4**  
 FOUL DRAINAGE FROM PLOT 6A, 6B AND FUTURE PHASE 3 PLOTS DRAIN TO WASTE WATER PUMPING STATION 4 BEFORE BEING PUMPED UP PASSED THE ACCESS TO PLOT 6 BEFORE JOINING THE GRAVITY FOUL SEWER IN THE ROAD BETWEEN THE SCHOOLSITE AND PLOT 6B.

**WWPS NO.3**  
 FOUL DRAINAGE FROM ALL COMMERCIAL PLOTS / PLOT 4A & PLOT 11 TO DRAIN TO WASTE WATER PUMPING STATION 3 BEFORE BEING PUMPED UP BETWEEN PONDS 2 AND 3 IN PHASE 1 PRIOR TO FINAL CONNECTION TO A GRAVITY SYSTEM WITHIN THE ROAD.

COMMERCIAL PLOTS TO FLOW NORTH TO SEPARATE OUTFALL ON THE MILL LADE

**PLOT C1**  
 TOTAL AREA: 2.03Ha  
 IMPERMEABLE AREA: 2.03Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 693m<sup>3</sup>  
 200 YEAR + 35% CC = 1318m<sup>3</sup>  
 ALLOWABLE DISCHARGE RATE: 5.29 l/s

**PLOT C3 WEST**  
 TOTAL AREA: 0.70Ha  
 IMPERMEABLE AREA: 0.70Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 239m<sup>3</sup>  
 200 YEAR + 35% CC = 455m<sup>3</sup>  
 ALLOWABLE DISCHARGE RATE: 1.83 l/s

**PLOT C2**  
 TOTAL AREA: 1.02Ha  
 IMPERMEABLE AREA: 1.02Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 349m<sup>3</sup>  
 200 YEAR + 35% CC = 664m<sup>3</sup>  
 ALLOWABLE DISCHARGE RATE: 2.66 l/s

**PLOT C3 EAST**  
 TOTAL AREA: 2.16Ha  
 IMPERMEABLE AREA: 2.16Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 737m<sup>3</sup>  
 200 YEAR + 35% CC = 1401m<sup>3</sup>  
 ALLOWABLE DISCHARGE RATE: 5.62 l/s

**PLOT 4A**  
 TOTAL AREA: 3.64Ha  
 IMPERMEABLE AREA: 2.55Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 888m<sup>3</sup>  
 200 YEAR + 35% CC = 1650m<sup>3</sup>

**PLOT 6A / 6B**  
 TOTAL AREA: 6.75Ha  
 IMPERMEABLE AREA: 4.72Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 1609m<sup>3</sup>  
 200 YEAR + 35% CC = 3059m<sup>3</sup>

**BLINDWELLS SCHOOL PLOT**  
 (DRAINING SEPARATELY THROUGH PHASE 1)

**PLOT 5A**  
 TOTAL AREA: 3.38Ha  
 IMPERMEABLE AREA: 2.67Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 909m<sup>3</sup>  
 200 YEAR + 35% CC = 1727m<sup>3</sup>

**PLOT 5B**  
 TOTAL AREA: 4.46Ha  
 IMPERMEABLE AREA: 3.12Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 1063m<sup>3</sup>  
 200 YEAR + 35% CC = 2021m<sup>3</sup>

**PLOT 9A / 9B**  
 TOTAL AREA: 5.10Ha  
 IMPERMEABLE AREA: 3.57Ha  
 STORAGE REQUIREMENT:  
 30 YEAR + 35% CC = 1217m<sup>3</sup>  
 200 YEAR + 35% CC = 2314m<sup>3</sup>

Rev	Date	Description	By
P05	14.01.21	AMENDED AS REQUESTED	PM
P04	08.01.21	AMENDED AS PER CLIENTS COMMENTS	AG
P03	08.01.21	LEGEND ADDED	PM
P02	18.12.20	AMSC PLANNING ISSUE	PM
P01	27.11.20	DRAFT PLANNING ISSUE	CON

Project: **BLINDWELLS**

Title: **PHASE 2 DRAINAGE STRATEGY**

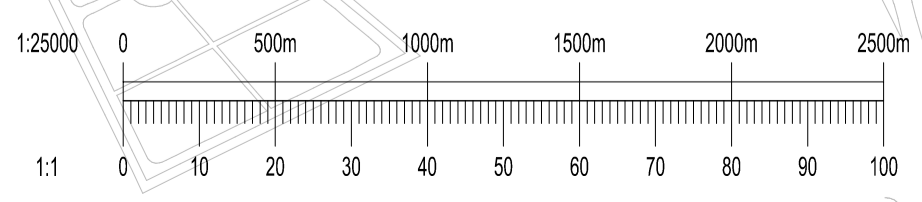
Client: **HARGREAVES SERVICES (BLINDWELLS) LTD**

South Suite 8 Nelson Mandela Place Glasgow G2 1BT  
 0141 418 1900  
 mail@watermangroup.com www.watermangroup.com

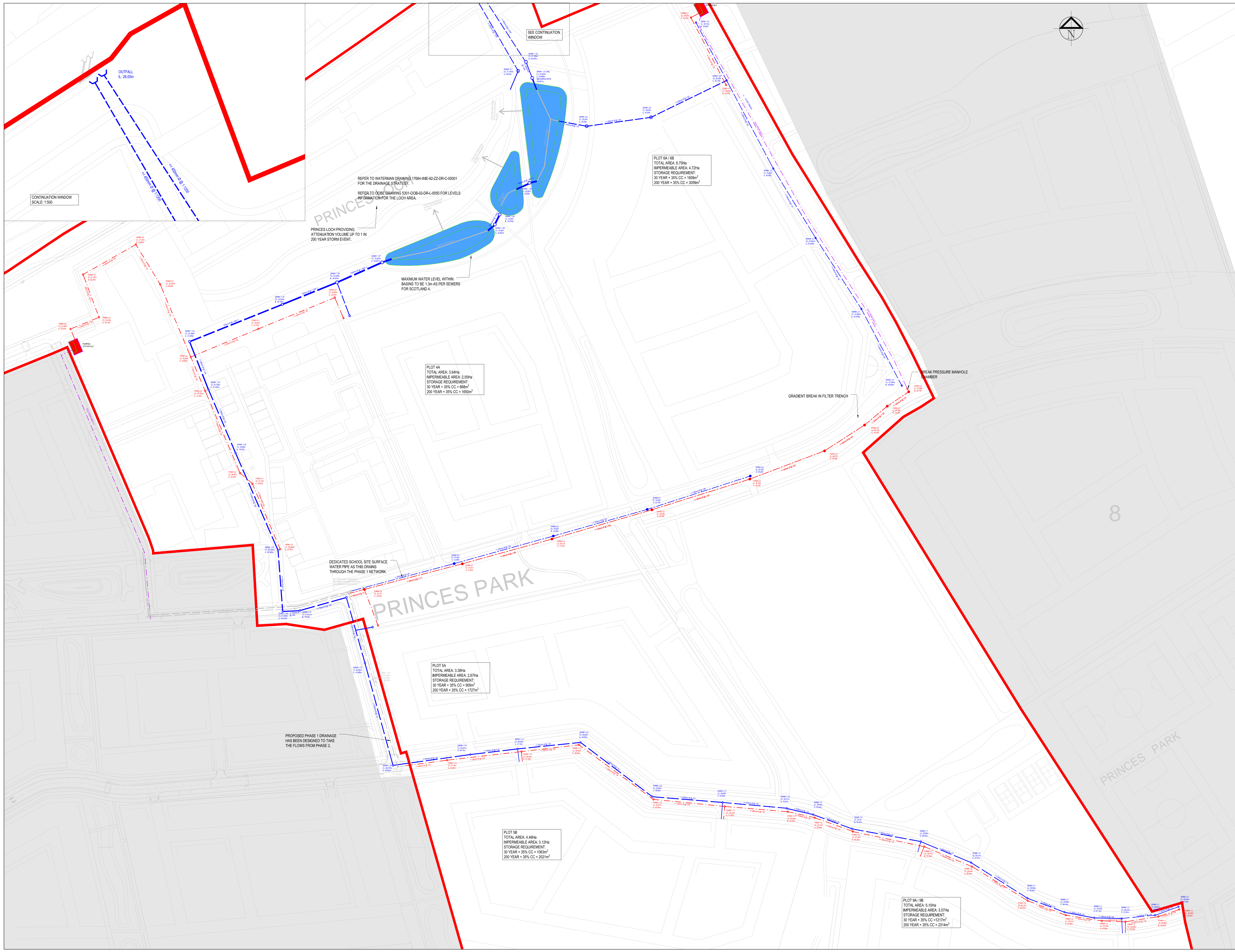
Status: **PLANNING**

Designed By	PM	Checked By	TM	Waterman Ref	WIE17684
Drawn By	PM	Date	24/11/2020	Scales @ A1	1:2500

Project - Originator - Volume - Level - Type - Role - Number Revision  
**17684-WIE-92-ZZ-DR-C-00001 P05**



**E. Proposed Drainage Layout**



Only figured dimensions to be used. Dimensions to be verified on site. Any discrepancies should be referred to the Engineer prior to work being put in hand.  
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**LEGEND**

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Rev	Date	Description	By
P01	14.01.21	AS PER REVISED ARCHITECT LAYOUT	PM
P02	08.01.21	AMENDED AS PER CLIENT'S COMMENTS	JG
P03	14.12.20	DRAFTED FOR PLANNING	PM

**BLINDWELLS**

**PHASE 2 DRAINAGE LAYOUT**

Client: HARGREAVES SERVICES (BLINDWELLS) LTD




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**PLANNING**

Designed By	PM	Checked By	TH	Waterman Ref	WIE17684
Drawn By	PM	Date	DEC 20	Scale @ No	1:1000
Project	Originator	Volume	Level	Type	Number
17684-WIE-92-ZZ-DR-C-00002					P03

## **F. Drainage Calculations**

Waterman Group		Page 1
Pickfords Wharf Clink Street London, SE1 9DG	Blindwells Phase 2 30 year model	
Date 14/01/2021 File 210112 Phase 2	Designed by PM Checked by KM	
Innovyze	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm














Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 341600 674800 NT 41600 74800
Data Type	Catchment
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500


Designed with Level Soffits

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)	Section Type	Auto Design
S1.000	23.645	0.591	40.0	1.785	15.00	0.0	0.600	o	375	Pipe/Conduit	
S1.001	25.966	0.633	41.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.002	34.962	0.851	41.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.003	55.633	1.636	34.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	46.731	1.416	33.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.005	61.540	1.923	32.0	1.785	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.006	34.358	0.996	34.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	22.683	0.597	38.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	55.310	1.383	40.0	0.040	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.009	61.063	1.527	40.0	1.560	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.010	78.438	1.961	40.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.011	52.413	1.310	40.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.012	40.805	1.020	40.0	1.560	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	48.09	15.14	62.200	1.785	0.0	0.0	0.0	2.87	317.2	232.5
S1.001	47.92	15.29	61.609	1.785	0.0	0.0	0.0	2.84	313.3	232.5
S1.002	47.68	15.50	60.976	1.785	0.0	0.0	0.0	2.83	312.9	232.5
S1.003	47.33	15.79	60.125	1.785	0.0	0.0	0.0	3.12	344.2	232.5
S1.004	47.05	16.04	58.489	1.785	0.0	0.0	0.0	3.16	349.4	232.5
S1.005	46.72	16.32	56.998	3.570	0.0	0.0	0.0	3.60	573.2	451.7
S1.006	46.53	16.49	55.075	3.570	0.0	0.0	0.0	3.47	552.0	451.7
S1.007	46.39	16.60	54.079	3.570	0.0	0.0	0.0	3.31	525.8	451.7
S1.008	46.07	16.89	53.482	3.610	0.0	0.0	0.0	3.22	512.5	451.7
S1.009	45.74	17.18	52.024	5.170	0.0	0.0	0.0	3.55	768.3	640.5
S1.010	45.33	17.54	50.497	5.170	0.0	0.0	0.0	3.55	768.3	640.5
S1.011	45.06	17.79	48.536	5.170	0.0	0.0	0.0	3.55	768.3	640.5
S1.012	44.87	17.97	47.151	6.730	0.0	0.0	0.0	3.86	1090.9	817.8


Waterman Group		Page 2
Pickfords Wharf Clink Street London, SE1 9DG	Blindwells Phase 2 30 year model	
Date 14/01/2021 File 210112 Phase 2 Basins - weir	Designed by PM Checked by KM	
Innovyze	Network 2019.1	

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)	Section Type	Auto Design
S1.013	66.439	1.329	50.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.014	89.817	2.897	31.0	0.040	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.015	58.454	1.719	34.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.016	41.443	0.518	80.0	2.750	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.017	14.717	0.184	80.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.018	52.523	2.387	22.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.019	90.965	3.526	25.8	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.020	58.674	1.778	33.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.021	44.770	0.195	229.6	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.022	85.719	0.214	400.0	0.000	0.00	0.0	0.600	o	975	Pipe/Conduit	
S1.023	50.469	0.050	1009.4	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.024	40.367	0.027	1500.0	2.550	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.025	51.900	0.035	1500.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.026	51.900	0.035	1500.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.027	9.504	0.010	1000.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.028	19.546	0.020	1000.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.029	20.472	0.102	200.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.030	29.715	0.149	200.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.031	13.164	0.013	1000.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S2.000	72.107	1.803	40.0	0.090	15.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	58.419	1.460	40.0	4.720	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.002	35.468	0.887	40.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.032	15.464	0.258	60.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.033	39.017	0.039	1000.0	0.000	0.00	0.0	0.600	o	1350	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)
S1.013	44.52	18.29	46.131	6.730	0.0	0.0	0.0	3.45	975.3	817.8
S1.014	44.16	18.63	44.802	6.770	0.0	0.0	0.0	4.38	1239.7	817.8
S1.015	43.92	18.86	41.905	6.770	0.0	0.0	0.0	4.19	1183.5	817.8
S1.016	43.69	19.08	40.036	9.520	0.0	0.0	0.0	3.13	1383.0	1126.4
S1.017	43.61	19.16	39.518	9.520	0.0	0.0	0.0	3.13	1383.0	1126.4
S1.018	43.46	19.31	39.334	9.520	0.0	0.0	0.0	5.98	2642.6	1126.4
S1.019	43.18	19.58	36.946	9.520	0.0	0.0	0.0	5.52	2439.8	1126.4
S1.020	42.98	19.78	33.420	9.520	0.0	0.0	0.0	4.88	2156.6	1126.4
S1.021	42.62	20.14	31.492	9.520	0.0	0.0	0.0	2.06	1312.9	1126.4
S1.022	41.78	21.01	31.222	9.520	0.0	0.0	0.0	1.64	1224.4	1126.4
S1.023	41.12	21.73	30.783	9.520	0.0	0.0	0.0	1.17	1322.2	1126.4
S1.024	40.54	22.39	30.583	12.070	0.0	0.0	0.0	1.03	1473.2	1325.2
S1.025	39.82	23.23	30.556	12.070	0.0	0.0	0.0	1.03	1473.2	1325.2
S1.026	39.13	24.07	30.522	12.070	0.0	0.0	0.0	1.03	1473.2	1325.2
S1.027	39.03	24.19	30.487	12.070	0.0	0.0	0.0	1.26	1808.2	1325.2
S1.028	38.82	24.45	30.478	12.070	0.0	0.0	0.0	1.26	1808.2	1325.2
S1.029	38.73	24.57	30.458	12.070	0.0	0.0	0.0	2.84	4065.5	1325.2
S1.030	38.59	24.75	30.356	12.070	0.0	0.0	0.0	2.84	4065.5	1325.2
S1.031	38.46	24.92	30.207	12.070	0.0	0.0	0.0	1.26	1808.2	1325.2
S2.000	47.38	15.75	36.198	0.090	0.0	0.0	0.0	1.60	28.2	11.5
S2.001	47.06	16.03	34.020	4.810	0.0	0.0	0.0	3.55	768.3	613.0
S2.002	46.87	16.19	32.560	4.810	0.0	0.0	0.0	3.55	768.3	613.0
S1.032	38.42	24.97	30.194	16.880	0.0	0.0	0.0	5.20	7437.8	1756.3
S1.033	38.03	25.48	29.936	16.880	0.0	0.0	0.0	1.26	1808.2	1756.3

Waterman Group		Page 3
Pickfords Wharf Clink Street London, SE1 9DG	Blindwells Phase 2 30 year model	
Date 14/01/2021 File 210112 Phase 2 Basins - weir	Designed by PM Checked by KM	
Innovyze	Network 2019.1	

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)	Section Type	Auto Design
S1.034	14.803	0.148	100.0	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
S1.035	89.384	0.894	100.0	0.000	0.00	0.0	0.600	o	1350	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)
S1.034	37.98	25.55	29.897	16.880	0.0	0.0	0.0	4.02	5757.1	1756.3
S1.035	37.70	25.92	29.749	16.880	0.0	0.0	0.0	4.02	5757.1	1756.3

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)
S1.2	64.210	2.010	Open Manhole	1350	S1.000	62.200	375				
S1.3	63.620	2.011	Open Manhole	1350	S1.001	61.609	375	S1.000	61.609	375	
S1.4	62.960	1.984	Open Manhole	1350	S1.002	60.976	375	S1.001	60.976	375	
S1.5	62.050	1.925	Open Manhole	1350	S1.003	60.125	375	S1.002	60.125	375	
S1.6	60.370	1.881	Open Manhole	1350	S1.004	58.489	375	S1.003	58.489	375	
S1.7	58.950	1.952	Open Manhole	1350	S1.005	56.998	450	S1.004	57.073	375	
S1.8	57.070	1.995	Open Manhole	1350	S1.006	55.075	450	S1.005	55.075	450	
S1.9	56.040	1.961	Open Manhole	1350	S1.007	54.079	450	S1.006	54.079	450	
S1.10	55.470	1.988	Open Manhole	1350	S1.008	53.482	450	S1.007	53.482	450	
S1.11	54.080	2.056	Open Manhole	1500	S1.009	52.024	525	S1.008	52.099	450	
S1.12	52.540	2.043	Open Manhole	1500	S1.010	50.497	525	S1.009	50.497	525	
S1.13	50.580	2.044	Open Manhole	1500	S1.011	48.536	525	S1.010	48.536	525	
S1.14	49.290	2.139	Open Manhole	1500	S1.012	47.151	600	S1.011	47.226	525	
S1.15	48.270	2.139	Open Manhole	1500	S1.013	46.131	600	S1.012	46.131	600	
S1.16	46.770	1.968	Open Manhole	1500	S1.014	44.802	600	S1.013	44.802	600	
S1.17	44.020	2.115	Open Manhole	1500	S1.015	41.905	600	S1.014	41.905	600	
S1.18	42.300	2.264	Open Manhole	1800	S1.016	40.036	750	S1.015	40.186	600	
S1.19	41.810	2.292	Open Manhole	1800	S1.017	39.518	750	S1.016	39.518	750	
S1.20	41.650	2.316	Open Manhole	1800	S1.018	39.334	750	S1.017	39.334	750	
S1.21	39.200	2.254	Open Manhole	1800	S1.019	36.946	750	S1.018	36.946	750	
S1.22	35.680	2.260	Open Manhole	1800	S1.020	33.420	750	S1.019	33.420	750	
S1.23	33.900	2.408	Open Manhole	1800	S1.021	31.492	900	S1.020	31.642	750	
S1.24	33.700	2.478	Open Manhole	1875	S1.022	31.222	975	S1.021	31.297	900	
S1.25	33.550	2.767	Open Manhole	2100	S1.023	30.783	1200	S1.022	31.008	975	
S1.26	33.500	2.917	Open Manhole	2250	S1.024	30.583	1350	S1.023	30.733	1200	
S1.27	33.550	2.994	Open Manhole	2250	S1.025	30.556	1350	S1.024	30.556	1350	
SBASIN 1	33.500	2.978	Open Manhole	2250	S1.026	30.522	1350	S1.025	30.522	1350	
S1.28	33.500	3.013	Open Manhole	2250	S1.027	30.487	1350	S1.026	30.487	1350	
S1.29	33.500	3.022	Open Manhole	2250	S1.028	30.478	1350	S1.027	30.478	1350	
SBASIN 2	33.500	3.042	Open Manhole	2250	S1.029	30.458	1350	S1.028	30.458	1350	
S1.30	33.500	3.144	Open Manhole	2250	S1.030	30.356	1350	S1.029	30.356	1350	
S34	33.000	2.793	Open Manhole	2250	S1.031	30.207	1350	S1.030	30.207	1350	
S2.4	39.500	3.302	Open Manhole	1200	S2.000	36.198	150				
S2.5	38.000	3.980	Open Manhole	1500	S2.001	34.020	525	S2.000	34.395	150	
S2.6	35.200	2.640	Open Manhole	1500	S2.002	32.560	525	S2.001	32.560	525	
S1.34	33.500	3.306	Open Manhole	2250	S1.032	30.194	1350	S1.031	30.194	1350	
								S2.002	31.673	525	654
SBASIN 3	33.000	3.064	Open Manhole	2250	S1.033	29.936	1350	S1.032	29.936	1350	
S1.31	33.500	3.603	Open Manhole	2250	S1.034	29.897	1350	S1.033	29.897	1350	
S1.32	31.760	2.011	Open Manhole	2250	S1.035	29.749	1350	S1.034	29.749	1350	
S	35.000	6.145	Open Manhole	600		OUTFALL		S1.035	28.855	1350	



Pickfords Wharf  
 Clink Street  
 London, SE1 9DG

Blindwells Phase 2  
 30 year model



Date 14/01/2021  
 File 210112 Phase 2 Basins - weir

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 Checked by KM

Innovyze Network 2019.1

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1.2	341864.037	673816.673	341864.037	673816.673	Required	
S1.3	341840.462	673818.493	341840.462	673818.493	Required	
S1.4	341814.851	673822.772	341814.851	673822.772	Required	
S1.5	341782.183	673835.229	341782.183	673835.229	Required	
S1.6	341734.935	673864.599	341734.935	673864.599	Required	
S1.7	341691.810	673882.598	341691.810	673882.598	Required	
S1.8	341631.477	673894.724	341631.477	673894.724	Required	
S1.9	341599.259	673906.664	341599.259	673906.664	Required	
S1.10	341577.001	673911.032	341577.001	673911.032	Required	
S1.11	341521.928	673916.147	341521.928	673916.147	Required	
S1.12	341461.177	673922.308	341461.177	673922.308	Required	
S1.13	341398.238	673969.118	341398.238	673969.118	Required	
S1.14	341346.217	673962.721	341346.217	673962.721	Required	
S1.15	341305.786	673957.206	341305.786	673957.206	Required	
S1.16	341239.842	673949.109	341239.842	673949.109	Required	
S1.17	341215.485	674035.561	341215.485	674035.561	Required	
S1.18	341199.569	674091.807	341199.569	674091.807	Required	
S1.19	341159.665	674080.619	341159.665	674080.619	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1.20	341144.965	674079.916	341144.965	674079.916	Required	
S1.21	341140.979	674132.288	341140.979	674132.288	Required	
S1.22	341104.586	674215.655	341104.586	674215.655	Required	
S1.23	341081.525	674269.607	341081.525	674269.607	Required	
S1.24	341065.130	674311.267	341065.130	674311.267	Required	
S1.25	341144.693	674343.163	341144.693	674343.163	Required	
S1.26	341191.501	674362.035	341191.501	674362.035	Required	
S1.27	341228.941	674377.128	341228.941	674377.128	Required	
SBASIN 1	341277.894	674394.370	341277.894	674394.370	Required	
S1.28	341326.846	674411.611	341326.846	674411.611	Required	
S1.29	341330.950	674420.184	341330.950	674420.184	Required	
SBASIN 2	341338.030	674438.404	341338.030	674438.404	Required	
S1.30	341356.453	674447.330	341356.453	674447.330	Required	
S34	341371.161	674473.150	341371.161	674473.150	Required	
S2.4	341525.457	674534.999	341525.457	674534.999	Required	
S2.5	341460.643	674503.400	341460.643	674503.400	Required	
S2.6	341407.151	674479.920	341407.151	674479.920	Required	
S1.34	341372.256	674486.269	341372.256	674486.269	Required	

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### Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SBASIN 3	341374.622	674501.550	341374.622	674501.550	Required	
S1.31	341358.807	674537.219	341358.807	674537.219	Required	
S1.32	341353.520	674551.046	341353.520	674551.046	Required	
S	341304.606	674625.858			No Entry	

### 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)
S1.035	S	35.000	28.855	0.000	600	0


### Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	4.000
Hot Start (mins)	0	Inlet Coefficient	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 Offline Controls 0    Number of Time/Area Diagrams 0  
Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

### Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	2	Winter Storms	No
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 341600 674800 NT 41600 74800	Cv (Winter)	0.840
Data Type		Catchment Storm Duration (mins)	30

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Online Controls for Storm


Hydro-Brake® Optimum Manhole: SBASIN 3, DS/PN: S1.033, Volume (m<sup>3</sup>): 31.1

Unit Reference	MD-SHE-0456-1456-1400-1456
Design Head (m)	1.400
Design Flow (l/s)	145.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	456
Invert Level (m)	29.936
Minimum Outlet Pipe Diameter (mm)	500
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	145.5	Kick-Flo®	1.123	130.7
Flush-Flo™	0.672	145.3	Mean Flow over Head Range	-	115.1

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)	Depth (m)	Flow (l/s)
0.100	11.9	0.800	144.1	2.000	173.2	4.000	243.1	7.000	319.9
0.200	43.4	1.000	138.2	2.200	181.4	4.500	257.5	7.500	331.0
0.300	86.6	1.200	135.0	2.400	189.3	5.000	271.2	8.000	341.6
0.400	130.0	1.400	145.5	2.600	196.9	5.500	284.2	8.500	352.0
0.500	142.4	1.600	155.3	3.000	211.1	6.000	296.6	9.000	362.0
0.600	144.8	1.800	164.5	3.500	227.7	6.500	308.5	9.500	371.8


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Storage Structures for Storm

Tank or Pond Manhole: SBASIN 3, DS/PN: S1.033

Invert Level (m) 29.937

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	4429.0	0.600	4429.0	1.200	4429.0	1.800	0.0	2.400	0.0
0.100	4429.0	0.700	4429.0	1.300	4429.0	1.900	0.0	2.500	0.0
0.200	4429.0	0.800	4429.0	1.400	4429.0	2.000	0.0		
0.300	4429.0	0.900	4429.0	1.500	4429.0	2.100	0.0		
0.400	4429.0	1.000	4429.0	1.600	0.0	2.200	0.0		
0.500	4429.0	1.100	4429.0	1.700	0.0	2.300	0.0		

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30 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 4.000  
Hot Start Level (mm) 0      Inlet Coefficient 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 Offline Controls 0      Number of Time/Area Diagrams 0  
Number of Online Controls 1      Number of Storage Structures 1      Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model      FEH      Data Type      Catchment  
FEH Rainfall Version      2013 Cv (Summer)      0.750  
Site Location GB 341600 674800 NT 41600 74800 Cv (Winter)      0.840

Margin for Flood Risk Warning (mm)      300.0  
Analysis Timestep 2.5 Second Increment (Extended)  
DTS Status      ON  
DVD Status      ON  
Inertia Status      ON

Profile(s)      Summer and Winter  
Duration(s) (mins)      15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,  
1440, 2160, 2880, 4320  
Return Period(s) (years)      30  
Climate Change (%)      35

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
S1.000	S1.2	30 minute 30 year Winter I+35%	64.210	62.757	0.182	0.000	287.4	SURCHARGED
S1.001	S1.3	30 minute 30 year Winter I+35%	63.620	62.122	0.138	0.000	283.5	SURCHARGED
S1.002	S1.4	30 minute 30 year Winter I+35%	62.960	61.443	0.092	0.000	286.3	SURCHARGED
S1.003	S1.5	30 minute 30 year Winter I+35%	62.050	60.586	0.086	0.000	291.6	SURCHARGED
S1.004	S1.6	30 minute 30 year Winter I+35%	60.370	59.359	0.495	0.000	301.6	SURCHARGED
S1.005	S1.7	30 minute 30 year Winter I+35%	58.950	58.358	0.911	0.000	513.5	SURCHARGED
S1.006	S1.8	30 minute 30 year Winter I+35%	57.070	56.648	1.123	0.000	502.4	SURCHARGED
S1.007	S1.9	30 minute 30 year Winter I+35%	56.040	55.581	1.052	0.000	510.9	SURCHARGED
S1.008	S1.10	30 minute 30 year Winter I+35%	55.470	54.798	0.866	0.000	522.2	SURCHARGED
S1.009	S1.11	30 minute 30 year Winter I+35%	54.080	53.235	0.686	0.000	731.2	SURCHARGED
S1.010	S1.12	30 minute 30 year Winter I+35%	52.540	51.601	0.578	0.000	725.9	SURCHARGED
S1.011	S1.13	30 minute 30 year Winter I+35%	50.580	49.581	0.520	0.000	741.2	SURCHARGED
S1.012	S1.14	30 minute 30 year Winter I+35%	49.290	48.180	0.428	0.000	984.9	SURCHARGED
S1.013	S1.15	30 minute 30 year Winter I+35%	48.270	47.037	0.306	0.000	982.8	SURCHARGED
S1.014	S1.16	30 minute 30 year Winter I+35%	46.770	45.379	-0.023	0.000	988.7	OK
S1.015	S1.17	30 minute 30 year Winter I+35%	44.020	43.252	0.747	0.000	1004.3	SURCHARGED
S1.016	S1.18	30 minute 30 year Winter I+35%	42.300	41.795	1.010	0.000	1461.1	SURCHARGED
S1.017	S1.19	30 minute 30 year Winter I+35%	41.810	40.919	0.651	0.000	1460.9	SURCHARGED
S1.018	S1.20	30 minute 30 year Winter I+35%	41.650	39.775	-0.309	0.000	1459.8	OK
S1.019	S1.21	30 minute 30 year Winter I+35%	39.200	37.392	-0.304	0.000	1459.3	OK
S1.020	S1.22	30 minute 30 year Winter I+35%	35.680	33.968	-0.202	0.000	1454.6	OK
S1.021	S1.23	30 minute 30 year Winter I+35%	33.900	32.950	0.557	0.000	1439.4	SURCHARGED
S1.022	S1.24	30 minute 30 year Winter I+35%	33.700	32.560	0.363	0.000	1424.4	SURCHARGED
S1.023	S1.25	60 minute 30 year Winter I+35%	33.550	32.208	0.224	0.000	1348.6	SURCHARGED
S1.024	S1.26	60 minute 30 year Winter I+35%	33.500	32.118	0.185	0.000	1641.1	SURCHARGED
S1.025	S1.27	60 minute 30 year Summer I+35%	33.550	32.054	0.148	0.000	1576.4	SURCHARGED
S1.026	SBASIN 1	30 minute 30 year Winter I+35%	33.500	31.984	0.113	0.000	1598.7	SURCHARGED
S1.027	S1.28	30 minute 30 year Winter I+35%	33.500	31.921	0.084	0.000	1598.2	SURCHARGED
S1.028	S1.29	30 minute 30 year Winter I+35%	33.500	31.877	0.049	0.000	1596.2	SURCHARGED

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Blindwells Phase 2  
30 year model



Date 14/01/2021

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Network 2019.1

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )	Pipe Flow (l/s)	Status
S1.029	SBASIN 2	30 minute 30 year Winter I+35%	33.500	31.833	0.024	0.000	1596.9	SURCHARGED
S1.030	S1.30	60 minute 30 year Summer I+35%	33.500	31.730	0.024	0.000	1563.1	SURCHARGED
S1.031	S34	120 minute 30 year Winter I+35%	33.000	31.557	0.000	0.000	1260.6	OK
S2.000	S2.4	30 minute 30 year Winter I+35%	39.500	36.598	0.250	0.000	20.3	SURCHARGED
S2.001	S2.5	30 minute 30 year Winter I+35%	38.000	36.189	1.644	0.000	888.2	SURCHARGED
S2.002	S2.6	30 minute 30 year Winter I+35%	35.200	33.788	0.703	0.000	887.7	SURCHARGED
S1.032	S1.34	960 minute 30 year Winter I+35%	33.500	31.398	-0.146	0.000	491.0	OK
S1.033	SBASIN 3	960 minute 30 year Winter I+35%	33.000	31.350	0.064	0.000	144.9	SURCHARGED
S1.034	S1.31	2880 minute 30 year Summer I+35%	33.500	30.100	-1.147	0.000	144.9	OK
S1.035	S1.32	2880 minute 30 year Winter I+35%	31.760	29.903	-1.196	0.000	144.9	OK

Pickfords Wharf  
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Blindwells Phase 2



Date 14/01/2021  
File 200 year attenuation

Designed by PM  
Checked by KM

Innovyze

Source Control 2019.1

Summary of Results for 200 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	99.282	0.282	79.2	3308.7	O K
30 min Summer	99.407	0.407	135.1	4777.2	O K
60 min Summer	99.555	0.555	144.9	6517.5	O K
120 min Summer	99.675	0.675	145.4	7930.3	O K
180 min Summer	99.745	0.745	145.4	8751.4	O K
240 min Summer	99.793	0.793	145.4	9313.5	O K
360 min Summer	99.855	0.855	145.4	10050.6	O K
480 min Summer	99.889	0.889	145.4	10449.2	O K
600 min Summer	99.907	0.907	145.4	10656.9	O K
720 min Summer	99.919	0.919	145.4	10802.5	O K
960 min Summer	99.934	0.934	145.4	10979.1	O K
1440 min Summer	99.943	0.943	145.4	11086.0	O K
2160 min Summer	99.925	0.925	145.4	10863.9	O K
2880 min Summer	99.886	0.886	145.4	10412.6	O K
4320 min Summer	99.785	0.785	145.4	9220.0	O K
15 min Winter	99.315	0.315	94.8	3702.5	O K
30 min Winter	99.456	0.456	141.8	5355.2	O K
60 min Winter	99.624	0.624	145.4	7329.9	O K
120 min Winter	99.761	0.761	145.4	8944.7	O K
180 min Winter	99.842	0.842	145.4	9897.2	O K
240 min Winter	99.899	0.899	145.4	10561.3	O K
360 min Winter	99.972	0.972	145.4	11417.2	O K
480 min Winter	101.960	2.960	247.4	11754.4	O K
600 min Winter	104.074	5.074	322.3	11756.5	O K
720 min Winter	105.502	6.502	364.1	11757.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m <sup>3</sup> )	Discharge Volume (m <sup>3</sup> )	Time-Peak (mins)
15 min Summer	106.218	0.0	2371.1	26
30 min Summer	77.787	0.0	3787.0	40
60 min Summer	53.973	0.0	6176.6	70
120 min Summer	33.770	0.0	7838.5	128
180 min Summer	25.488	0.0	8923.6	186
240 min Summer	20.841	0.0	9756.4	244
360 min Summer	15.685	0.0	11040.1	362
480 min Summer	12.774	0.0	11990.2	480
600 min Summer	10.881	0.0	12755.2	554
720 min Summer	9.538	0.0	13396.1	610
960 min Summer	7.746	0.0	14436.6	734
1440 min Summer	5.785	0.0	15913.8	1000
2160 min Summer	4.320	0.0	19155.9	1416
2880 min Summer	3.508	0.0	20706.8	1824
4320 min Summer	2.610	0.0	22903.4	2604
15 min Winter	106.218	0.0	2733.8	26
30 min Winter	77.787	0.0	4329.7	40
60 min Winter	53.973	0.0	6974.3	68
120 min Winter	33.770	0.0	8831.6	126
180 min Winter	25.488	0.0	10042.4	184
240 min Winter	20.841	0.0	10970.1	240
360 min Winter	15.685	0.0	12400.9	356
480 min Winter	12.774	0.0	13468.6	432
600 min Winter	10.881	0.0	14338.8	458
720 min Winter	9.538	0.0	15062.8	516



Pickfords Wharf  
Clink Street  
London, SE1 9DG

Blindwells Phase 2



Date 14/01/2021  
File 200 year attenuation

Designed by PM  
Checked by KM


Innovyze

Source Control 2019.1

Summary of Results for 200 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m <sup>3</sup> )	Status
960 min Winter	105.453	6.453	362.7	11757.9	O K
1440 min Winter	103.482	4.482	303.3	11755.9	O K
2160 min Winter	100.618	1.618	184.1	11753.9	O K
2880 min Winter	99.939	0.939	145.4	11031.6	O K
4320 min Winter	99.772	0.772	145.4	9071.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m <sup>3</sup> )	Discharge Volume (m <sup>3</sup> )	Time-Peak (mins)
960 min Winter	7.746	0.0	16229.6	652
1440 min Winter	5.785	0.0	17852.1	946
2160 min Winter	4.320	0.0	21489.3	1488
2880 min Winter	3.508	0.0	23223.2	1988
4320 min Winter	2.610	0.0	25725.5	2780

Waterman Group		Page 3
Pickfords Wharf Clink Street London, SE1 9DG	Blindwells Phase 2	
Date 14/01/2021 File 200 year attenuation	Designed by PM Checked by KM	
Innovyze	Source Control 2019.1	

Model Details

Storage is Online Cover Level (m) 106.000

Tank or Pond Structure

Invert Level (m) 99.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	11750.0	0.600	11750.0	1.200	0.0	1.800	0.0	2.400	0.0
0.100	11750.0	0.700	11750.0	1.300	0.0	1.900	0.0	2.500	0.0
0.200	11750.0	0.800	11750.0	1.400	0.0	2.000	0.0		
0.300	11750.0	0.900	11750.0	1.500	0.0	2.100	0.0		
0.400	11750.0	1.000	11750.0	1.600	0.0	2.200	0.0		
0.500	11750.0	1.001	0.0	1.700	0.0	2.300	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0463-1456-1000-1456
Design Head (m)	1.000
Design Flow (l/s)	145.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	463
Invert Level (m)	99.000
Minimum Outlet Pipe Diameter (mm)	500
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	145.6	Kick-Flo®	0.885	137.2
Flush-Flo™	0.616	145.4	Mean Flow over Head Range	-	106.3

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)	Depth (m)	Flow (l/s)
0.100	12.0	0.800	141.6	2.000	204.2	4.000	286.8	7.000	377.6
0.200	43.9	1.000	145.6	2.200	213.9	4.500	303.8	7.500	390.6
0.300	87.7	1.200	159.1	2.400	223.2	5.000	320.0	8.000	403.2
0.400	132.5	1.400	171.5	2.600	232.2	5.500	335.3	8.500	415.5
0.500	143.6	1.600	183.1	3.000	249.0	6.000	350.0	9.000	427.3
0.600	145.4	1.800	193.9	3.500	268.6	6.500	364.1	9.500	438.9

Assessment of Restricting Discharge

Parameters

<b>M5-60</b>	12		Summer	Winter	2.78	Unit conversion factor											
<b>r</b>	0.25	Cv	0.75	0.84	Cr	Dimensionless routing coefficient					I/s/ha	2.6					
<b>Area (ha)</b>	56.000	Cr	1.3	1.3	Cv	Volumetric runoff coefficient					I/s	145.60					
<b>Area (m<sup>2</sup>)</b>	560000.0	Cv * Cr	0.98	1.09	i (mm/hr)	rainfall intensity for design return period					m <sup>3</sup> /s	0.146					
<b>PIMP (%)</b>					A (ha)	Impervious area draining to pipe											
<b>Imp Area (ha)</b>	27.793																
<b>Imp Area (m<sup>2</sup>)</b>	277933.8	<b>Climate Change</b>		35%													

$Q = 2.78 \times CR \times CV \times i \times A$

30																
Duration (min)	Z1	M5-D	MT-D	i (mm/h)	i (mm/h)	Q <sub>(summer)</sub> (l/s)	Q <sub>(summer)</sub> (m <sup>3</sup> /s)	Inflow (m <sup>3</sup> )	Outflow (m <sup>3</sup> )	Storage (m <sup>3</sup> )	Q <sub>(winter)</sub> (l/s)	Q <sub>(winter)</sub> (m <sup>3</sup> /s)	Inflow (m <sup>3</sup> )	Outflow (m <sup>3</sup> )	Storage (m <sup>3</sup> )	
5	0.32	3.80	5.42	65.06	62.95	4742.19	4.742	1422.66	43.68	1378.98	5311.25	5.311	1593.38	43.68	1549.70	2092.09
10	0.47	5.60	8.06	48.38	46.82	3526.90	3.527	2116.14	87.36	2028.78	3950.13	3.950	2370.08	87.36	2282.72	3081.67
15	0.57	6.80	9.79	39.17	37.90	2855.11	2.855	2569.60	131.04	2438.56	3197.72	3.198	2877.95	131.04	2746.91	3708.33
30	0.75	9.04	13.02	26.04	25.19	1897.81	1.898	3416.06	262.08	3153.98	2125.55	2.126	3825.98	262.08	3563.90	4811.27
60	1.00	12.00	17.88	17.88	17.30	1303.34	1.303	4692.04	524.16	4167.88	1459.75	1.460	5255.08	524.16	4730.92	6386.75
120	1.29	15.48	23.12	11.56	11.18	842.54	0.843	6066.27	1048.32	5017.95	943.64	0.944	6794.22	1048.32	5745.90	7756.97
240	1.69	20.24	29.82	7.46	7.21	543.43	0.543	7825.38	2096.64	5728.74	608.64	0.609	8764.43	2096.64	6667.79	9001.51
360	1.96	23.52	34.57	5.76	5.58	420.04	0.420	9072.95	3144.96	5927.99	470.45	0.470	10161.71	3144.96	7016.75	9472.61
600	2.35	28.16	41.11	4.11	3.98	299.69	0.300	10788.96	5241.60	5547.36	335.66	0.336	12083.63	5241.60	6842.03	9236.74
1440	3.27	39.20	55.86	2.33	2.25	169.66	0.17	14658.68	12579.84	2078.84	190.020	0.190	16417.72	12579.84	3837.88	5181.14

30 year

5185

Assessment of Restricting Discharge

Parameters

M5-60	12		Summer	Winter	2.78	Unit conversion factor										
r	0.25	Cv	0.75	0.84	Cr	Dimensionless routing coefficient		I/s/ha	2.6							
Area (ha)	56.000	Cr	1.3	1.3	Cv	Volumetric runoff coefficient		I/s	145.60							
Area (m <sup>2</sup> )	560000.0	Cv * Cr	0.98	1.09	i (mm/hr)	rainfall intensity for design return period		m <sup>3</sup> /s	0.146							
PIMP (%)					A (ha)	Impervious area draining to pipe										
Imp Area (ha)	27.792															
Imp Area (m <sup>2</sup> )	277919.1	Climate Change		35%												
					Q = 2.78 x CR x CV x i x A											

200																
Duration (min)	Z1	M5-D	MT-D	i (mm/h)	i (mm/h)	Q <sub>(summer)</sub> (l/s)	Q <sub>(summer)</sub> (m <sup>3</sup> /s)	Inflow (m <sup>3</sup> )	Outflow (m <sup>3</sup> )	Storage (m <sup>3</sup> )	Q <sub>(winter)</sub> (l/s)	Q <sub>(winter)</sub> (m <sup>3</sup> /s)	Inflow (m <sup>3</sup> )	Outflow (m <sup>3</sup> )	Storage (m <sup>3</sup> )	
5	0.32	3.80	7.94	95.30	92.22	6946.72	6.947	2084.02	43.68	2040.34	7780.32	7.780	2334.10	43.68	2290.42	3092.06
10	0.47	5.60	11.70	70.22	67.95	5118.63	5.119	3071.18	87.36	2983.82	5732.87	5.733	3439.72	87.36	3352.36	4525.69
15	0.57	6.80	14.21	56.85	55.01	4143.66	4.144	3729.29	131.04	3598.25	4640.89	4.641	4176.81	131.04	4045.77	5461.78
30	0.75	9.04	18.89	37.79	36.56	2754.31	2.754	4957.76	262.08	4695.68	3084.83	3.085	5552.69	262.08	5290.61	7142.33
																0.00
60	1.00	12.00	25.08	25.08	24.27	1828.08	1.828	6581.10	524.16	6056.94	2047.45	2.047	7370.83	524.16	6846.67	9243.01
120	1.29	15.48	33.20	16.60	16.06	1210.14	1.210	8713.03	1048.32	7664.71	1355.36	1.355	9758.59	1048.32	8710.27	11758.87
240	1.69	20.24	44.93	11.23	10.87	818.79	0.819	11790.56	2096.64	9693.92	917.04	0.917	13205.43	2096.64	11108.79	14996.87
360	1.96	23.52	52.68	8.78	8.50	640.03	0.640	13824.72	3144.96	10679.76	716.84	0.717	15483.69	3144.96	12338.73	16657.28
600	2.35	28.16	63.22	6.32	6.12	460.81	0.461	16588.99	5241.60	11347.39	516.10	0.516	18579.67	5241.60	13338.07	18006.40
1440	3.27	39.20	87.81	3.66	3.54	266.68	0.27	23041.20	12579.84	10461.36	298.682	0.299	25806.14	12579.84	13226.30	17855.51

30 year

5185

1 in 200 + 35% CC							
Plot / Road	Total Plot Area (Ha)	Urban Creep (10%)	Impermeable Plot Area	Total Imp Area (Ha)	% of Total Imp	Attenuation Volume (m3)	Discharge Rate (l/s)
<b>NOT ATTENUATED IN BASINS</b>			<i>100% for Commercial</i>				
C1	2.03		2.03	2.03	7.3%	1318	5.29
C2	1.02		1.02	1.02	3.7%	664	2.66
C3 (east)	2.16		2.16	2.16	7.8%	1401	5.62
C3 (west)	0.70		0.70	0.70	2.5%	455	1.83
School Site	4.25		4.25	4.25	15.3%	2755	11.05
Road behind Commercial	0.12		0.12	0.12	0.4%	79	0.32
Road area through commercial	0.11		0.11	0.11	0.4%	70	0.28
<b>Total</b>			<b>10.30</b>	<b>10.30</b>	<b>37.0%</b>	<b>6592</b>	
<b>PLOTS ATTENUATED IN BASINS</b>			<i>60% for Residential</i>				
4A	3.64	0.36	2.18	2.55	9.2%	1650	9.46
5A	3.81	0.38	2.29	2.67	9.6%	1727	9.90
5B	4.46	0.45	2.67	3.12	11.2%	2021	11.58
6A / 6B	6.75	0.67	4.05	4.72	17.0%	3059	17.54
9A / 9B	5.10	0.51	3.06	3.57	12.9%	2314	13.27
<b>ROADS ATTENUATED IN BASINS</b>			<i>100% for Roads</i>				
Between 5A / 5B	0.08		0.08	0.08	0.30%	54	0.22
Between 6A / 6B	0.09		0.09	0.09	0.32%	57	0.23
Between 5A / School	0.04		0.04	0.04	0.16%	29	0.12
Between 5A / 5B	0.08		0.08	0.08	0.29%	52	0.21
<b>LANDSCAPE AREAS ATTENUATED IN BASINS</b>			<i>10% for saturated runoff</i>				
Between Plots 5b / 9A	0.63		0.06	0.06	0.23%	41	1.63
Play Park / Tennis Area	1.79		0.18	0.18	0.64%	116	4.66
Strip adjacent to school	0.78		0.08	0.08	0.28%	50	2.02
Princes Park	0.89		0.09	0.09	0.32%	58	2.31
Between Plots 4A / 6B	0.59		0.06	0.06	0.21%	38	1.52
<b>Total</b>	<b>39.12</b>			<b>27.79</b>	<b>100.00%</b>	<b>18006</b>	<b>101.70</b>
<b>Total draining to Basins</b>	<b>28.63</b>			<b>17.39</b>	<b>62.56%</b>	<b>11265</b>	<b>74.65</b>

Total Plot Area	39.12	2.6	101.70
Total Phase 2	54	2.6	140.40
Total Basin Draining Area	28.63	2.6	74.44
% Imp	0.51		
Storage Volume For Phase 2	18006	200yr +35%cc	
Basins Storage Volume (200yr +cc)	11265		
<b>Loch Storage Volume (m3)</b>	<b>5339</b>		
Current Loch Area (m2)	19664		
Depth increase in loch (m)	0.271		

1 in 30 + 35% CC							
Plot / Road	Total Plot Area (Ha)	Urban Creep (10%)	Impermeable Plot Area	Total Imp Area (Ha)	% of Total Imp	Attenuation Volume (m3)	Discharge Rate (l/s)
<b>NOT ATTENUATED IN BASINS</b>			<i>100% for Commercial</i>				
C1	2.03		2.03	2.03	7.3%	693	
C2	1.02		1.02	1.02	3.7%	349	
C3 (east)	2.16		2.16	2.16	7.8%	737	
C3 (west)	0.70		0.70	0.70	2.5%	239	
School Site	4.25		4.25	4.25	15.3%	1449	
Road behind Commercial	0.12		0.12	0.12	0.4%	41	
Road area through commercial	0.11		0.11	0.11	0.4%	37	
<b>Total</b>			<b>10.30</b>	<b>10.30</b>	<b>37.0%</b>	<b>3468</b>	
<b>PLOTS ATTENUATED IN BASINS</b>			<i>60% for Residential</i>				
4A	3.64	0.36	2.18	2.55	9.2%	868	
5A	3.81	0.38	2.29	2.67	9.6%	909	
5B	4.46	0.45	2.67	3.12	11.2%	1063	
6A / 6B	6.75	0.67	4.05	4.72	17.0%	1609	
9A / 9B	5.10	0.51	3.06	3.57	12.9%	1217	
<b>ROADS ATTENUATED IN BASINS</b>			<i>100% for Roads</i>				
Between 5A / 5B	0.08		0.08	0.08	0.30%	28	
Between 6A / 6B	0.09		0.09	0.09	0.32%	30	
Between 5A / School	0.04		0.04	0.04	0.16%	15	
Between 5A / 5B	0.08		0.08	0.08	0.29%	27	
<b>LANDSCAPE AREAS ATTENUATED IN BASINS</b>			<i>10% for saturated runoff</i>				
Between Plots 5b / 9A	0.63		0.06	0.06	0.23%	21	
Play Park / Tennis Area	1.79		0.18	0.18	0.64%	61	
Strip adjacent to school	0.78		0.08	0.08	0.28%	26	
Princes Park	0.89		0.09	0.09	0.32%	30	
Between Plots 4A / 6B	0.59		0.06	0.06	0.21%	20	
<b>Total</b>	<b>39.12</b>			<b>27.79</b>	<b>100.00%</b>	<b>9473</b>	
<b>Total draining to Basins</b>	<b>28.63</b>			<b>17.39</b>	<b>62.56%</b>	<b>5926</b>	

Total Plot Area	39.12	2.6	101.71
Total Phase 2	54	2.6	140.40
% Imp	0.71		
Storage Volume For Phase 2	9473	30yr +35%cc	
<b>BASIN VOLUME (m3)</b>	<b>5926</b>		
	2859		

# UK and Ireland Office Locations

