1. GENERAL
(i) THIS DRAWING IS NOT TO BE SCALED, WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
(ii) THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
(iii) ANY DISCREPANCY ON THIS DRAWING IS TO BE REPORTED IMMEDIATELY TO THE PARTNERSHIP FOR CLARIFICATION.
(iv) THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.

THE PROPOSED DRAINAGE SCHEME IS FOR THE USE OF LINED PERMEABLE PAVING TO MANAGE RUNOFF POST-DEVELOPMENT.
DUE TO THE STEEP SLOPE OF THE PROPOSED GROUND LEVELS, THE DEVELOPMENT WAS DIVIDED INTO AN UPPER AND LOWER CATCHMENT, AS INDICATED ON THE DRAWING.
OFFSITE CONNECTION AT 5L/S TO COMBINED SEWER IS PROPOSED AS AGREED WITH UNITED UTILITIES AND LLFA.
WATER BUTTS AND RAIN PLANTERS PROPOSED AT EVERY RAINWATER PIPE TO LIMIT THE TOTAL DISCHARGE RATES AND VOLUMES AS AGREED WITH LLFA.

LEGEND

- UPPER CATCHMENT
- LOWER CATCHMENT
- PRIVATE SURFACE WATER DRAIN
- PERFORATED SURFACE WATER DRAIN
- TYPE 2 MANHOLE WITH FLOW CONTROL
- TYPE 3 INSPECTION CHAMBER
- TYPE 4 INSPECTION CHAMBER
- PERMEABLE PAVING WITHOUT ATTENUATION
- PERMEABLE PAVING WITH ATTENUATION
- OVERLAND FLOW ROUTE
- RWP — RAIN WATER PIPE
- WATER BUTT SUITABLE FOR 25m2 OF ROOF AREA
- SUDS PLANTER SUITABLE FOR 25m2 OF ROOF AREA

CHECK PRINT ONLY
DRAWING FOR INFORMATION ONLY. NOT FOR CONSTRUCTION.

ALL SERVICES FOR ALL UNITS TO BE ROUTED AROUND DRAINAGE

UPPER PERMEABLE PAVING WITH RUNOFF ATTENUATION
TYPE C LINED
TOTAL AREA:440m²
DEPTH: 0.3m
SUB-BASE MATERIAL: 6-20mm CRUSHED STONE WITH 0.3 VOID RATIO
FORMATION LEVEL BETWEEN 61.73 (TBC)
SUB-BASE TO BE WRAPPED IN PERMEABLE GEOTEXTILES AND IMPERMEABLE GEOMEMBRANES TO PROTECT THE FOUNDATIONS AND PREVENT INFILTRATION INTO MADE GROUND

UPPER CATCHMENT
TOTAL AREA : 1480m²
IMPERMEABLE AREA: 1010m²

BINS AREAS TO DRAIN TO THE FOUL NETWORK

CONNECT RWPs TO PRIVATE MANHOLES OR PERFORATED PIPES AS NECESSARY

PERFORATED PIPES TO BE LAID AT THE FORMATION LEVEL OF THE PAVEMENT.

TYPE 2 MANHOLE FITTED WITH 55mm ORIFICE PLATE TO LIMIT FLOWS TO LOWER CATCHMENTS TO 3.0l/s

CHECK DAM/FLOW BARRIER

MH TO BE PROVIDED FOR RODDING ACCESS

PERFORATED PIPE TO BE LAID AT THE BASE OF THE INFILTRATION TRENCHES

SLOPING SECTION OF PERMEABLE PAVEMENT (NO STORAGE ACCOUNTED FOR)

TYPE 2 MANHOLE FITTED WITH HYDROBREAK TO LIMIT OFFSITE DISCHARGE RATES TO 5.0l/s AS AGREED WITH UU

LOWER CATCHMENT
TOTAL AREA : 1050m²
IMPERMEABLE AREA: 830m²

DISCHARGE OF SURFACE WATER FLOWS TO THE COMBINED SEWER AS AGREED BY UU AND LLFA

LOWER PERMEABLE PAVING WITH RUNOFF ATTENUATION
TYPE C LINED
TOTAL AREA: 220m²
DEPTH: 0.3m
SUB-BASE MATERIAL : 6-20mm CRUSHED STONE WITH 0.3 VOID RATIO
FORMATION LEVEL 60.85 FLAT (TBC)
SUB-BASE TO BE WRAPPED IN PERMEABLE GEOTEXTILES AND IMPERMEABLE GEOMEMBRANES TO PROTECT THE FOUNDATIONS AND PREVENT INFILTRATION INTO MADE GROUND.

Queens Park Close
Camelia Road
Kingsbridge Road
New Adoptable Road
Permeable Paving
Gabion to be used for Retaining Wall
Approved Position of Plots 5 & 6

Rev	Date	By	Description
D	26/05/2021	BB	AS AGREED WITH COUNCIL
C	15/02/2021	SD	AMENDED TO SUIT FINAL PLAN LAYOUT
B	05/02/2021	SD	AMENDED TO SUIT INFILTRATION TEST RESULTS

Client
Tang&Associates

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The Sussex Innovation Centre
Science Park Square,
Brighton, BN1 9SB
Tel +44 (0) 203 857 8530
www.ambientalt.co.uk
drainage@ambientalt.co.uk

Project
Land adjacent to Kingsbridge Road

Drawing
3586_Tang&Associates_Manchester
Surface Water Drainage Strategy

Drawn by:	BB	Date: 12/12/2017
Checked by:	RH	Date: 12/12/2017
Approved by:	RH	Date: 12/12/2017

Drawing No. 3586
Revision D
Drawing Scale: 1:100@A1

Cascade Summary of Results for 6044_Upper Catchment.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	6044_Lower Catchment.SRCX	(None)

Half Drain Time : 108 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	62.002	0.142	0.0	2.6	2.6	18.9	O K
30 min Summer	62.047	0.187	0.0	3.0	3.0	24.9	O K
60 min Summer	62.083	0.223	0.0	3.2	3.2	29.6	O K
120 min Summer	62.100	0.240	0.0	3.3	3.3	31.9	O K
180 min Summer	62.102	0.242	0.0	3.3	3.3	32.2	O K
240 min Summer	62.097	0.237	0.0	3.3	3.3	31.6	O K
360 min Summer	62.082	0.222	0.0	3.2	3.2	29.6	O K
480 min Summer	62.067	0.207	0.0	3.1	3.1	27.6	O K
600 min Summer	62.052	0.192	0.0	3.0	3.0	25.6	O K
720 min Summer	62.039	0.179	0.0	2.9	2.9	23.9	O K
960 min Summer	62.015	0.155	0.0	2.7	2.7	20.7	O K
1440 min Summer	61.978	0.118	0.0	2.5	2.5	15.8	O K
2160 min Summer	61.940	0.080	0.0	2.1	2.1	10.7	O K
2880 min Summer	61.915	0.055	0.0	1.9	1.9	7.4	O K
4320 min Summer	61.886	0.026	0.0	1.5	1.5	3.5	O K
5760 min Summer	61.873	0.013	0.0	1.3	1.3	1.8	O K
7200 min Summer	61.866	0.006	0.0	1.1	1.1	0.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	120.438	0.0	20.5	18
30 min Summer	80.963	0.0	28.4	32
60 min Summer	52.002	0.0	37.1	60
120 min Summer	32.297	0.0	46.5	96
180 min Summer	24.104	0.0	52.3	128
240 min Summer	19.455	0.0	56.4	162
360 min Summer	14.290	0.0	62.4	232
480 min Summer	11.485	0.0	66.8	300
600 min Summer	9.686	0.0	70.5	368
720 min Summer	8.423	0.0	73.7	434
960 min Summer	6.751	0.0	78.6	560
1440 min Summer	4.932	0.0	86.0	808
2160 min Summer	3.596	0.0	93.8	1168
2880 min Summer	2.870	0.0	99.4	1528
4320 min Summer	2.085	0.0	107.4	2244
5760 min Summer	1.660	0.0	113.1	2944
7200 min Summer	1.390	0.0	117.4	3672

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Cascade Summary of Results for 6044_Upper Catchment.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	61.860	0.000	0.0	1.0	1.0	0.1	O K
10080 min Summer	61.860	0.000	0.0	0.9	0.9	0.0	O K
15 min Winter	62.021	0.161	0.0	2.8	2.8	21.5	O K
30 min Winter	62.073	0.213	0.0	3.1	3.1	28.4	O K
60 min Winter	62.115	0.255	0.0	3.4	3.4	34.0	O K
120 min Winter	62.135	0.275	0.0	3.5	3.5	36.7	O K
180 min Winter	62.136	0.276	0.0	3.5	3.5	36.8	O K
240 min Winter	62.129	0.269	0.0	3.5	3.5	35.8	O K
360 min Winter	62.106	0.246	0.0	3.3	3.3	32.8	O K
480 min Winter	62.083	0.223	0.0	3.2	3.2	29.7	O K
600 min Winter	62.061	0.201	0.0	3.1	3.1	26.8	O K
720 min Winter	62.042	0.182	0.0	2.9	2.9	24.2	O K
960 min Winter	62.009	0.149	0.0	2.7	2.7	19.8	O K
1440 min Winter	61.960	0.100	0.0	2.3	2.3	13.4	O K
2160 min Winter	61.916	0.056	0.0	1.9	1.9	7.5	O K
2880 min Winter	61.891	0.031	0.0	1.6	1.6	4.1	O K
4320 min Winter	61.870	0.010	0.0	1.2	1.2	1.3	O K
5760 min Winter	61.860	0.000	0.0	1.0	1.0	0.0	O K
7200 min Winter	61.860	0.000	0.0	0.8	0.8	0.0	O K
8640 min Winter	61.860	0.000	0.0	0.7	0.7	0.0	O K
10080 min Winter	61.860	0.000	0.0	0.6	0.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.202	0.0	120.9	4400
10080 min Summer	1.064	0.0	123.8	0
15 min Winter	120.438	0.0	23.2	18
30 min Winter	80.963	0.0	32.0	32
60 min Winter	52.002	0.0	41.9	60
120 min Winter	32.297	0.0	52.4	100
180 min Winter	24.104	0.0	58.9	138
240 min Winter	19.455	0.0	63.5	176
360 min Winter	14.290	0.0	70.1	250
480 min Winter	11.485	0.0	75.3	322
600 min Winter	9.686	0.0	79.3	392
720 min Winter	8.423	0.0	82.8	460
960 min Winter	6.751	0.0	88.5	590
1440 min Winter	4.932	0.0	96.8	838
2160 min Winter	3.596	0.0	105.5	1208
2880 min Winter	2.870	0.0	111.9	1556
4320 min Winter	2.085	0.0	121.1	2244
5760 min Winter	1.660	0.0	127.7	2936
7200 min Winter	1.390	0.0	132.7	0
8640 min Winter	1.202	0.0	136.7	0
10080 min Winter	1.064	0.0	140.2	0

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Cascade Rainfall Details for 6044_Upper Catchment.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.400	Shortest Storm (mins)	15
Ratio R	0.351	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.101

Time (mins) From:	To:	Area (ha)
0	4	0.101

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Cascade Model Details for 6044_Upper Catchment.SRCX

Storage is Online Cover Level (m) 62.310

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	44.4
Max Percolation (l/s)	123.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	61.860	Membrane Depth (m)	150

Orifice Outflow Control

Diameter (m) 0.055 Discharge Coefficient 0.600 Invert Level (m) 61.800

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Cascade Summary of Results for 6044_Lower Catchment.SRCX

Upstream Structures	Outflow To	Overflow To
6044_Upper Catchment.SRCX	(None)	(None)

Half Drain Time : 56 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	61.086	0.236	0.0	5.0	5.0	15.6	O K
30 min Summer	61.164	0.314	0.0	5.0	5.0	20.7	O K
60 min Summer	61.234	0.384	0.0	5.0	5.0	25.3	O K
120 min Summer	61.273	0.423	0.0	5.0	5.0	27.9	O K
180 min Summer	61.270	0.420	0.0	5.0	5.0	27.7	O K
240 min Summer	61.257	0.407	0.0	5.0	5.0	26.9	O K
360 min Summer	61.223	0.373	0.0	5.0	5.0	24.6	O K
480 min Summer	61.177	0.327	0.0	5.0	5.0	21.6	O K
600 min Summer	61.130	0.280	0.0	5.0	5.0	18.5	O K
720 min Summer	61.089	0.239	0.0	5.0	5.0	15.8	O K
960 min Summer	61.018	0.168	0.0	5.0	5.0	11.1	O K
1440 min Summer	60.932	0.082	0.0	4.9	4.9	5.4	O K
2160 min Summer	60.899	0.049	0.0	4.3	4.3	3.2	O K
2880 min Summer	60.885	0.035	0.0	3.7	3.7	2.3	O K
4320 min Summer	60.870	0.020	0.0	2.9	2.9	1.3	O K
5760 min Summer	60.861	0.011	0.0	2.4	2.4	0.7	O K
7200 min Summer	60.854	0.004	0.0	2.0	2.0	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	120.438	0.0	38.1	18
30 min Summer	80.963	0.0	52.4	33
60 min Summer	52.002	0.0	68.3	62
120 min Summer	32.297	0.0	85.5	120
180 min Summer	24.104	0.0	96.1	168
240 min Summer	19.455	0.0	103.6	200
360 min Summer	14.290	0.0	114.4	266
480 min Summer	11.485	0.0	122.6	330
600 min Summer	9.686	0.0	129.4	386
720 min Summer	8.423	0.0	135.1	446
960 min Summer	6.751	0.0	144.3	560
1440 min Summer	4.932	0.0	157.9	778
2160 min Summer	3.596	0.0	172.3	1124
2880 min Summer	2.870	0.0	182.7	1472
4320 min Summer	2.085	0.0	197.8	2204
5760 min Summer	1.660	0.0	208.6	2936
7200 min Summer	1.390	0.0	216.8	3672

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Cascade Summary of Results for 6044_Lower Catchment.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	60.850	0.000	0.0	1.8	1.8	0.0	O K
10080 min Summer	60.850	0.000	0.0	1.6	1.6	0.0	O K
15 min Winter	61.120	0.270	0.0	5.0	5.0	17.9	O K
30 min Winter	61.213	0.363	0.0	5.0	5.0	24.0	O K
60 min Winter	61.291	0.441	0.0	5.0	5.0	29.1	O K
120 min Winter	61.341	0.491	0.0	5.0	5.0	32.4	O K
180 min Winter	61.342	0.492	0.0	5.0	5.0	32.5	O K
240 min Winter	61.324	0.474	0.0	5.0	5.0	31.3	O K
360 min Winter	61.279	0.429	0.0	5.0	5.0	28.3	O K
480 min Winter	61.227	0.377	0.0	5.0	5.0	24.9	O K
600 min Winter	61.147	0.297	0.0	5.0	5.0	19.6	O K
720 min Winter	61.078	0.228	0.0	5.0	5.0	15.0	O K
960 min Winter	60.974	0.124	0.0	5.0	5.0	8.2	O K
1440 min Winter	60.905	0.055	0.0	4.5	4.5	3.6	O K
2160 min Winter	60.883	0.033	0.0	3.5	3.5	2.1	O K
2880 min Winter	60.871	0.021	0.0	2.9	2.9	1.4	O K
4320 min Winter	60.858	0.008	0.0	2.2	2.2	0.5	O K
5760 min Winter	60.850	0.000	0.0	1.8	1.8	0.0	O K
7200 min Winter	60.850	0.000	0.0	1.5	1.5	0.0	O K
8640 min Winter	60.850	0.000	0.0	1.3	1.3	0.0	O K
10080 min Winter	60.850	0.000	0.0	1.1	1.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.202	0.0	223.6	0
10080 min Summer	1.064	0.0	229.4	0
15 min Winter	120.438	0.0	43.0	18
30 min Winter	80.963	0.0	59.1	32
60 min Winter	52.002	0.0	76.9	62
120 min Winter	32.297	0.0	96.2	118
180 min Winter	24.104	0.0	108.1	172
240 min Winter	19.455	0.0	116.5	222
360 min Winter	14.290	0.0	128.6	282
480 min Winter	11.485	0.0	138.0	362
600 min Winter	9.686	0.0	145.5	424
720 min Winter	8.423	0.0	151.8	480
960 min Winter	6.751	0.0	162.2	586
1440 min Winter	4.932	0.0	177.5	778
2160 min Winter	3.596	0.0	193.6	1128
2880 min Winter	2.870	0.0	205.5	1500
4320 min Winter	2.085	0.0	222.6	2204
5760 min Winter	1.660	0.0	235.0	0
7200 min Winter	1.390	0.0	244.6	0
8640 min Winter	1.202	0.0	252.3	0
10080 min Winter	1.064	0.0	259.1	0

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Cascade Rainfall Details for 6044_Lower Catchment.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.400	Shortest Storm (mins)	15
Ratio R	0.351	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.083

Time (mins) From:	To:	Area (ha)
0	4	0.083

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Cascade Model Details for 6044_Lower Catchment.SRCX

Storage is Online Cover Level (m) 61.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	22.0
Max Percolation (l/s)	61.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	60.850	Membrane Depth (m)	150

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0112-5000-0550-5000
Design Head (m)	0.550
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	112
Invert Level (m)	60.790
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.550	5.0
Flush-Flo™	0.186	5.0
Kick-Flo®	0.401	4.3
Mean Flow over Head Range	-	4.2

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	3.9	1.200	7.2	3.000	11.1	7.000	16.6
0.200	5.0	1.400	7.7	3.500	11.9	7.500	17.2
0.300	4.8	1.600	8.2	4.000	12.7	8.000	17.8
0.400	4.3	1.800	8.7	4.500	13.4	8.500	18.3
0.500	4.8	2.000	9.1	5.000	14.1	9.000	18.9
0.600	5.2	2.200	9.6	5.500	14.8	9.500	19.4
0.800	5.9	2.400	10.0	6.000	15.4		
1.000	6.6	2.600	10.3	6.500	16.0		

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