

Oldlands Farm Phase 1A
Planning Ref: BE/61/13 & BE/4/17/RES
Hanbury Properties

Planning Condition No 25

AMc/19:0170/4692

18th March 2019

Condition No 25:

Submission of a surface water drainage scheme:

No development of each phase shall take place until a surface water drainage scheme for the phase, based on sustainable drainage principles and an assessment of the hydrological and hydrogeological context of the development, has been submitted to and approved in writing by the Local Planning Authority. The drainage strategy should: - Demonstrate the surface water run-off generated up to and including the 1 in 100 year plus 30% for climate change critical storm will not exceed the run-off from the undeveloped site following the corresponding rainfall event (as stated within the approved FRA ref: 13/0404/4692) . - Consider pollution prevention measures.

The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, the recommendations of the SUDS Manual produced by CIRIA. Winter groundwater monitoring to establish highest annual ground water levels and Percolation testing to BRE 365, or similar approved, will be required to support the design of any Infiltration drainage in the event that any infiltration drainage is included within an approved scheme or schemes. No building shall be occupied until the complete surface water drainage system serving the phase within which that building is situated has been implemented in accordance with the agreed details (which may be revised from time to time with the written approval of the Planning Authority).

This following statement is to support Planning Condition 25 relating to the provision of a surface water scheme for Phase 1A of the Oldlands Farm Commercial development. The surface water designs follow the principles as outlined with the approved Flood Risk Assessment produced by MJA Consulting Ref:13/0404/4692.

The development storm water outfall was approved as part of the main access road design and attenuation.

As highlighted within the approved FRA infiltration as a method of drainage was discounted due to the makeup of the underlying geology. The site is underlain by Aeolian Deposits (Brickearth clay). Infiltration testing was not carried out due to the nature of the sub strata.

As part of the Phase 1 works the Phase 1A area levels were lifted and ground improved & stabilised.

The FRA highlights that the surface water runoff from the roads and parking areas will drain via a permeable paved surface to the sub base below. Storm water will be stored temporarily within the voids with the flow being restricted to a typical Greenfield runoff rate of 9l/sec.

This will then link to the main storm system and outfall to the attenuation pond. This will provide a first treatment to runoff and improve the downstream water quality.

Roof runoff will be collected by traditional guttering and downpipe system where it will be discharged to the sub base of the permeable paving structure within the parking areas via permavoid® diffuser cells.



The surface water design follows the principles within the FRA; the running surfaces will be a mix of macadam roads and permeable block paved parking areas. Both running surfaces will be underlain by a sealed permeable stone sub base. Macadam areas will drain via gullies directly to the permeable stone.

Runoff will be restricted to a maximum discharge rate of 9 l/sec via a vortex flow control outfalling to the main storm drain with the access road.

Typically the sealed permeable stone layer will be set at a depth of between 375mm – 450mm.

Under the Bericote Properties Ltd Phase 1 works the discharge from the access road to the watercourse was restricted to 5.3 l/sec for all storm events. The Phase 1A site has a restricted discharge of 9 l/sec to the access road drainage. The existing access road flow control will be increased to a maximum discharge rate of 14.3 l/sec.

The storm water drainage strategy for the proposed development is considered the most suitable and accords with the original design proposals.

Alistair McShane
FOR MJA CONSULTING

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Monarch House Barton Lane OX14 3NB			Oldlands Farm Phase 1A Parking area				
Date 18/03/2019 17:08 File Retail area Section1.srcx			Designed by mcshane Checked by				
Innovyze			Source Control 2017.1.2				
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 1691 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	2.343	0.093	0.0	4.0	4.0	308.9	O K
30 min Summer	2.380	0.130	0.0	5.8	5.8	431.4	O K
60 min Summer	2.421	0.171	0.0	6.0	6.0	564.9	O K
120 min Summer	2.463	0.213	0.0	6.0	6.0	703.9	O K
180 min Summer	2.487	0.237	0.0	6.0	6.0	782.7	O K
240 min Summer	2.502	0.252	0.0	6.0	6.0	834.5	O K
360 min Summer	2.523	0.273	0.0	6.0	6.0	904.2	O K
480 min Summer	2.538	0.288	0.0	6.0	6.0	951.1	O K
600 min Summer	2.548	0.298	0.0	6.0	6.0	984.0	O K
720 min Summer	2.555	0.305	0.0	6.0	6.0	1007.6	O K
960 min Summer	2.563	0.313	0.0	6.0	6.0	1036.5	O K
1440 min Summer	2.568	0.318	0.0	6.0	6.0	1052.3	O K
2160 min Summer	2.567	0.317	0.0	6.0	6.0	1048.1	O K
2880 min Summer	2.562	0.312	0.0	6.0	6.0	1031.8	O K
4320 min Summer	2.546	0.296	0.0	6.0	6.0	979.1	O K
5760 min Summer	2.527	0.277	0.0	6.0	6.0	914.7	O K
7200 min Summer	2.506	0.256	0.0	6.0	6.0	847.6	O K
8640 min Summer	2.487	0.237	0.0	6.0	6.0	783.8	O K
10080 min Summer	2.469	0.219	0.0	6.0	6.0	724.0	O K
15 min Winter	2.357	0.107	0.0	4.7	4.7	352.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	124.633	0.0	176.7	29			
30 min Summer	83.789	0.0	273.0	42			
60 min Summer	53.779	0.0	471.3	72			
120 min Summer	33.337	0.0	602.6	130			
180 min Summer	24.832	0.0	677.4	188			
240 min Summer	20.006	0.0	726.8	248			
360 min Summer	14.706	0.0	792.5	366			
480 min Summer	11.818	0.0	833.7	486			
600 min Summer	9.966	0.0	858.2	604			
720 min Summer	8.665	0.0	870.1	724			
960 min Summer	6.943	0.0	864.8	962			
1440 min Summer	5.071	0.0	798.5	1370			
2160 min Summer	3.696	0.0	1337.5	1708			
2880 min Summer	2.949	0.0	1388.7	2076			
4320 min Summer	2.142	0.0	1399.1	2860			
5760 min Summer	1.705	0.0	1695.7	3688			
7200 min Summer	1.427	0.0	1744.9	4464			
8640 min Summer	1.235	0.0	1777.8	5192			
10080 min Summer	1.093	0.0	1791.5	5952			
15 min Winter	124.633	0.0	210.5	29			
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Monarch House Barton Lane OX14 3NB			Oldlands Farm Phase 1A Parking area				
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Innovyze			Source Control 2017.1.2				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
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
30 min Winter	2.398	0.148	0.0	5.9	5.9	490.3	O K
60 min Winter	2.444	0.194	0.0	6.0	6.0	640.8	O K
120 min Winter	2.491	0.241	0.0	6.0	6.0	797.9	O K
180 min Winter	2.518	0.268	0.0	6.0	6.0	887.7	O K
240 min Winter	2.536	0.286	0.0	6.0	6.0	947.0	O K
360 min Winter	2.561	0.311	0.0	6.0	6.0	1027.9	O K
480 min Winter	2.578	0.328	0.0	6.0	6.0	1083.5	O K
600 min Winter	2.589	0.339	0.0	6.0	6.0	1122.5	O K
720 min Winter	2.598	0.348	0.0	6.0	6.0	1150.5	O K
960 min Winter	2.608	0.358	0.0	6.0	6.0	1185.6	O K
1440 min Winter	2.615	0.365	0.0	6.0	6.0	1208.7	O K
2160 min Winter	2.610	0.360	0.0	6.0	6.0	1190.5	O K
2880 min Winter	2.603	0.353	0.0	6.0	6.0	1166.0	O K
4320 min Winter	2.579	0.329	0.0	6.0	6.0	1087.2	O K
5760 min Winter	2.547	0.297	0.0	6.0	6.0	982.1	O K
7200 min Winter	2.514	0.264	0.0	6.0	6.0	874.3	O K
8640 min Winter	2.484	0.234	0.0	6.0	6.0	774.2	O K
10080 min Winter	2.457	0.207	0.0	6.0	6.0	683.8	O K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
30 min Winter	83.789		0.0	317.2	42		
60 min Winter	53.779		0.0	539.1	70		
120 min Winter	33.337		0.0	682.1	128		
180 min Winter	24.832		0.0	761.2	186		
240 min Winter	20.006		0.0	811.4	244		
360 min Winter	14.706		0.0	871.9	360		
480 min Winter	11.818		0.0	900.9	478		
600 min Winter	9.966		0.0	909.1	594		
720 min Winter	8.665		0.0	903.4	708		
960 min Winter	6.943		0.0	873.8	936		
1440 min Winter	5.071		0.0	813.5	1378		
2160 min Winter	3.696		0.0	1497.0	1800		
2880 min Winter	2.949		0.0	1540.6	2220		
4320 min Winter	2.142		0.0	1483.9	3156		
5760 min Winter	1.705		0.0	1924.7	3992		
7200 min Winter	1.427		0.0	1985.3	4824		
8640 min Winter	1.235		0.0	2028.9	5616		
10080 min Winter	1.093		0.0	2051.8	6344		
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Monarch House
Barton Lane
OX14 3NB

Oldlands Farm
Phase 1A
Parking area

Date 18/03/2019 17:08
File Retail area Section1.srcx

Designed by mcshane
Checked by

InnovyzeSource Control 2017.1.2

Rainfall Details

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.575

Time (mins) From:	(mins) To:	Area (ha)	Time (mins) From:	(mins) To:	Area (ha)	Time (mins) From:	(mins) To:	Area (ha)	Time (mins) From:	(mins) To:	Area (ha)
0	4	0.700	4	8	0.450	8	12	0.325	12	16	0.100

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Model Details

Storage is Online Cover Level (m) 3.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	105.0
Membrane Percolation (mm/hr)	1000	Length (m)	105.0
Max Percolation (l/s)	3062.5	Slope (1:X)	0.0
Safety Factor	1.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.250	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0123-6000-0400-6000
Design Head (m)	0.400
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	123
Invert Level (m)	2.250
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	6.0
Flush-Flo™	0.182	6.0
Kick-Flo®	0.318	5.4
Mean Flow over Head Range	-	4.7

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	4.4	1.200	10.0	3.000	15.5	7.000	23.4
0.200	6.0	1.400	10.8	3.500	16.7	7.500	24.3
0.300	5.6	1.600	11.5	4.000	17.8	8.000	25.1
0.400	6.0	1.800	12.1	4.500	18.7	8.500	25.9
0.500	6.6	2.000	12.8	5.000	19.8	9.000	26.6
0.600	7.2	2.200	13.4	5.500	20.8	9.500	27.3
0.800	8.3	2.400	13.9	6.000	21.7		
1.000	9.2	2.600	14.5	6.500	22.6		

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Monarch House Barton Lane OX14 3NB			Oldlands Farm Phase 1A Loading Area																																																																																																																																																																																																																																																																																					
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 649 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>2.356</td><td>0.106</td><td>0.0</td><td>3.0</td><td>3.0</td><td>72.8</td><td>O K</td></tr><tr><td>30 min Summer</td><td>2.397</td><td>0.147</td><td>0.0</td><td>3.0</td><td>3.0</td><td>100.8</td><td>O K</td></tr><tr><td>60 min Summer</td><td>2.441</td><td>0.191</td><td>0.0</td><td>3.0</td><td>3.0</td><td>130.6</td><td>O K</td></tr><tr><td>120 min Summer</td><td>2.484</td><td>0.234</td><td>0.0</td><td>3.0</td><td>3.0</td><td>159.9</td><td>O K</td></tr><tr><td>180 min Summer</td><td>2.506</td><td>0.256</td><td>0.0</td><td>3.0</td><td>3.0</td><td>175.1</td><td>O K</td></tr><tr><td>240 min Summer</td><td>2.519</td><td>0.269</td><td>0.0</td><td>3.0</td><td>3.0</td><td>183.8</td><td>O K</td></tr><tr><td>360 min Summer</td><td>2.533</td><td>0.283</td><td>0.0</td><td>3.0</td><td>3.0</td><td>193.4</td><td>O K</td></tr><tr><td>480 min Summer</td><td>2.539</td><td>0.289</td><td>0.0</td><td>3.0</td><td>3.0</td><td>197.6</td><td>O K</td></tr><tr><td>600 min Summer</td><td>2.541</td><td>0.291</td><td>0.0</td><td>3.0</td><td>3.0</td><td>198.8</td><td>O K</td></tr><tr><td>720 min Summer</td><td>2.541</td><td>0.291</td><td>0.0</td><td>3.0</td><td>3.0</td><td>199.0</td><td>O K</td></tr><tr><td>960 min Summer</td><td>2.539</td><td>0.289</td><td>0.0</td><td>3.0</td><td>3.0</td><td>197.8</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>2.529</td><td>0.279</td><td>0.0</td><td>3.0</td><td>3.0</td><td>191.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>2.371</td><td>0.121</td><td>0.0</td><td>3.0</td><td>3.0</td><td>83.0</td><td>O K</td></tr><tr><td>30 min Winter</td><td>2.418</td><td>0.168</td><td>0.0</td><td>3.0</td><td>3.0</td><td>114.7</td><td>O K</td></tr><tr><td>60 min Winter</td><td>2.467</td><td>0.217</td><td>0.0</td><td>3.0</td><td>3.0</td><td>148.4</td><td>O K</td></tr><tr><td>120 min Winter</td><td>2.516</td><td>0.266</td><td>0.0</td><td>3.0</td><td>3.0</td><td>181.8</td><td>O K</td></tr><tr><td>180 min Winter</td><td>2.542</td><td>0.292</td><td>0.0</td><td>3.0</td><td>3.0</td><td>199.6</td><td>O K</td></tr><tr><td>240 min Winter</td><td>2.557</td><td>0.307</td><td>0.0</td><td>3.0</td><td>3.0</td><td>210.1</td><td>O K</td></tr><tr><td>360 min Winter</td><td>2.574</td><td>0.324</td><td>0.0</td><td>3.0</td><td>3.0</td><td>221.9</td><td>O K</td></tr><tr><td>480 min Winter</td><td>2.582</td><td>0.332</td><td>0.0</td><td>3.0</td><td>3.0</td><td>227.4</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>124.633</td><td>0.0</td><td>64.9</td><td>26</td></tr><tr><td>30 min Summer</td><td>83.789</td><td>0.0</td><td>93.3</td><td>40</td></tr><tr><td>60 min Summer</td><td>53.779</td><td>0.0</td><td>131.7</td><td>68</td></tr><tr><td>120 min Summer</td><td>33.337</td><td>0.0</td><td>166.7</td><td>128</td></tr><tr><td>180 min Summer</td><td>24.832</td><td>0.0</td><td>187.7</td><td>186</td></tr><tr><td>240 min Summer</td><td>20.006</td><td>0.0</td><td>202.3</td><td>244</td></tr><tr><td>360 min Summer</td><td>14.706</td><td>0.0</td><td>223.9</td><td>362</td></tr><tr><td>480 min Summer</td><td>11.818</td><td>0.0</td><td>240.2</td><td>480</td></tr><tr><td>600 min Summer</td><td>9.966</td><td>0.0</td><td>253.1</td><td>560</td></tr><tr><td>720 min Summer</td><td>8.665</td><td>0.0</td><td>263.9</td><td>612</td></tr><tr><td>960 min Summer</td><td>6.943</td><td>0.0</td><td>281.1</td><td>734</td></tr><tr><td>1440 min Summer</td><td>5.071</td><td>0.0</td><td>304.8</td><td>992</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>74.9</td><td>26</td></tr><tr><td>30 min Winter</td><td>83.789</td><td>0.0</td><td>106.6</td><td>40</td></tr><tr><td>60 min Winter</td><td>53.779</td><td>0.0</td><td>149.4</td><td>68</td></tr><tr><td>120 min Winter</td><td>33.337</td><td>0.0</td><td>188.5</td><td>126</td></tr><tr><td>180 min Winter</td><td>24.832</td><td>0.0</td><td>212.0</td><td>182</td></tr><tr><td>240 min Winter</td><td>20.006</td><td>0.0</td><td>228.4</td><td>240</td></tr><tr><td>360 min Winter</td><td>14.706</td><td>0.0</td><td>252.5</td><td>356</td></tr><tr><td>480 min Winter</td><td>11.818</td><td>0.0</td><td>270.7</td><td>468</td></tr></table>								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	2.356	0.106	0.0	3.0	3.0	72.8	O K	30 min Summer	2.397	0.147	0.0	3.0	3.0	100.8	O K	60 min Summer	2.441	0.191	0.0	3.0	3.0	130.6	O K	120 min Summer	2.484	0.234	0.0	3.0	3.0	159.9	O K	180 min Summer	2.506	0.256	0.0	3.0	3.0	175.1	O K	240 min Summer	2.519	0.269	0.0	3.0	3.0	183.8	O K	360 min Summer	2.533	0.283	0.0	3.0	3.0	193.4	O K	480 min Summer	2.539	0.289	0.0	3.0	3.0	197.6	O K	600 min Summer	2.541	0.291	0.0	3.0	3.0	198.8	O K	720 min Summer	2.541	0.291	0.0	3.0	3.0	199.0	O K	960 min Summer	2.539	0.289	0.0	3.0	3.0	197.8	O K	1440 min Summer	2.529	0.279	0.0	3.0	3.0	191.2	O K	15 min Winter	2.371	0.121	0.0	3.0	3.0	83.0	O K	30 min Winter	2.418	0.168	0.0	3.0	3.0	114.7	O K	60 min Winter	2.467	0.217	0.0	3.0	3.0	148.4	O K	120 min Winter	2.516	0.266	0.0	3.0	3.0	181.8	O K	180 min Winter	2.542	0.292	0.0	3.0	3.0	199.6	O K	240 min Winter	2.557	0.307	0.0	3.0	3.0	210.1	O K	360 min Winter	2.574	0.324	0.0	3.0	3.0	221.9	O K	480 min Winter	2.582	0.332	0.0	3.0	3.0	227.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	64.9	26	30 min Summer	83.789	0.0	93.3	40	60 min Summer	53.779	0.0	131.7	68	120 min Summer	33.337	0.0	166.7	128	180 min Summer	24.832	0.0	187.7	186	240 min Summer	20.006	0.0	202.3	244	360 min Summer	14.706	0.0	223.9	362	480 min Summer	11.818	0.0	240.2	480	600 min Summer	9.966	0.0	253.1	560	720 min Summer	8.665	0.0	263.9	612	960 min Summer	6.943	0.0	281.1	734	1440 min Summer	5.071	0.0	304.8	992	15 min Winter	124.633	0.0	74.9	26	30 min Winter	83.789	0.0	106.6	40	60 min Winter	53.779	0.0	149.4	68	120 min Winter	33.337	0.0	188.5	126	180 min Winter	24.832	0.0	212.0	182	240 min Winter	20.006	0.0	228.4	240	360 min Winter	14.706	0.0	252.5	356	480 min Winter	11.818	0.0	270.7	468
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																																																																																																																																																																																																																																																																																	
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Monarch House Barton Lane OX14 3NB			Oldlands Farm Phase 1A Loading Area				
Date 18/03/2019 18:02 File Retail area Section-2.srcx			Designed by mcshane Checked by				
Innovyze			Source Control 2017.1.2				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
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
600 min Winter	2.585	0.335	0.0	3.0	3.0	229.3	O K
720 min Winter	2.585	0.335	0.0	3.0	3.0	228.9	O K
960 min Winter	2.579	0.329	0.0	3.0	3.0	225.3	O K
1440 min Winter	2.565	0.315	0.0	3.0	3.0	215.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
600 min Winter	9.966	0.0	285.2	578			
720 min Winter	8.665	0.0	297.2	682			
960 min Winter	6.943	0.0	316.2	778			
1440 min Winter	5.071	0.0	341.8	1084			
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Monarch House Barton Lane OX14 3NB	Oldlands Farm Phase 1A Loading Area	
Date 18/03/2019 18:02 File Retail area Section-2.srcx	Designed by mcshane Checked by	
Innovyze	Source Control 2017.1.2	

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Monarch House Barton Lane OX14 3NB	Oldlands Farm Phase 1A Loading Area	
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Innovyze	Source Control 2017.1.2	

Model Details

Storage is Online Cover Level (m) 3.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	24.0
Membrane Percolation (mm/hr)	1000	Length (m)	95.0
Max Percolation (l/s)	633.3	Slope (1:X)	0.0
Safety Factor	1.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.250	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0091-3000-0400-3000
Design Head (m)	0.400
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	91
Invert Level (m)	2.250
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	3.0
Flush-Flo™	0.141	3.0
Kick-Flo®	0.297	2.6
Mean Flow over Head Range	-	2.5

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	2.8	1.200	5.0	3.000	7.7	7.000	11.6
0.200	2.9	1.400	5.4	3.500	8.2	7.500	12.0
0.300	2.6	1.600	5.7	4.000	8.8	8.000	12.4
0.400	3.0	1.800	6.0	4.500	9.3	8.500	12.8
0.500	3.3	2.000	6.3	5.000	9.8	9.000	13.1
0.600	3.6	2.200	6.6	5.500	10.3	9.500	13.5
0.800	4.1	2.400	6.9	6.000	10.7		
1.000	4.6	2.600	7.2	6.500	11.2		