

Technical Note

To: Manchester City Council (Planning)

From: Jake Busby (Curtins)

Subject: Surface Water Drainage Strategy

Reference: 20200-CUR-INZ-XX-GN-C-00002

Date: 13th October 2022

This technical note has been prepared in support of an application for planning permission for additional carparking on land within the North Manchester General Hospital (NMGH) campus (hereafter referred to as the TCP05).

The package of works proposed within the planning application comprises:

- Phase 1 and 2 construction of a new temporary carpark;
- Installation of required drainage and other associated infrastructure.

Further details of the works and the proposed surface water drainage strategy is detailed below:

TCP05 Phase 1

The new carpark (phase 1) is to be located in an area of predominantly existing hardstanding (carparking), the now demolished Limbert building and some areas of landscaping. The existing carpark area is positively drained to the existing NMGH networks, as was Limbert building prior to demolition. There is an existing impermeable catchment generating a surface water flow to the NMGH network where the new temporary carpark is proposed. All run-off from within the estate discharges to the surrounding UU network at an unrestricted rate.

There is to be a new surface water network for TCP05 Phase 1, this consists of permeable paving with subbase laid to fall towards a below ground stone trench. The stone trench is to be unlined to allow infiltration where possible, however the available investigations show the soakaway test was successful however the rate was less than 10^{-5} which is not suitable for drainage purposes. The trench shall be filled with a no-fines aggregate of 30% void ratio to provide attenuation. Permeable paving does not provide attenuation in carparks on excessive gradients without the introduction of weirs within the stone substrata, these are prone to failure and create maintenance issues as they are inaccessible. Therefore, all attenuation is provided within the stone filled trench.

The outgoing pipe from the downstream chamber of the stone pit to the existing manhole will need to be fitted with a 50mm orifice plate to limit discharge to a maximum 5 l/s. The temporary nature of the carpark means that climate change is not considered within the hydraulic design (appended here). The stone filled pit is described as “porous carpark structure” within the simulation.

Road gullies and linear drains are easily maintainable from surface level, as is the main sewer run from the proposed manhole. The run of drainage currently within Central Drive ultimately discharges to the UU combined sewer network and therefore risk of pollution is considered very low.

TCP05 Phase 2

The additional carparking to be made available during phase 2 will follow the same strategy as phase 1. A stone filled trench with a 30% void ratio no fines aggregate will provide attenuation as to not exceed the 5 l/s used within Phase 1. An additional 37m³ of storage is provided within Phase 2.

To simulate phase 2, an additional 950m² is added to the areas within the calculation and the attenuation volume increased as required. The two appended calculation sets show that Phase 1 can be built independently, with phase 2 having no impact.

Summary

- Infiltration is deemed unviable from the available site investigations.
- Overall there is likely a decrease on the discharge of surface water to the site network through the removal of the Limbert building, existing carparking (phase 1) and building “47” demolished to enable phase 2.
- A flow restriction and attenuation meets planning policy for sustainable drainage.
- There is no increase in flow to the UU sewers.

Summary of Results for 100 year Return Period

Half Drain Time : 82 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	-0.896	0.604	0.0	4.0	4.0	25.9	O K
30 min Summer	-0.745	0.755	0.0	4.5	4.5	32.4	O K
60 min Summer	-0.650	0.850	0.0	4.7	4.7	36.5	O K
120 min Summer	-0.618	0.882	0.0	4.8	4.8	37.8	O K
180 min Summer	-0.633	0.867	0.0	4.8	4.8	37.2	O K
240 min Summer	-0.665	0.835	0.0	4.7	4.7	35.8	O K
360 min Summer	-0.737	0.763	0.0	4.5	4.5	32.7	O K
480 min Summer	-0.803	0.697	0.0	4.3	4.3	29.9	O K
600 min Summer	-0.863	0.637	0.0	4.1	4.1	27.3	O K
720 min Summer	-0.915	0.585	0.0	3.9	3.9	25.1	O K
960 min Summer	-1.001	0.499	0.0	3.6	3.6	21.4	O K
1440 min Summer	-1.123	0.377	0.0	3.1	3.1	16.2	O K
2160 min Summer	-1.233	0.267	0.0	2.6	2.6	11.5	O K
2880 min Summer	-1.298	0.202	0.0	2.2	2.2	8.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	98.681	0.0	28.3	22
30 min Summer	64.789	0.0	37.4	36
60 min Summer	40.510	0.0	46.9	62
120 min Summer	24.461	0.0	56.8	92
180 min Summer	17.964	0.0	62.7	126
240 min Summer	14.342	0.0	66.7	160
360 min Summer	10.418	0.0	72.8	228
480 min Summer	8.302	0.0	77.3	294
600 min Summer	6.956	0.0	81.0	360
720 min Summer	6.017	0.0	84.1	424
960 min Summer	4.784	0.0	89.1	546
1440 min Summer	3.456	0.0	96.5	786
2160 min Summer	2.493	0.0	104.3	1152
2880 min Summer	1.975	0.0	110.1	1504

Summary of Results for 100 year Return Period

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
4320 min Summer	-1.368	0.132	0.0	1.7	1.7	5.6	O K
5760 min Summer	-1.403	0.097	0.0	1.4	1.4	4.1	O K
7200 min Summer	-1.423	0.077	0.0	1.2	1.2	3.3	O K
8640 min Summer	-1.433	0.067	0.0	1.0	1.0	2.9	O K
10080 min Summer	-1.439	0.061	0.0	0.9	0.9	2.6	O K
15 min Winter	-0.819	0.681	0.0	4.2	4.2	29.2	O K
30 min Winter	-0.644	0.856	0.0	4.8	4.8	36.7	O K
60 min Winter	-0.529	0.971	0.0	5.1	5.1	41.7	O K
120 min Winter	-0.503	0.997	0.0	5.1	5.1	42.8	O K
180 min Winter	-0.533	0.967	0.0	5.1	5.1	41.5	O K
240 min Winter	-0.583	0.917	0.0	4.9	4.9	39.3	O K
360 min Winter	-0.690	0.810	0.0	4.6	4.6	34.8	O K
480 min Winter	-0.785	0.715	0.0	4.3	4.3	30.7	O K
600 min Winter	-0.867	0.633	0.0	4.1	4.1	27.1	O K
720 min Winter	-0.937	0.563	0.0	3.8	3.8	24.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
4320 min Summer	1.421	0.0	118.4	2212
5760 min Summer	1.124	0.0	124.6	2936
7200 min Summer	0.936	0.0	129.4	3672
8640 min Summer	0.806	0.0	133.4	4376
10080 min Summer	0.710	0.0	136.7	5136
15 min Winter	98.681	0.0	31.8	21
30 min Winter	64.789	0.0	41.9	35
60 min Winter	40.510	0.0	52.7	62
120 min Winter	24.461	0.0	63.7	98
180 min Winter	17.964	0.0	70.3	136
240 min Winter	14.342	0.0	74.8	174
360 min Winter	10.418	0.0	81.6	244
480 min Winter	8.302	0.0	86.7	314
600 min Winter	6.956	0.0	90.8	380
720 min Winter	6.017	0.0	94.3	444

Summary of Results for 100 year Return Period

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
960 min Winter	-1.048	0.452	0.0	3.4	3.4	19.4	O K
1440 min Winter	-1.191	0.309	0.0	2.8	2.8	13.3	O K
2160 min Winter	-1.303	0.197	0.0	2.2	2.2	8.4	O K
2880 min Winter	-1.360	0.140	0.0	1.8	1.8	6.0	O K
4320 min Winter	-1.413	0.087	0.0	1.3	1.3	3.7	O K
5760 min Winter	-1.433	0.067	0.0	1.0	1.0	2.9	O K
7200 min Winter	-1.441	0.059	0.0	0.9	0.9	2.5	O K
8640 min Winter	-1.446	0.054	0.0	0.7	0.7	2.3	O K
10080 min Winter	-1.450	0.050	0.0	0.7	0.7	2.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	4.784	0.0	99.9	572
1440 min Winter	3.456	0.0	108.2	812
2160 min Winter	2.493	0.0	117.0	1172
2880 min Winter	1.975	0.0	123.5	1508
4320 min Winter	1.421	0.0	132.9	2212
5760 min Winter	1.124	0.0	139.8	2936
7200 min Winter	0.936	0.0	145.3	3672
8640 min Winter	0.806	0.0	149.8	4288
10080 min Winter	0.710	0.0	153.6	5128

Model Details

Storage is Online Cover Level (m) 0.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	10000	Invert Level (m)	-1.500	Depression Storage (mm)	5
Max Percolation (l/s)	397.2	Width (m)	5.5	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	26.0	Cap Volume Depth (m)	1.000

Orifice Outflow Control

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) -1.500

Summary of Results for 100 year Return Period

Half Drain Time : 160 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	-0.979	0.521	0.0	3.7	3.7	43.0	O K
30 min Summer	-0.832	0.668	0.0	4.2	4.2	55.1	O K
60 min Summer	-0.711	0.789	0.0	4.6	4.6	65.1	O K
120 min Summer	-0.650	0.850	0.0	4.7	4.7	70.1	O K
180 min Summer	-0.642	0.858	0.0	4.8	4.8	70.8	O K
240 min Summer	-0.649	0.851	0.0	4.7	4.7	70.2	O K
360 min Summer	-0.677	0.823	0.0	4.7	4.7	67.9	O K
480 min Summer	-0.712	0.788	0.0	4.6	4.6	65.0	O K
600 min Summer	-0.750	0.750	0.0	4.4	4.4	61.9	O K
720 min Summer	-0.787	0.713	0.0	4.3	4.3	58.9	O K
960 min Summer	-0.854	0.646	0.0	4.1	4.1	53.3	O K
1440 min Summer	-0.965	0.535	0.0	3.7	3.7	44.2	O K
2160 min Summer	-1.082	0.418	0.0	3.3	3.3	34.5	O K
2880 min Summer	-1.163	0.337	0.0	2.9	2.9	27.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	98.681	0.0	45.0	22
30 min Summer	64.789	0.0	59.6	37
60 min Summer	40.510	0.0	75.0	66
120 min Summer	24.461	0.0	90.9	114
180 min Summer	17.964	0.0	100.2	144
240 min Summer	14.342	0.0	106.8	176
360 min Summer	10.418	0.0	116.4	244
480 min Summer	8.302	0.0	123.7	314
600 min Summer	6.956	0.0	129.6	382
720 min Summer	6.017	0.0	134.5	448
960 min Summer	4.784	0.0	142.6	582
1440 min Summer	3.456	0.0	154.4	840
2160 min Summer	2.493	0.0	167.0	1196
2880 min Summer	1.975	0.0	176.1	1564

Summary of Results for 100 year Return Period

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
4320 min Summer	-1.264	0.236	0.0	2.4	2.4	19.4	O K
5760 min Summer	-1.323	0.177	0.0	2.0	2.0	14.6	O K
7200 min Summer	-1.361	0.139	0.0	1.8	1.8	11.5	O K
8640 min Summer	-1.385	0.115	0.0	1.6	1.6	9.5	O K
10080 min Summer	-1.402	0.098	0.0	1.4	1.4	8.0	O K
15 min Winter	-0.913	0.587	0.0	3.9	3.9	48.4	O K
30 min Winter	-0.746	0.754	0.0	4.5	4.5	62.2	O K
60 min Winter	-0.606	0.894	0.0	4.9	4.9	73.8	O K
120 min Winter	-0.528	0.972	0.0	5.1	5.1	80.2	O K
180 min Winter	-0.527	0.973	0.0	5.1	5.1	80.2	O K
240 min Winter	-0.539	0.961	0.0	5.0	5.0	79.2	O K
360 min Winter	-0.585	0.915	0.0	4.9	4.9	75.5	O K
480 min Winter	-0.639	0.861	0.0	4.8	4.8	71.0	O K
600 min Winter	-0.694	0.806	0.0	4.6	4.6	66.5	O K
720 min Winter	-0.748	0.752	0.0	4.5	4.5	62.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
4320 min Summer	1.421	0.0	189.3	2292
5760 min Summer	1.124	0.0	199.2	3000
7200 min Summer	0.936	0.0	206.8	3680
8640 min Summer	0.806	0.0	213.0	4408
10080 min Summer	0.710	0.0	218.2	5144
15 min Winter	98.681	0.0	50.6	22
30 min Winter	64.789	0.0	66.9	36
60 min Winter	40.510	0.0	84.2	64
120 min Winter	24.461	0.0	102.0	120
180 min Winter	17.964	0.0	112.5	150
240 min Winter	14.342	0.0	119.8	188
360 min Winter	10.418	0.0	130.6	264
480 min Winter	8.302	0.0	138.8	338
600 min Winter	6.956	0.0	145.4	410
720 min Winter	6.017	0.0	150.9	480

Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Winter Storms	Yes	Shortest Storm (mins)	15
Return Period (years)	100	Ratio R	0.400	Cv (Summer)	0.750	Longest Storm (mins)	10080
Region	England and Wales	Summer Storms	Yes	Cv (Winter)	0.840	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.252

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 0.000	4	8 0.252

Model Details

Storage is Online Cover Level (m) 0.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	10000	Invert Level (m)	-1.500	Depression Storage (mm)	5
Max Percolation (l/s)	763.9	Width (m)	5.5	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	50.0	Cap Volume Depth (m)	1.000

Orifice Outflow Control

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) -1.500