Drainage Technical Note (Discharge of Condition 18 additional information)

Scope

This technical note addresses the additional information requested by the London Borough of Camden on 20th December 2018 to fully discharge planning condition 18 in relation to the Charlie Ratchford site. The information requested and our responses are set out below;

Calculations in demonstration of the hydraulic performance of the pipe network to ensure it can manage the 1 in 100 + 40% climate change event

"Tables for the hydraulic design of pipes sewers and channels" eighth edition by HR Wallingford, provides solutions to the Colebrook white equation for a range of pipe diameters and gradients.

The minimum pipe diameter and gradient used as part of the proposed surface water pipe carrier network for the Charlie Ratchford site is 150mm laid at a gradient of 1 in 125. Using HR Wallingford hydraulic tables, a full-bore discharge of 15.80l/s is present under these conditions.

The 100 year, 15 minute duration rainfall intensity is 107.183mm/hr (refer to Appendix A). Including for +40% allowance for climate change, the rainfall intensity is 150.056mm/hr.

Using the modified rational method in conjunction with the data above, the maximum extent of impermeable area a 150mm pipe at 1 in 125 could convey without becoming surcharged can be calculated as follows;

$$Q = 2.78.C_R.C_V.I.A$$

Where;

Q = Discharge in l/s
2.78 = Unit conversion factor
C_R = Routing coefficient (taken as 1.3 as of HR Wallingford guidance)
C_V = Runoff coefficient (taken as 0.90 for roof areas as of HR Wallingford guidance)
I = Rainfall intensity (as above)
A = Area of impermeable area in hectares

$$Q = 2.78.C_R.C_V.I.A$$

$$A = \frac{Q}{2.78.C_R.C_V.I}$$

$$A = \frac{15.80}{2.78\ x\ 1.3\ x\ 0.9\ x\ 150.056}$$

$$A = \frac{15.80}{488.072}$$

$$A = 0.0324ha$$

The maximum extent of impermeable area a proposed 150mm pipe conveys within the drainage strategy is 303m^2 (0.030ha) as shown on 47707-C-002. This is below the full-bore capacity of the pipe and therefore acceptable.

Leading to the tank are 2x 225mm diameter pipes. The flattest of these pipes is laid at a gradient of 1 in 123.

Using HR Wallingford hydraulic tables, a full- bore discharge of 46.69l/s is present under these conditions. Using the modified rational method in conjunction with the data above, the maximum extent of impermeable area a 225mm pipe at 1 in 123 could convey without becoming surcharged can be calculated as follows;

$$Q = 2.78.C_R.C_V.I.A$$

$$A = \frac{Q}{2.78.C_R.C_V.I}$$

$$A = \frac{46.69}{2.78\ x\ 1.3\ x\ 0.9\ x\ 150.056}$$

$$A = \frac{46.69}{488.072}$$

$$A = 0.0956ha$$

The maximum extent of impermeable area a proposed 225mm pipe conveys within the drainage strategy is 546m^2 (0.055ha) as shown on 47707-C-002. This is below the full-bore capacity of the pipe and therefore acceptable.

A summary of the sites existing runoff rates

As shown on 47707-C-007, (refer to Appendix B), the existing extent of impermeable area is 1390m^2 (0.139ha).

The rainfall intensity for a 15minute duration storm during the 1, 30 and 100 year return periods using the FSR method are shown below;

- The 1 year return; rainfall intensity is 28.55mm/hr
- The 30 year return; rainfall intensity is 80.616mm/hr
- The 100 year return; rainfall intensity is 107.183mm/hr

It is believed the existing site made a free flow connection to the Thames water public sewer. Using the modified rational method, the existing runoff rates discharging from the site to the sewer based on the rainfall intensities above and the existing impermeable area is as shown below;

- 1 in 1 year existing runoff rate = 11.03l/s
- 1 in 30 year existing runoff rate = 31.15 l/s
- 1 in 100 year existing runoff rate = 41.42 l/s

The proposed drainage strategy releases all flows up to and including the 100 year storm event at 3l/s and therefore it is believed considerable benefit is created

Appendix A – 100-year rainfall intensity using FSR rainfall data

Appendix B – Existing site impermeable area plan