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Rev : Date : January 2015

Project No : 14T638

Project Title : South Tyneside Hospital ICH

Report for : Drainage Design Philosophy

Made by : M Wilson | Checked : J Conway | Refs :

Client : South Tyneside NHS Trust

Project Title : Integrated Care Hub

Title of Report : Drainage Design Philosophy Statement for Proposed ICH Facility

Rev	Description	Prepared by Date	Checked by Date	Approved by Date
2	Design Philosophy for drainage	M Wilson Jan 2015	J Conway Jan 2015	

Surface Water Drainage Design Philosophy

The site lies within a Flood Zone 1 as designated by the Environment Agency flood maps. The risk of flooding from sewers, overland flows or the sea is therefore LOW. An extract from the EA flood maps is shown in the Flood Risk Assessment.

Existing drainage infrastructure

The current hospital site drainage system is a combination of Foul, surface water and combined pipes in a gravity system. The pipes with which the proposed ICH drainage will communicate are substantial sizes ranging from 300 – 450mm in diameter. There is good flow in the system and a section of the sewer has recently been diverted and renewed (see drawing 14T638-100).

Design Parameters and Philosophy

The proposed development consists of the demolition of the existing Estates office and the construction of an Intensive Care Hub which will cover and area of 4782.6m². A new car park will be provided which will have an impermeable area of 855.26m².

All of the proposed foul drainage will connect to the existing site combined sewer and will pass through the system and adopted sewers to Northumbrian Water Ltd treatment works.

The roof drainage and external area surface water is connected to the existing system via an attenuation tank designed to attenuate surface water from the proposed development up to and including the 100yr, 360 minute rainfall event plus an allowance of 30% for climate change. The volume of the tank which will be constructed using proprietary cellular systems will be a minimum of 282m³.

The tank and the drainage system as a whole will be maintained by the South Tyneside NHS Trust Estates department. The adopted drainage surrounding the site is maintained by Northumbrian Water Ltd.

BREEAM

The drainage design presented in dwg 14T638-100 is intended to comply with BREEAM Pol 03 Surface water run-off a follows:

1. Flood Risk – A flood Risk Assessment has been prepared and identifies the site as being located within a Flood Zone 1
2. The peak rate of run-off has been controlled to 5l/s as identified in the BREEAM technical Manual 2014 (page 340 "Limiting Discharge rate")
3. The attenuation tank has been sized for 100yr plus 30% with a flow control device at 5l/s

4. Roof water does not need to pass through an interceptor as it is not considered to carry any pollutants, the car park surface water is designed to pass through trapped gullies, each gully capable of acting as an interceptor for 200m², before entering the attenuation tank.

Attached to this philosophy are Micro Drainage calculation sheets showing the figures relating to the requirements of BREEAM Pol 03

(i) Pre development surface water run-off (QBAR Urban)
(ii) Summary of results for attenuation tank design (100yr + 30%)

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	0.560	Urban	0.200
SAAR (mm)	648	Region Number	Region 3

Results l/s

QBAR Rural	0.9
QBAR Urban	1.4
Q100 years	2.7
Q1 year	1.2
Q30 years	2.3
Q100 years	2.7

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 488 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	18.066	0.386	0.0	4.9	4.9	108.1	O K
30 min Summer	18.196	0.516	0.0	4.9	4.9	144.4	O K
60 min Summer	18.331	0.651	0.0	4.9	4.9	182.4	O K
120 min Summer	18.458	0.778	0.0	4.9	4.9	217.7	O K
180 min Summer	18.516	0.836	0.0	4.9	4.9	234.0	O K
240 min Summer	18.544	0.864	0.0	4.9	4.9	241.8	O K
360 min Summer	18.555	0.875	0.0	4.9	4.9	245.1	O K
480 min Summer	18.549	0.869	0.0	4.9	4.9	243.2	O K
600 min Summer	18.538	0.858	0.0	4.9	4.9	240.3	O K
720 min Summer	18.525	0.845	0.0	4.9	4.9	236.7	O K
960 min Summer	18.496	0.816	0.0	4.9	4.9	228.6	O K
1440 min Summer	18.433	0.753	0.0	4.9	4.9	210.8	O K
2160 min Summer	18.331	0.651	0.0	4.9	4.9	182.4	O K
2880 min Summer	18.216	0.536	0.0	4.9	4.9	150.1	O K
4320 min Summer	18.044	0.364	0.0	4.9	4.9	101.8	O K
5760 min Summer	17.930	0.250	0.0	4.9	4.9	70.0	O K
7200 min Summer	17.861	0.181	0.0	4.7	4.7	50.7	O K
8640 min Summer	17.820	0.140	0.0	4.5	4.5	39.2	O K
10080 min Summer	17.800	0.120	0.0	4.3	4.3	33.7	O K
15 min Winter	18.114	0.434	0.0	4.9	4.9	121.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.729	0.0	111.2	26
30 min Summer	72.479	0.0	150.0	40
60 min Summer	46.629	0.0	194.9	70
120 min Summer	29.039	0.0	242.9	128
180 min Summer	21.721	0.0	272.6	186
240 min Summer	17.567	0.0	293.9	244
360 min Summer	12.909	0.0	324.0	360
480 min Summer	10.381	0.0	347.4	424
600 min Summer	8.758	0.0	366.4	488
720 min Summer	7.619	0.0	382.5	552
960 min Summer	6.109	0.0	408.8	684
1440 min Summer	4.467	0.0	448.0	966
2160 min Summer	3.259	0.0	492.2	1384
2880 min Summer	2.603	0.0	524.0	1756
4320 min Summer	1.892	0.0	570.8	2464
5760 min Summer	1.507	0.0	607.4	3120
7200 min Summer	1.263	0.0	635.8	3816
8640 min Summer	1.092	0.0	659.7	4488
10080 min Summer	0.966	0.0	680.3	5144
15 min Winter	107.729	0.0	124.7	26

Summary of Results for 100 year Return Period (+30%)

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	18.261	0.581	0.0	4.9	4.9	162.7	O K
60 min Winter	18.415	0.735	0.0	4.9	4.9	205.7	O K
120 min Winter	18.559	0.879	0.0	4.9	4.9	246.2	O K
180 min Winter	18.629	0.949	0.0	4.9	4.9	265.7	O K
240 min Winter	18.665	0.985	0.0	4.9	4.9	275.7	O K
360 min Winter	18.687	1.007	0.0	5.0	5.0	281.8	O K
480 min Winter	18.684	1.004	0.0	5.0	5.0	281.0	O K
600 min Winter	18.667	0.987	0.0	4.9	4.9	276.4	O K
720 min Winter	18.650	0.970	0.0	4.9	4.9	271.7	O K
960 min Winter	18.612	0.932	0.0	4.9	4.9	261.0	O K
1440 min Winter	18.520	0.840	0.0	4.9	4.9	235.2	O K
2160 min Winter	18.370	0.690	0.0	4.9	4.9	193.1	O K
2880 min Winter	18.189	0.509	0.0	4.9	4.9	142.5	O K
4320 min Winter	17.949	0.269	0.0	4.9	4.9	75.4	O K
5760 min Winter	17.835	0.155	0.0	4.6	4.6	43.3	O K
7200 min Winter	17.796	0.116	0.0	4.1	4.1	32.4	O K
8640 min Winter	17.781	0.101	0.0	3.6	3.6	28.2	O K
10080 min Winter	17.771	0.091	0.0	3.2	3.2	25.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	72.479	0.0	168.1	40
60 min Winter	46.629	0.0	218.3	68
120 min Winter	29.039	0.0	272.1	126
180 min Winter	21.721	0.0	305.3	182
240 min Winter	17.567	0.0	329.3	240
360 min Winter	12.909	0.0	363.0	352
480 min Winter	10.381	0.0	389.2	458
600 min Winter	8.758	0.0	410.4	554
720 min Winter	7.619	0.0	428.4	578
960 min Winter	6.109	0.0	457.9	732
1440 min Winter	4.467	0.0	501.7	1042
2160 min Winter	3.259	0.0	551.3	1496
2880 min Winter	2.603	0.0	586.9	1872
4320 min Winter	1.892	0.0	639.5	2516
5760 min Winter	1.507	0.0	680.3	3120
7200 min Winter	1.263	0.0	712.2	3744
8640 min Winter	1.092	0.0	739.0	4416
10080 min Winter	0.966	0.0	762.2	5144

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)	17.800	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.560

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.187	4	8	0.187	8	12	0.187

Model Details

Storage is Online Cover Level (m) 19.000

Cellular Storage Structure

Invert Level (m) 17.680 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	280.0	280.0	1.100	0.0	348.0
1.000	280.0	348.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	105
Invert Level (m)	17.680
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.295	4.9
Kick-Flo®	0.636	4.0
Mean Flow over Head Range	-	4.3

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)
0.100	3.6	1.200	5.4	3.000	8.3	7.000	12.4
0.200	4.8	1.400	5.8	3.500	8.9	7.500	12.8
0.300	4.9	1.600	6.2	4.000	9.5	8.000	13.2
0.400	4.9	1.800	6.5	4.500	10.1	8.500	13.6
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.0
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.4
0.800	4.5	2.400	7.5	6.000	11.5		
1.000	5.0	2.600	7.8	6.500	12.0		