FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

80 CHURCH STREET
EDMONTON
N9 9PB

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Date: 25 March 2024
Reference: 17043NA-FRA01
Revision:
Status: For Approval

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LIST OF FIGURES

1.0 INTRODUCTION

Gyoury Self Partnership has been commissioned by Kervan Sofrasi Ltd to undertake a Surface Water Drainage Strategy (SWDS) at 80 Church Street, Edmonton London, N9 9PB.

This report summarises the items included in the assessment carried out by Gyoury Self. This has been produced in accordance with the National Planning Policy Framework (NPPF), Technical Guidance to the Planning Practice Guidance (PPG), The London Plan 2021, Building Regulations Part H and CIRIA C753 'The SuDS Manual'.

Information published by the British Geological Survey (BGS) has been referenced in this report.

2.0 SCOPE OF WORK

The scope of work that relates to this assessment is on the basis of the guidance outlined in the documents referenced above, and sets out to obtain the following;

- Collation and review of proposals;
- Outline drainage calculations up to and including the 1 in 100 year + Climate Change rainfall event;
- Sizing and proposed siting of attenuation features;
- Production of a drainage strategy layout;
- Production of a management and maintenance schedule;
- Production of a final SWDS report summarising the findings of the surface water drainage proposals.

3.0 SITE DESCRIPTION

The site is located at National Grid Reference TQ 34054 93645 in a residential area in lower Edmonton.

The site is accessed from Church Street to the north. The site is bounded by All Saint's church to the west, residential flats to the South, Victoria road to the east and Church Street to the North.

The existing site consists of a ground floor Indian restaurant and 4 residential flats. There is a hard standing carpark at the rear and an access road connecting to Victoria Road.

Ground levels across the site are reasonably flat at around 17.4mAOD

The site is located in Flood Zone 1 Low Probability (land having a less than 1 in 1000 annual probability of fluvial flooding). The indicative flood map is shown in Figure 1.

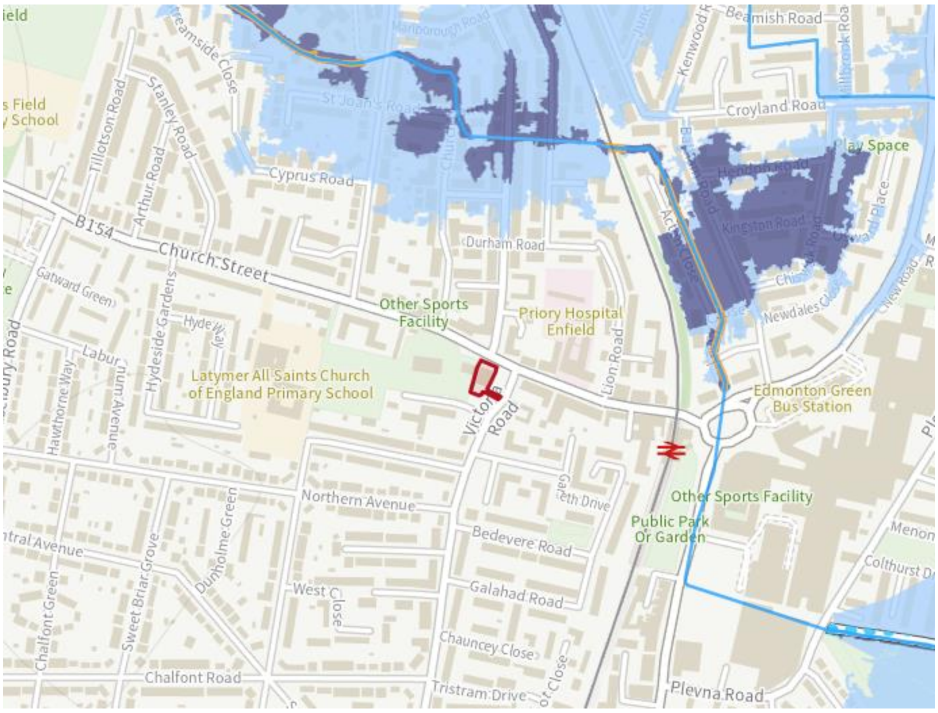


Figure 1: EA Flood Map

4.0 PROPOSED DEVELOPMENT

The development is an extension of the upper floors to create extra residential units.

The Flood Zone and Flood Risk Tables within the PPG, Table 2: Flood Risk Vulnerability Classification, identifies the vulnerability of the end users of the site. The table indicates that residential institutions are classified as 'More Vulnerable'.

As a residential development it is estimated the lifetime of the proposed scheme will be at least 100 years.

5.0 GEOLOGY AND INFILTRATION POTENTIAL

According to the British Geological Survey (BGS) Geology Viewer, bedrock geology on site is of the London Clay Formation consisting of clay and silt. There are shown to be superficial deposits on site of sand and gravel.

Infiltration has not been recommended as the proposed works are all above ground floor level.

6.0 SUSTAINABLE URBAN DRAINAGE (SuDS) ASSESSMENT

In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development.

The management of surface water has been considered in respect to the SuDS hierarchy below as detailed in the CIRIA 753 'The SuDS Manual', Section 3.2.3:

SuDS DRAINAGE HIERARCHY			
		Suitability	**Comment**
1.	**Store rainwater for later use**	✓	Rainwater utilised for blue/green roofs and SuDS planters.
2.	**Use infiltration techniques, such as porous surfaces in non-clay areas**	x	Unsuitable as all development is above the ground floor level.
3.	**Attenuate rainwater in ponds or open water features for gradual release**	x	Space constraints on site mean that it isn't feasible to implement open water SuDS.
4.	**Attenuate rainwater by storing in tanks or sealed water features for gradual release**	✓	Attenuation tanks in blue roofs on levels 1 & 3 manage runoff and provide amenity benefits.
5.	**Discharge rainwater direct to a watercourse**	x	There are no watercourses in close proximity to the site.
6.	**Discharge rainwater to a surface water sewer/drain**	✓	Runoff to be discharged into existing on site drain with betterment of flow rate.
7.	**Discharge rainwater to Combined Sewer**	-	Unnecessary due to management further up the hierarchy.

Table 1: SuDS Drainage Hierarchy

The suitability of SuDS components has been assessed in order to provide a sustainable means of providing the required attenuation volumes. The following components have been assessed as follows in Table 2, below.

SUITABILITY OF SuDS COMPONENTS		
SuDS Component	**Comment**	**Suitability**
Infiltrating SuDS	Unsuitable as all works are to be carried out above the ground floor	x
Permeable Pavement	Unsuitable as all works are to be carried out above the ground floor	x
Green / Blue Roofs	Blue roofs proposed on levels one and three.	✓
Rainwater Harvesting	It is recommended that Water Butts be implemented, where feasible and where there is space to do so.	✓
Swales	Insufficient space to implement such conveyancing SuDS techniques	x
Rills and Channels	Insufficient space to implement such conveyancing SuDS techniques and would provide little benefit overall.	x
Bioretention Systems	SuDS planters in rear garden provide greening and bioretention.	✓
Retention Ponds and Wetlands	Insufficient space on site to implement large scale SuDS techniques such as ponds/wetlands. These SuDS measures are better suited to large scale developments.	x
Detention Basins	Insufficient space on site to implement large scale SuDS techniques such as detention basins. These SuDS measures are better suited to large scale developments.	x
Geocellular Systems	Geocellular attenuation unnecessary due to ample attenuation being provided by blue roofs	x
Proprietary Treatment Systems	SuDS planters used in the rear of property provide amenity and biodiversity benefits as well as a degree of runoff interception.	✓
Filter Drains and Filter Strips	Not required as water quality is managed by blue roofs and planters	x

Table 2: Suitability of SuDS Components

Rainwater harvesting

The standard position taken by regulators, is that the storage provided within water butts or rainfall harvesting measures does not normally count towards the attenuation storage requirements as there is no guarantee that these devices would be empty at the time that a rainfall event occurs. The principle which allows rainwater systems to be designed to provide surface water control (prevent runoff) is based on demand being greater (on average over a period of time) than the supply to it. As such, rainwater harvesting can be considered around the site in the form of water butts, but has been excluded from any storage calculations.

Blue Roof

Blue roofs come in various arrangements and can be overlain with a variety of green roof systems. A standard layout to filter and attenuate the water would be as follows:

- Intensive planting (anything from lawns to shrubs and trees)
- Substrate
- Filter
- Drainage board
- Attenuation Cell
- Protective waterproofing layers
- Flow restrictor (designed by supplier to specification)

Guidance about proper use, installation and maintenance of any proprietary system should be provided by the supplier and incorporated into the site proposals at detailed design stage.

7.0 SURFACE WATER DRAINAGE STRATEGY

In accordance with the NPPF, developments are required to use SuDS to reduce both the volume and runoff rates to the drainage system. Current local Sustainable drainage guidance is to achieve as close as feasible to greenfield runoff rates for storm runoff from new developments.

As this site is small the pre-development greenfield rates are very low. As such, it is impracticable to have a flow control device to limit to these rates as the orifice would be too small to be practical and would pose blockage risks. It is proposed instead to provide a significant betterment to the brownfield runoff rate to reduce flooding risk onsite and elsewhere in the network..

The betterment has been calculated from the plan area of the building that is proposed to be altered. The front façade and rear conservatory have been excluded from the calculations as they are to remain the same. Ground level hardstanding has also been excluded as it is to remain unchanged.

The strategy (Figure 2) proposed to manage runoff is to attenuate the runoff in Blue Roofs on levels 1 & 3.

Area	**Plan area m^2**	**Storage volume m^3**
Level 3 Blue Roof	85	5.5
Level 1 Blue Roof	68	4.5

Table 3: Plan area and storage volumes of the proposed blue roofs

Outline calculations indicate these storage areas will provide a betterment of 81% on brownfield runoff rates for the altered area in a 1 in 100 year +40% CC storm. Outlets for each element are to be designed by the supplier at the detailed design phase.

Blue roofs provide amenity and biodiversity benefits as well as slowing the rate of runoff into the network.

Blue roofs have a non-trivial impact on the structural loading, the design should be verified by a structural engineer. The system has been designed with 70mm of attenuation holding 66l/m2.

Storm drainage layout provided in Figure 2

SURFACE WATER DISCHARGE RATES SUMMARY						
	Area (ha)	**Discharge Rates (l/s)**				
		2 year/ QBAR	**30 year**	**100 year**	**100 year +40%CC**
Greenfield Rates (site area)	0.1	0.16	0.36	0.5	-
Existing Brownfield Rates (existing area)	0.027	4	11.7	15.3	19.7
Proposed Runoff Rates (proposed alteration area)	0.027	0.5	1.7	2.4	3.6
Betterment		87%	85%	84%	81%

Table 4: Proposed rates compared to existing for the alteration area.

A range of SuDS benefits will also be provided via the inclusion of SuDS planters in the rear garden. These benefits include biodiversity, amenity and water quality improvements. Some water quantity benefits in the form of interception are also going to be provided via the SuDS planters.

8.0 MANAGEMENT AND MAINTAINANCE SCHEDULE

All onsite SuDS and drainage systems will be privately maintained. The property owner will be responsible for the management and maintenance of SuDS devices.
Specific maintenance schedule is to be agreed with selected manufacturer of the blue roofs and planters. Typical key suds components operation and maintenance activities are provided below.

Item	**Visual Inspection**	**Cleanse / De-sludge**	**CCTV Survey**	**Comments**
Blue Roofs	Quarterly	1 Year	N/A	Inspect outlets, overflows and attenuation chambers to ensure they are draining freely.
SuDS Planters	Monthly and after first heavy rainfall	1 Year	N/A	Clear outlet structures, weed and replace plants as per manufacturers guidance.

Table 5: Schedule of Maintenance for Drainage

In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction.

9.0 SUMMARY AND CONCLUSIONS

An assessment of the site levels and flood modelling has identified that the site is located entirely within Flood Zone 1 Low Probability (land having a less than 1 in 1000 annual probability of fluvial flooding).

The risk of flooding from surface water, groundwater and other sources is considered to be low.

Runoff will be attenuated on site and discharged into the existing downpipes with an 83% betterment for the areas undergoing construction to the rate compared to the brownfield.

Sustainable drainage techniques for the proposed drainage will be provided, in the form of blue/green roofs and SuDS planters.

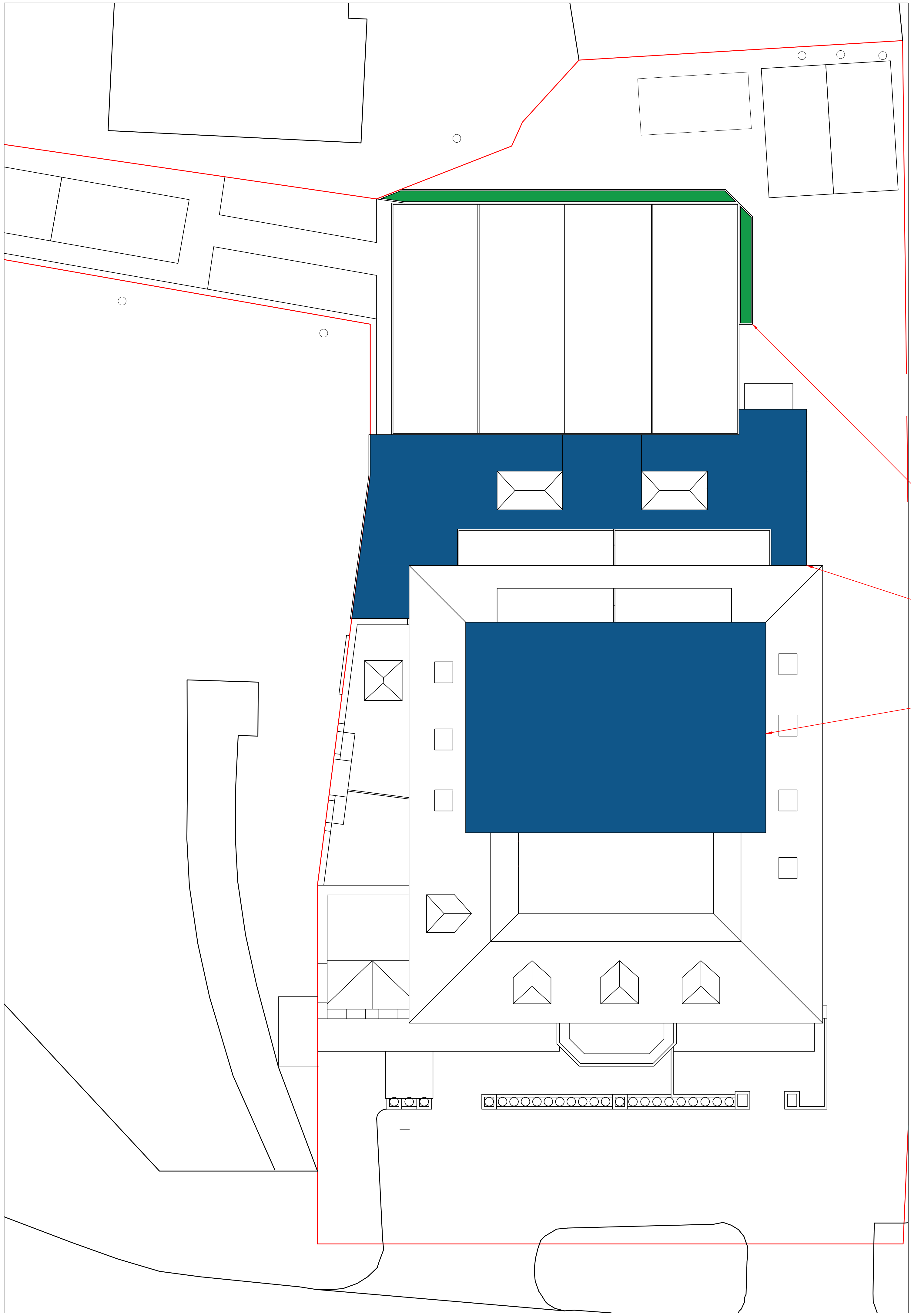
The proposed drainage will be designed to accommodate all storm events up to the critical 100-year event including an appropriate allowance for climate change. Attenuation will be accommodated within the blue roofs discharging through an orifice to control flow.

Surface water drainage will discharge into the current network at an 81% reduced rate,

Overall, it has been demonstrated that the development would be safe without increasing flood risk elsewhere.

FIGURE 2

PROPOSED LAYOUT



Design Philosophy

The drainage network has been designed to attenuate and treat the surface water runoff as close to the source as possible. This will be achieved through blue/green roofs. A 83% betterment on existing runoff rate will reduce the risk of the flood on site and in the local area.

Blue roofs and flow control orifices to be specified by manufacturers. Fully saturated imposed load to be checked by structural engineers.

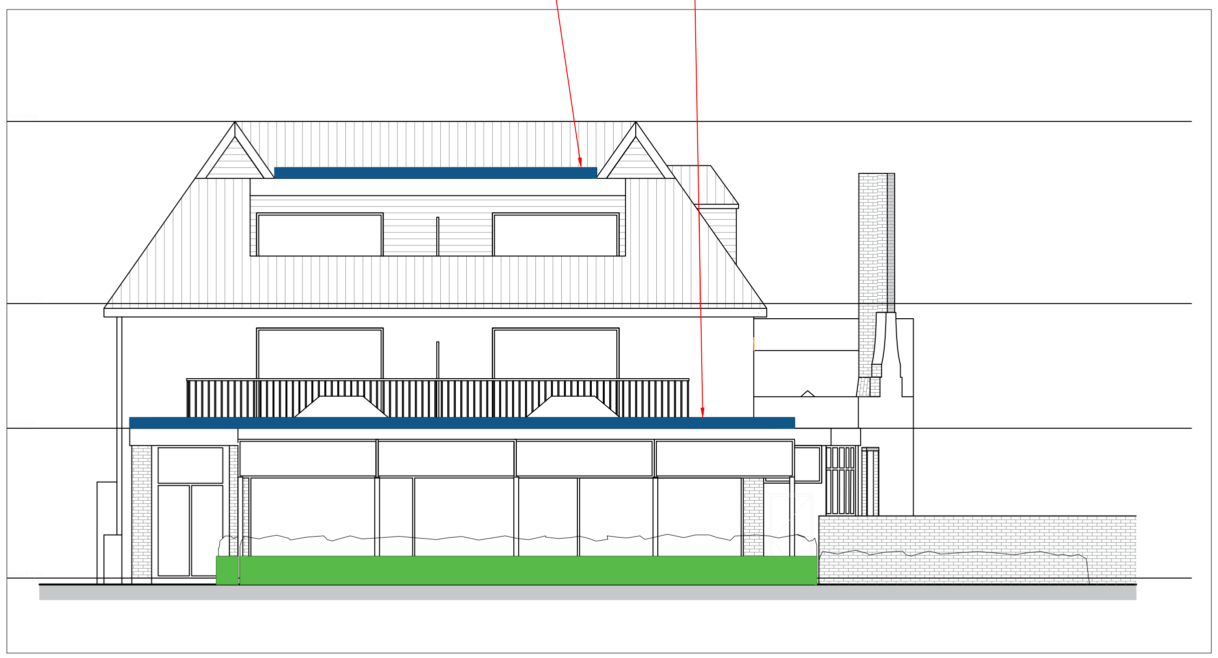
Legend

Blue Roof area	(blue)
SuDS Planters	(green)

SUDS planters provide amenity benefits

Blue roof of 68m2 with 70mm of attenuation required on the level 1 terrace
Maximum outflow of 2.8 l/s in an 1 in 100+CC year storm

Blue roof of 85m2 with 70mm of attenuation required on the level 1 terrace
Maximum Outflow of 0.9 l/s in an 1 in 100+CC year storm



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NOTES

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REV.	DATE	DESCRIPTION	DRN.

Gyoury Self
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CLIENT	Kervan Sofrasi Ltd
ARCHITECT	#############
JOB TITLE	Church Street, Edmonton
DRAWING TITLE	Drainage Stratergy
DRAWN: DF	CHECKED: NA
DATE: March 2024	ENGINEER: DF
SCALE (AT A1 SIZE): #####	DRAWING No.: 101
JOB No.: #######	
REV.: #	STATUS: PRELIMINARY

FIGURE 3

BROWNFIELD CALCULATIONS

Design Settings

Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	40
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	4.00

Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
1	0.012	4.00	0.000	59.775	53.913	1.300
3	0.015	4.00	0.000	59.963	62.555	1.300
4			0.000	69.455	61.163	1.554
5			0.000	69.455	54.114	1.561

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	4	12.094	0.600	-1.300	-1.504	0.204	59.3	100	4.20	50.0
2.000	3	4	9.594	0.600	-1.300	-1.504	0.204	47.0	100	4.14	50.0
1.001	4	5	7.049	0.600	-1.554	-1.561	0.007	1007.0	150	4.58	50.0

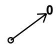
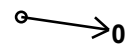
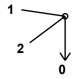
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.002	7.9	2.4	1.200	1.404	0.012	0.0	38	0.880
2.000	1.127	8.8	2.9	1.200	1.404	0.015	0.0	39	1.010
1.001	0.309	5.5	5.2	1.404	1.411	0.028	0.0	117	0.351

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	12.094	59.3	100	SW_Standard	0.000	-1.300	1.200	0.000	-1.504	1.404
2.000	9.594	47.0	100	SW_Standard	0.000	-1.300	1.200	0.000	-1.504	1.404
1.001	7.049	1007.0	150	SW_Standard	0.000	-1.554	1.404	0.000	-1.561	1.411

Link	US Node	Node Type	DS Node	Node Type
1.000	1	Junction	4	Junction
2.000	3	Junction	4	Junction
1.001	4	Junction	5	Junction

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Connections		Link	IL (m)	Dia (mm)
1	59.775	53.913	0.000	1.300		0	1.000	-1.300	100
3	59.963	62.555	0.000	1.300		0	2.000	-1.300	100
4	69.455	61.163	0.000	1.554		1	2.000	-1.504	100
						2	1.000	-1.504	100
						0	1.001	-1.554	150
5	69.455	54.114	0.000	1.561		1	1.001	-1.561	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	-1.267	0.033	1.8	0.0000	0.0000	OK
15 minute winter	3	10	-1.266	0.034	2.2	0.0000	0.0000	OK
15 minute summer	4	10	-1.480	0.074	4.0	0.0000	0.0000	OK
15 minute summer	5	10	-1.504	0.057	4.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	4	1.8	0.814	0.228	0.0267	
15 minute winter	3	2.000	4	2.2	0.937	0.249	0.0225	
15 minute summer	4	1.001	5	4.0	0.540	0.732	0.0522	1.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	-1.240	0.060	5.3	0.0000	0.0000	OK
15 minute winter	3	10	-1.237	0.063	6.4	0.0000	0.0000	OK
15 minute winter	4	10	-1.420	0.134	11.7	0.0000	0.0000	OK
15 minute winter	5	10	-1.461	0.100	11.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	4	5.3	0.922	0.673	0.0722	
15 minute winter	3	2.000	4	6.4	1.077	0.723	0.0586	
15 minute winter	4	1.001	5	11.7	0.792	2.142	0.1026	5.1

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	-1.227	0.073	6.9	0.0000	0.0000	OK
15 minute winter	3	10	-1.222	0.078	8.4	0.0000	0.0000	OK
15 minute winter	4	10	-1.387	0.167	15.3	0.0000	0.0000	SURCHARGED
15 minute winter	5	10	-1.446	0.115	15.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	4	6.9	0.922	0.877	0.0841	
15 minute winter	3	2.000	4	8.4	1.100	0.949	0.0689	
15 minute winter	4	1.001	5	15.3	0.895	2.803	0.1130	6.6

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	-1.067	0.233	9.6	0.0000	0.0000	SURCHARGED
15 minute winter	3	10	-1.012	0.288	11.7	0.0000	0.0000	SURCHARGED
15 minute winter	4	11	-1.344	0.210	19.6	0.0000	0.0000	SURCHARGED
15 minute winter	5	11	-1.433	0.128	19.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	4	8.8	1.126	1.119	0.0946	
15 minute winter	3	2.000	4	10.8	1.384	1.223	0.0751	
15 minute winter	4	1.001	5	19.7	1.127	3.617	0.1186	9.3

FIGURE 4

DESIGN CALCULATIONS

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
High BR	0.012	4.00	0.500	59.775	53.913	1.100
Low BR	0.015	4.00	0.400	59.963	62.555	1.100
Gully			0.000	69.455	61.163	1.004
5			0.000	69.455	54.114	1.074

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	High BR	Gully	12.094	0.600	-0.600	-1.004	0.404	29.9	100	4.14	50.0
2.000	Low BR	Gully	9.594	0.600	-0.700	-1.004	0.304	31.6	100	4.12	50.0
1.001	Gully	5	7.049	0.600	-1.004	-1.074	0.070	100.7	100	4.30	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.415	11.1	2.4	1.000	0.904	0.012	0.0	32	1.131
2.000	1.378	10.8	2.9	1.000	0.904	0.015	0.0	35	1.158
1.001	0.766	6.0	5.2	0.904	0.974	0.028	0.0	72	0.863

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node High BR Online Orifice Control

Flap Valve	x	Design Depth (m)	1.000	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	2.0		
Invert Level (m)	-0.600	Diameter (m)	0.045		

Node Low BR Online Orifice Control

Flap Valve	x	Design Depth (m)	1.000	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	3.0		
Invert Level (m)	-0.700	Diameter (m)	0.120		

Node Conservatory Online Orifice Control

Flap Valve	x	Design Depth (m)	1.000	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	1.5		
Invert Level (m)	0.000	Diameter (m)	0.026		

Node High BR Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-0.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	86

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	85.0	0.0	0.070	85.0	0.0	0.071	0.0	0.0

Node Low BR Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-0.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	28

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	68.0	0.0	0.070	68.0	0.0	0.071	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	High BR	168	-0.581	0.019	0.4	1.5053	0.0000	OK
180 minute winter	Low BR	116	-0.680	0.020	0.6	1.2817	0.0000	OK
180 minute winter	Gully	120	-0.984	0.020	0.5	0.0000	0.0000	OK
180 minute winter	5	120	-1.054	0.020	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	High BR	Orifice	Gully	0.2				
180 minute winter	Low BR	2.000	Gully	0.4	0.448	0.035	0.0081	
180 minute winter	Gully	1.001	5	0.5	0.475	0.088	0.0079	4.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	High BR	88	-0.560	0.040	1.6	3.1997	0.0000	OK
60 minute winter	Low BR	43	-0.658	0.042	3.0	2.7068	0.0000	OK
120 minute winter	Gully	80	-0.968	0.036	1.7	0.0000	0.0000	OK
120 minute winter	5	80	-1.038	0.036	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	High BR	Orifice	Gully	0.5				
60 minute winter	Low BR	2.000	Gully	1.2	0.650	0.115	0.0186	
120 minute winter	Gully	1.001	5	1.7	0.661	0.281	0.0180	10.2

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	High BR	88	-0.551	0.049	2.1	3.9849	0.0000	OK
60 minute winter	Low BR	43	-0.647	0.053	4.0	3.3945	0.0000	OK
60 minute winter	Gully	44	-0.960	0.044	2.4	0.0000	0.0000	OK
60 minute winter	5	44	-1.030	0.044	2.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	High BR	Orifice	Gully	0.7				
60 minute winter	Low BR	2.000	Gully	1.8	0.715	0.164	0.0242	
60 minute winter	Gully	1.001	5	2.4	0.727	0.398	0.0232	10.4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	High BR	88	-0.532	0.068	2.9	5.4920	0.0000	OK
30 minute winter	Low BR	24	-0.630	0.070	8.7	4.5134	0.0000	OK
60 minute winter	Gully	43	-0.949	0.055	3.6	0.0000	0.0000	OK
60 minute winter	5	43	-1.019	0.055	3.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	High BR	Orifice	Gully	0.9				
30 minute winter	Low BR	2.000	Gully	2.8	0.818	0.256	0.0326	
60 minute winter	Gully	1.001	5	3.6	0.803	0.593	0.0313	14.6