

Richard Phillips
Strategic and Major Applications Team
Civic Centre
Hillingdon Council
Uxbridge UB8 9ST

Our Ref: LE/2106060/LLFA

1st March 2023

Dear Richard,

RESPONSE TO LLFA COMMENTS (REF. 21432/APP/2021/4649 - LLFA Response)

Ardent Consulting Engineers (hereafter referred to as 'Ardent') have been commissioned by use FJC Developments and North Hyde Investments to address comments raised by Hillingdon Borough Council (HBC) as Lead Local Flood Authority (LLFA) On 6 February 2023 with respect to the proposed development at the Former Victoria Public House, 32 North Hyde Road, UB3 4NE.

This letter seeks to address the HBC LLFA comments. For ease of reference, the comments with are replicated below followed with an Ardent response immediately below.

- ***"The applicant does not comply with the hierarchy of drainage set out in the London Plan, Policy SI 13. The applicant should either include rainwater harvesting in the design, or provide information which justifies the exclusion of rainwater harvesting."***

Rainwater butts can be included within the drainage system and the location of these would be subject to the final landscape design as part of the detailed design. Refer to Drawing No. 2106060-001B included in **Appendix A** for an indicative drainage layout showing rainwater butts, subject to detailed design, and location of rainwater down pipes.

- ***"The applicant should provide information which demonstrates that the required attenuation volume is less than or equal to the proposed volume."***

The required and proposed storage estimates for the site are included in **Appendix B**. An impermeable area of 0.197ha was used to determine the required storage volumes, a conservative approach has been taken and the green roof and permeable paving areas are assumed to be 100% impermeable for the calculations. The storage volumes have been determined using a

Microdrainage Network model to simulate the drainage system. As a more basic check, the Microdrainage Quick Storage Estimate shows an attenuation requirement from 125m³ at the lower end, to 168m³ at the upper end, storage provided at the site totals 204m³ meaning the required attenuation volume is less than the proposed attenuation volume.

- ***"The applicant should provide information which clarifies why the microdrainage calculations for the permeable paving totals to less than the proposed volume."***

The Microdrainage calculations have been amended to reflect the proposed permeable paving area and are included in **Appendix C**. The Microdrainage network module modelling results show there is no flooding on the Site for any event including the 1 in 100 year including 40% climate change rainfall event.

- ***"The applicant should provide the Greenfield, Existing and proposed runoff volumes."***

The greenfield, existing and proposed runoff volumes (1 in 100 year 6 hour storm) are included in **Appendix D**. There will be a reduction of impermeable area as a result providing green amenity spaces and green roofs within the development, and as such the runoff volume generated by the developed area will be reduced. Therefore, there is no requirement for Long Term Storage.

- ***"The applicant should state the maintenance owner for the development."***

A private management company will be appointed for maintenance of SuDS feature. It is too early to have determined the name of the management company but this can be confirmed at a later date.

We trust that the above and attached information is sufficient however, if you have any further queries, please do not hesitate to contact the undersigned.

Yours sincerely,

L. Eaborn

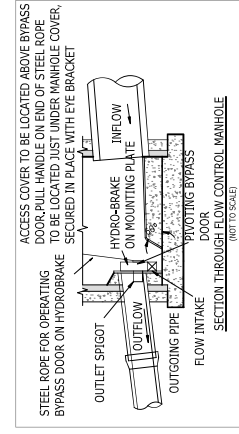
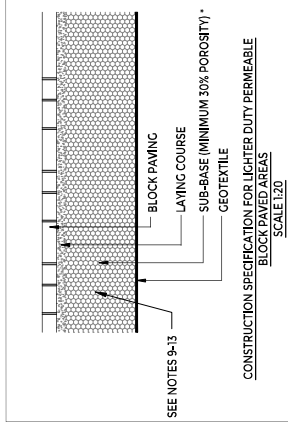
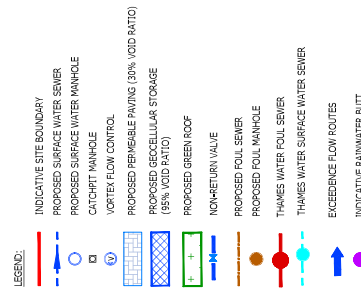
Lauren Eaborn
Graduate Consultant

Approved by:

C. Cooper

Charlie Cooper
Associate Director

Appendix A



- NOT FOR
CONSTRUCTION

FJC DEVELOPMENT AND NORTH HYDE INVESTMENTS	FORMER VICTORIA PUBLIC HOUSE
FOUL AND SURFACE WATER DRAINAGE STRATEGY	NEW
Project Title	Drawings Title
AS2 scale	Date
1:250	21/02/2023
Drawn by	Designed by
FH/ALE	FH
Checked by	Approved by
CC	BC
Drawing Number	2106060/001
B	B

Appendix B

PRELIMINARY DRAINAGE CALCULATIONS

PROPOSED SURFACE WATER



Discharge rate 1 l/s

Impermeable Area 0.197 ha

Greenfield Run off Rates

Quick Storage

Estimate

Lower 125 m3
Upper 168 m3
Average 146.5 m3

Q100 years 1.9

Q1 year 0.5

Q30 years 1.4

Q100 years 1.9

Cellular Tanks		Permeable Paving	
Area Allocated (m2)	Storage volume Offered (m3)	Area Allocated (m2)	Storage volume Offered (m3)
180	136.8	751	67.59
		Storage required, upper end (m3)	
		Check (m3)	
		Total Storage Volume (m3)	
		204.39	
		168	
		+36	

Appendix C

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Innovyze		Network 2020.1

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	4
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.402		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 6, DS/PN: 1.004, Volume (m³): 3.0

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	30.800
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0
Flush-Flo™	0.196	0.7
Kick-Flo®	0.398	0.6
Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

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Storage Structures for Storm

Porous Car Park Manhole: 2, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	160.0
Max Percolation (l/s)	133.3	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	32.000	Cap Volume Depth (m)	0.300

Cellular Storage Manhole: 3, DS/PN: 1.002

Invert Level (m)	31.303	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	80.0	0.0	0.801	0.0	0.0
0.800	80.0	0.0			

Cellular Storage Manhole: 5, DS/PN: 1.003

Invert Level (m)	31.213	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	100.0	0.0	0.801	0.0	0.0
0.800	100.0	0.0			

Porous Car Park Manhole: 6, DS/PN: 1.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.4
Membrane Percolation (mm/hr)	1000	Length (m)	80.0
Max Percolation (l/s)	75.6	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	31.820	Cap Volume Depth (m)	0.300

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 4
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.404
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

										Water
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.		Level (m)
1.000	1	15 Winter	100	+40%						32.103
1.001	2	960 Winter	100	+40%	100/15 Summer					31.947
1.002	3	960 Winter	100	+40%	30/120 Winter					31.946
2.000	4	960 Winter	100	+40%						31.945
1.003	5	960 Winter	100	+40%	30/30 Winter					31.945
1.004	6	960 Winter	100	+40%	1/15 Summer					31.943

		<u>Surcharged</u>		<u>Flooded</u>		<u>Half Drain</u>		<u>Pipe</u>		
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded	
1.000	1	-0.084	0.000	0.70			37.3	OK		
1.001	2	0.281	0.000	0.09		727	4.0	SURCHARGED		
1.002	3	0.418	0.000	0.05			2.2	SURCHARGED		
2.000	4	0.000	0.000	0.02			0.8	OK		
1.003	5	0.507	0.000	0.02			1.2	SURCHARGED		

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow		
1.004	6	0.918	0.000	0.04				1.0	SURCHARGED	

Appendix D

Difference in Runoff Volume Following Development (i.e. Long Term Storage Volume)

This methodology is taken from *The SuDS Manual* (Ciria C753) and is also in accordance with the methods in *SC030219 Rainfall Runoff for Developments* and *BS 8582 Code of Practice for Surface Water Management for Development Sites*.

The SuDS Manual Equation for greenfield development sites

$$Vol_{xs} = RD \times A \times 10 (0.8 - SPR) \frac{PIMP}{100}$$

Calculation Inputs

RD	63	Rainfall depth during 1 in 100 year, 6hour storm event (taken from Figure A3.1 in 'Rainfall runoff management for developments') (mm)
A	0.361	Total area of site (ha)
SPR	0.47	Standard Percentage Runoff from greenfield site
PIMP	55	Percentage imperable area following development (%)

Calculation Outputs

Pre-development runoff volume	106.89	m ³	(assuming greenfield site)
Post development runoff volume	148.17	m ³	
Difference in Runoff Volume, Vol _{xs} (i.e. Long Term Storage Volume)	41.28	m ³	

Where a development is found to increase the volume of runoff then the additional volume should be prevented from leaving the site (i.e. infiltration or rainwater harvesting). If this is not possible then the additional volume should be released at a very low rate (2 l/s/ha or less).

Difference in Runoff Volume Following Development (i.e. Long Term Storage Volume)

This methodology is taken from *The SuDS Manual* (Ciria C753) and is also in accordance with the methods in *SC030219 Rainfall Runoff for Developments* and *BS 8582 Code of Practice for Surface Water Management for Development Sites*.

The SuDS Manual Equation for brownfield development sites

$$Vol_{xs} = RD \times A \times 10 \left[(0.8 - SPR) \frac{PIMP_2}{100} + (SPR - 0.8) \frac{PIMP_1}{100} \right]$$

Calculation Inputs

RD	63	Rainfall depth during 1 in 100 year, 6hour storm event (taken from Figure A3.1 in 'Rainfall runoff management for developments') (mm)
A	0.361	Total area of site (ha)
SPR	0.3	Standard Percentage Runoff from greenfield site
PIMP ₁	100	Percentage impermeable area before development (%)
PIMP ₂	55	Percentage impermeable area following development (%)

Calculation Outputs

Pre-development runoff volume	181.94	m ³	(assuming brownfield site)
Post development runoff volume	130.77	m ³	
Difference in Runoff Volume, Vol _{xs} (i.e. Long Term Storage Volume)	-51.17	m ³	

Where a development is found to increase the volume of runoff then the additional volume should be prevented from leaving the site (i.e. infiltration or rainwater harvesting). If this is not possible then the additional volume should be released at a very low rate (2 l/s/ha or less).