Sustainable Drainage Strategy

For

Development of

6 Terraced Houses

On Former Petrol Station Site at

138-140 Highgate Road

London, NW5 1PB

London Borough of Camden
Planning Reference 2018/1528/P

Architect
The D*Haus Company Ltd
Unit 13 Old Dairy Court
17 Crouch Hill, London, N4 4AP

Employer
Design Ventures Highgate Ltd
11 Brunswick Industrial Estate,
Brunswick Way, London, N11 1JL

18035/nak
01 July 2019

AMA Consulting Engineers | 3 Marconi Place, LONDON N11 1PE : e: ama@amacl.co.uk | t: +44(0)208 361 6827

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01	NK	cc		Preliminary

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Contents

1 Introduction

1.1 An existing petrol station and garage is to be demolished for a development of 6 terraced houses, a Sustainable Drainage System (SuDS) is to be provide for the development. This document explains why a SuDS is to be installed and why it is important that it is maintained, how it must be managed and a schedule of maintenance.

1.2 The SuDS selected are intended to require as low a level of maintenance within the capacity of a general landscape maintenance organisation with any pumps managed under a service contract.

1.3 With the increase in urban development it was realised that the traditional collection of ever larger volumes of surface water into public sewers was not sustainable and that measures were required to control the amount of water discharged off-site and to improve the quality of the water discharged.

1.4 The UK Government sets out a National Planning Policy Framework for England and to support decision making provides guidance in a document "Guidance-Flood risk and coastal change this includes requirements for Sustainable Drainage Systems (SuDS)" Paragraph 51 states.

"Why are sustainable drainage systems important?

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> Sustainable drainage systems are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible. They provide opportunities to:
> reduce the causes and impacts of flooding;
> remove pollutants from urban run-off at source;
> combine water management with green space with benefits for amenity, recreation and wildlife."

1.5 This development does not comprise a "Major Development" being less than 1 hectare in area and with less than 10 dwellings. Notwithstanding the development needs to incorporate as far as is reasonable a Sustainable Drainage System.

1.6 The Officer's Report to the Planning Committee made by London Borough of Camden, includes the following draft conditions No 31.

31 SuDS

A. *Prior to commencement of development details of a sustainable urban drainage system shall be submitted to and approved in writing by the local planning authority. Such system shall be designed to accommodate all storms up to and including a 1:100 year storm with a 30% provision for climate change, and shall demonstrate that greenfield run off rates (5l/s) will be achieved (unless otherwise agreed). The system shall include green and brown roofs and below ground attenuation, as stated in the approved drawings.*

B. *Prior to occupation of the development, evidence that the sustainable drainage system has been implemented in accordance with the approved details shall be submitted to the local planning authority and approved in writing. The systems shall thereafter be retained and maintained in accordance with the approved maintenance plan.*

Reason: To reduce the rate of surface water run-off from the buildings and limit the impact on the storm-water drainage system in accordance with policies CC1, CC2 and CC3 of the Camden Local Plan 2017.

1.7 The report also includes a before occupation clause to ensure compliance.

32 SuDS implementation

Prior to occupation, evidence that the system has been implemented in accordance with the approved details required by condition 31 (SUDS) as part of the development shall be submitted to the Local Authority and approved in writing. The systems shall thereafter be retained and maintained in accordance with the approved maintenance plan.

Reason: To reduce the rate of surface water run-off from the buildings and limit the impact on the storm-water drainage system in accordance with policies CC1, CC2 and CC3 of the Camden Local Plan 2017..

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1.8 The London Borough of Camden publishes a document "*CPG Water and flooding*" dated March 2013, which guides compliance with CC1, CC2 and CC3, and an "*Advice Note on contents of a Surface Water Drainage Statement, London Borough of Camden."* Which includes inter alia the London Plan Drainage Hierarchy and a description of the principles of a SuDS Management Train.

Drainage Heirarchy
Extract from Advice Note

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer.

1.9 The Advice note includes an assessment pro-forma which has been completed.

1.10 A management system will be required where the SuDS serves more than one property or has complex features. The size of development makes individual SuDS systems impractical so the Development will require arrangements to management the SuDS.

1.11 For the continued efficiency and effectiveness of the SuDS system maintenance is required. A schedule of anticipated maintenance is included.

1.12 This document is intended to address Draft Condition 31 and provide the evidence required in the *Advice Note on contents of a Surface Water Drainage Statement, London Borough of Camden.*

1.13 This is neither the Flood Risk Assessment nor the Basement Impact Assessment which address the requirements of Camden Policies CC1, CC2 and CC3 other than SuDS.

2 Constraints

2.1 The site area is 757 sq m or $^{1}/_{13}$ of a hectare, the existing drained area is 685 sq m and the proposed developed drained area is 521 sq m.

2.2 The subsoil is clay which is impervious so infiltration is not viable.

2.3 There has been extensive consultation with the planners and interested third parties to develop the proposed scheme, the SuDS scheme will need to fit into the consulted scheme. Any rain gardens would reduce the available amenity space, which is far from generous.

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2.4 A landscaped terrace garden is provided over basement store rooms.

2.5 The roofs are arched green roofs. These can be considered to provide interception storage and reduce total water volume leaving site due to transpiration and evaporation.

2.6 Within the site area the frontage on Highgate hill will be a private grassed area.

2.7 Thames Water provided consultation on the proposed development

(i.) There is adequate capacity in the system

(ii.) Drainage from the basement must be pumped as there is a risk of surcharge in the combined system.

(iii.) Thames Water limit surface Water discharge rate to 2 l/sec which gives a London Plan Betterment of 79 % against existing 1 in 1 year discharge.

2.8 Design for exceedance in the event of blockage or a storm exceeding the maximum design storm after falling above ground level will flow off the site as existing, however water falling onto surfaces below ground level have nowhere to go. The Basement Impact Assessment addresses the design of adjacent areas with flood resilience.

2.9 Climate Change. In accordance with the draft clause rainfall intensities are increased by 30% for the development.

2.10 The Greenfield Runoff Rate q_{bar} (calculated in accordance with HIS Report 125) Rate from sites as small as this are very small 0.22 l/sec and the scope for storing storm water on site are limited. A flow control for rates this low would be complex and likely to block causing flooding of the property. The highly curved roof precludes a blue roof storing storm water.
In accordance with the draft clause a discharge rate of half (50%) of the existing 1 in 1 year I (rainfall intensity) of 50 mm/hour which gives 4.71 l/sec was proposed but Thames Water have stipulated 2 l/sec.

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3 Application of the Hierarchy of Drainage Control & Treatment

3.1 *Store rainwater for later use.*
The scale of the development is not conducive to re-use other than domestic water butts.

3.2 *Use infiltration techniques, such as porous surfaces in non-clay areas*.
The sub-soil is not appropriate for soakaways. See 2.2 above.

3.3 *Attenuate rainwater in ponds or open water features for gradual release*.
There are no ponds or open water features in or adjacent to the development.

3.4 *Attenuate rainwater by storing in tanks or sealed water features for gradual release.*
The option of attenuating on site and discharging to the public sewer is adopted. We need not consider options lower down the hierarchy.

3.5 The attenuated surface water will be controlled by a vortex flow control with integral bypass, discharging to a penultimate access chamber meeting Sewers for Adoption before being combined with the foul water at a demarcation chamber, and discharging to the combined sewer under Highgate Road. This allows for future connection to a surface water sewer.

3.6 Discharge Rates before and after development, with a discharge rate reflecting the Thames Water requirement.

Return Period for Storm	**Duration**	**Existing Rate l/sec**	**Attenuated Rate l/sec**	**%age Reduction**
1 in 1 year storm	30 Mins	9.35	2	79%
1 in 30 year storm	3 Hours	26.73	2	92.5%
1 in 100 year storm	6 Hours	33.71	2	94%
1 in 100 year storm +Climate Change	6 Hours	43.8	2	95.5%

3.7 The drained area is less than the pre development drained area. This gives a reduction on discharge from the site as follows.

Return Period for Storm	**Duration**	**Existing Volume cu m**	**Development Volume cu m**	**%age Reduction**
1 in 1 year storm	30 Mins	16.8	13.04	22%
1 in 30 year storm	3 Hours	33.0	21.5	34%
1 in 100 year storm	6 Hours	42.3	32.6	23%

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Return Period for Storm	Duration	Existing Volume cu m	Development Volume cu m	%age Reduction
1 in 100 year storm +Climate Change	6 Hours	55.64	42.4	24%

Note that after development, the discharge is over a longer time frame for any given storm so reducing the load on the surface water infrastructure.

3.8 The water will be stored in an underground attenuation tank buried under the private grassed area.

3.9 In assessing the volume to be stored no account has been taken of the interception storage from the terrace gardens and the green roof, as in the event of severe storms it is likely any soft surface will be saturated. Refer to the *CPG Water and flooding.* Nor are any losses by transpiration or evaporation accounted for in the calculations. Water lost through transpiration and evaporation especially after frequent low intensity storms significantly reduce load on downstream water treatment infrastructure.

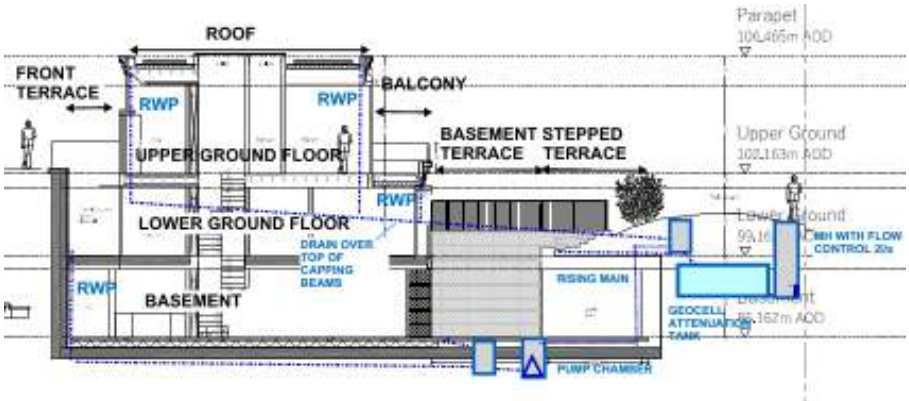
3.10 There is no vehicle parking or access within the site so the likelihood of contamination is low. A silt pit manhole will intercept any solids before the attenuation tank. Source control will be applied by using the green roof system on the roof and the terraced gardens.

4 Description of the Sustainable Drainage System.

4.1 The drainage system is shown on drawings 18035 D100.

Surface water falling on roofs, balconies, and the stepped terrace will flow by gravity to the ends of the terrace and discharge through rainwater pipes to collector drains running on top of the capping beams above the piled retaining walls. These and the terraced gardens will flow by gravity to the attenuation tank.

Rainfall to the terraces at the front of the building and the basement terrace will be pumped up to the attenuation tank.



Section through Building Showing Indicative Drainage

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4.2 Pipes are sized not to surcharge for a storm up to 1 in 30 but the pump in the basement is designed for the 1 in 100 + Climate Change storm.

5 Hydraulic Calculations & Parameters

5.1 The calculations are attached, parameters are based on the draft planning condition and Thames Water requirements.

5.2 $Q_{bar\ rural}$ is calculated in accordance with the "Flood estimation for small catchments Marshall DCW and Bayliss AC. IOH Report No.124. Institute of hydrology, Wallingford, 1994 ," see spread sheet. For the developed site, $Q_{bar\ rural}$= 0.21 l/sec.

5.3 The 1 in 1 Year discharge for the existing site is 9.35 l/sec so a betterment of 79% is achieved exceeding the London Plan which sets a target of 50%.

5.4 The uplift for Climate Change is based on the draft planning condition at 30%.

5.5 The volume to be stored is considered by balancing storm inflows and limited outflows with a hydrograph based on the Wallingford Modified Rational Method.

5.6 The volume of storage was not increased for Urban Creep as the intensity of development leaves no surface undeveloped within the individual property boundaries.

5.7 The total storage volume required is 20.3 cu m.

5.8 Time to empty after the 100 Year +CC 6 hour storm is 2 Hours 50 Mins which is better than required.

5.9 Summary of storage provided.

Storage	Volume cu m
Interception	1.1
Underground	20.3

5.10 The pump chamber is designed to store the first cubic metre of storm water to prevent surcharge for storms of up to least 100 Years + Climate Change.

6 Exceedance Flows

6.1 The existing ground levels fall from the North to the South. Offsite exceedance will flow either side of the terrace around the development which touches the North, East and South Boundaries. The private grassed areas are elevated so flows will flow around the site as is the existing case.

6.2 Exceedance on site on the roofs will overflow the side gable walls onto the ground below. Exceedance water on the balconies should flow towards the gables onto the ground below.

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6.3 Water falling onto front terraces drains to the rear basement terrace and a 100 mm pipe at 1:100 should carry the 100 Year Storm peak flow but may cause local flooding of the terrace if the drain is blocked or the flow exceeds the capacity.

6.4 Exceedance on the stepped terraces will, if it exceeds the drain capacity, flows to the basement terrace.

6.5 The basement Terrace would flood in the event of a blockage, power failure or storm exceeding the design storm.

6.6 This is shown on the accompanying sketch, 18035 SK SW 003

7 Monitoring and Compliance Report.

7.1 To show compliance with the SuDS design, the Contract Administrator shall ensure that the contractor records the construction and takes progress photographs of all aspects of the construction of the Surface Water drainage scheme.

7.2 The Contract Administrator shall prepare or ensure the contractor prepares a report to comply with the Draft Planning Condition 32 or the substantive condition if different.

7.3 The report shall be submitted to London Borough of Camden Planning Department with sufficient time to discharge the condition before occupation.

8 Management of the SuDS

8.1 The SuDS is intended to be simple and robust.

8.2 Management of the SuDS will be a responsibility of the block management, the developers will make arrangements for the freeholders to contribute to maintenance of the SuDS and make provision to ensure ongoing management.

8.3 Further guidance on management of SuDS can be found in the SuDS Manual published by CIRIA as Report C735. It is available as a free download from http://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

8.4 Foul and Surface water pumps will require periodic maintenance and a system of remote monitoring to provide emergency call outs.

8.5 Over the life of the building the pumps will require replacing. A prudent management company will set up a sinking fund to finance this together with other work affecting the terrace as a whole.

8.6 Otherwise the maintenance should be within the competence of a landscape maintenance firm.

9 Maintenance of the SuDS

9.1 A SuDS maintenance table is attached below.

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9.2 SuDS maintenance may be considered to be

a) Regular maintenance, including inspections,
b) Occasional Maintenance, and
c) Remedial Maintenance.

9.3 Items described as regular or occasional can be included in the landscape maintenance. Items described as remedial may require design and result in a capital expenditure see note above regarding replacement of the pumps.

9.4 The frequency of maintenance may require to be ascertained after the system has been in use.

9.5 Where SuDS elements need to be replaced then the design drawings should be used to specify replacement material.

9.6 At the end of construction this schedule will be updated as required.

10 Maintenance Schedule

Ref	SuDS Element	Activity	Frequency	Type & Notes
1.	Gullies	Inspect to check for sediment and empty if full.	Annually or as required.	Routine/Occasional Material removed should be disposed of as contaminated.
2.	Silt Pit Manholes	Inspect to check for sediment and empty if full.	Annually or as required.	Routine/Occasional Material removed should be disposed of as contaminated.
3.	Underground drains	Pipes to be cleaned if blocked	As required	Occasional
4.	Flow Control Unit	Inspect for blocked flow control unit in Spring and Autumn. Unblock if necessary.	When Blocked .	Routine/Remedial *Use chain secured under the manhole cover to open by-pass to drain manhole before unblocking flow control unit*
5.	Pumps located in Basement	Periodic Maintenance	Annually	The pumps (together with the foul pump) shall be under a maintenance contract.
6.	Pumps located in Basement	Emergency action	In case of Fault Condition	

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7.	Pumps located in Basement	Replacement during the life of the building.	As advised by maintenance contractor. 25-30 Years	Remedial

In the event that entry is required into a manhole, no personnel should enter into the manhole unless trained and equipped for confined entry work.

11 Completed Camden Proforma

11.1 Copy Attached with page numbers as this document.

12 Attached documents

AMA Documents

12.1 18059 D100 Drainage Drawing
12.2 18059 SK SW 01 Area Before Development
12.3 18059 SK SW 02 Area After Development
12.4 18059 SK SW 03 Exceedance Flows.
12.5 SuDS Calculations

Others' Documents.

12.6 Thames Water Consultation Letter
12.7 Thames water e-mail with discharge limit.
12.8 Architects Roof Plan
12.9 Existing Site Plan
12.10 Soils Information (extract)

12.11 London Borough of Camden Surface Water Proforma, completed.

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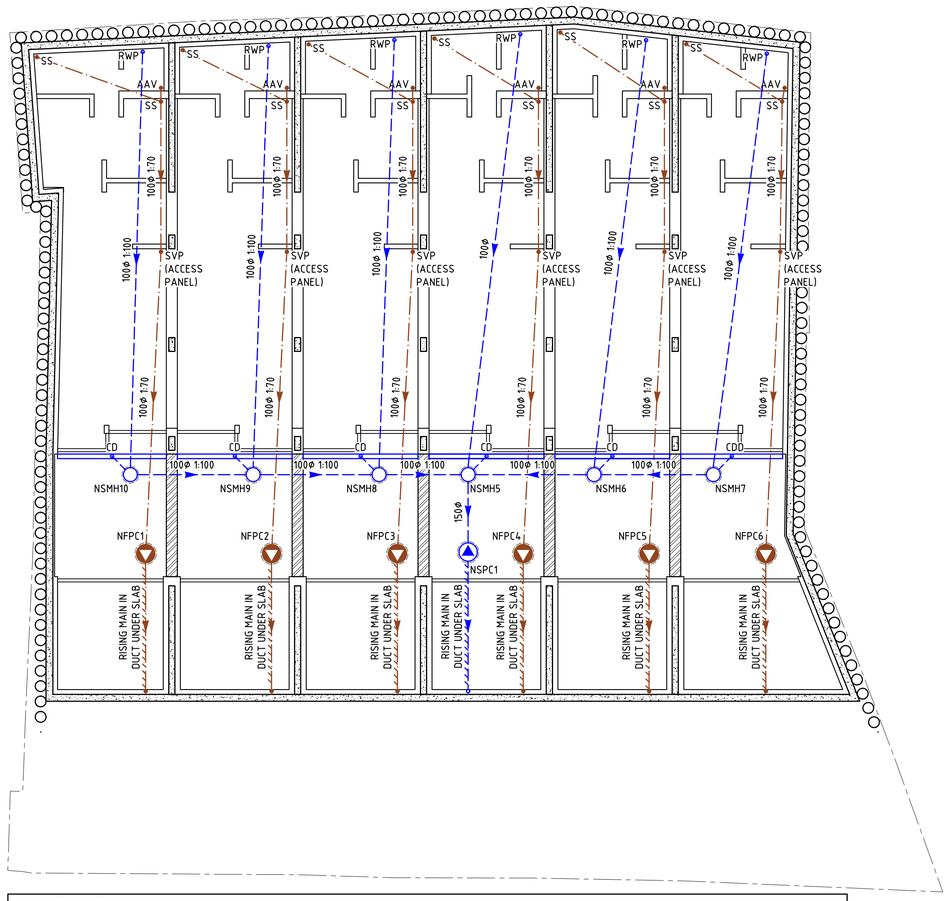
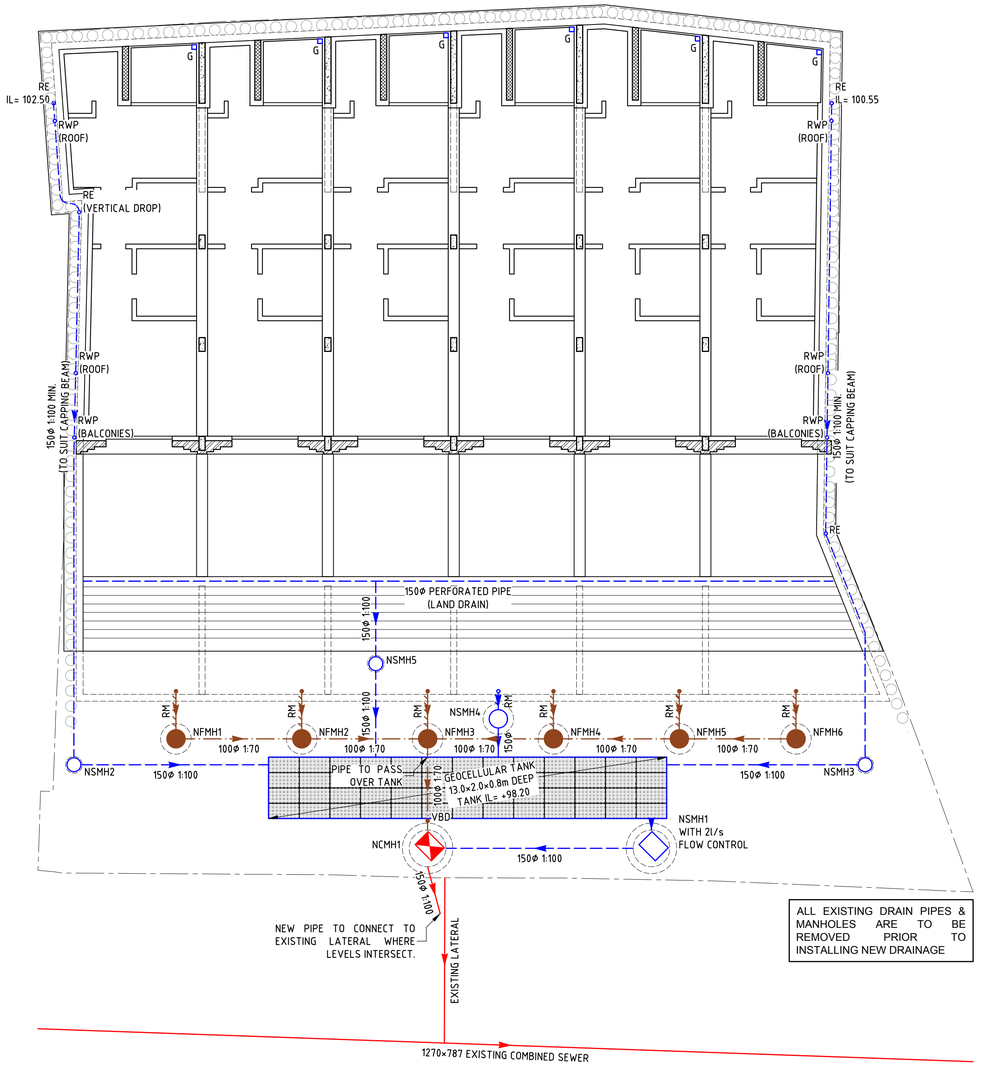
BASEMENT FLOOR DRAINAGE

1:25 @ A1/1:50 @ A3



LOWER GROUND FLOOR DRAINAGE

1:25 @ A1/1:50 @ A3



MANHOLE SCHEDULE

MANHOLE No.	APPROX. COVER LEVEL	INVERT LEVEL IN	INVERT LEVEL OUT	DEPTH (mm)	PIPE SIZE OUT (mm)	GRADIENT OUT	TYPE/COMMENT		COVER
							SIZE/DIA.	TYPE	
NCMH1	100.53	98.05	98.05	2480	150ø	1:100 MINIMUM	1200ø	P.C. RING	750×600 DUCTILE IRON 'C250'
NSMH1	100.53	98.15	98.15	2380	150ø	1:100	1200ø	P.C. RING WITH FLOW CONTROL	750×600 DUCTILE IRON 'C250'
NSMH2	100.64	100.00	100.00	640	150ø	1:6	450ø	UIC	450ø PLASTIC 'B125'
NSMH3	100.64	99.70	99.70	940	150ø	1:100	450ø	UIC	450ø PLASTIC 'B125'
NSMH4	100.53	99.33	99.33	1200	150ø	1:2	600ø	DISCHARGE CHAMBER	600ø PLASTIC 'B125'
NSMH5	100.00	98.85	98.85	1150	150ø	1:100	450ø	UIC	450ø PLASTIC 'B125'
NSMH6	96.16	95.26	95.26	900	150ø	1:100	450ø	UIC CATCHPIT	450ø PLASTIC 'B125'
NSMH7	96.16	95.29	95.29	870	100ø	1:100	450ø	UIC	450ø PLASTIC 'B125'
NSMH8	96.16	95.32	95.32	840	100ø	1:100	450ø	UIC	450ø PLASTIC 'B125'
NSMH9	96.16	95.29	95.29	870	100ø	1:100	450ø	UIC	450ø PLASTIC 'B125'
NSMH10	96.16	95.32	95.32	840	100ø	1:100	450ø	UIC	450ø PLASTIC 'B125'
NSMH11	96.16	95.35	95.35	810	100ø	1:100	450ø	UIC	450ø PLASTIC 'B125'
NFMH1	100.57	99.70	99.70	870	100ø	1:70	600ø	DISCHARGE CHAMBER	600ø PLASTIC 'B125'
NFMH2	100.57	99.65	99.65	920	100ø	1:70	600ø	DISCHARGE CHAMBER	600ø PLASTIC 'B125'
NFMH3	100.57	99.60	99.60	970	100ø	1:70	600ø	DISCHARGE CHAMBER	600ø PLASTIC 'B125'
NFMH4	100.57	99.65	99.65	920	100ø	1:70	600ø	DISCHARGE CHAMBER	600ø PLASTIC 'B125'
NFMH5	100.57	99.70	99.70	870	100ø	1:70	600ø	DISCHARGE CHAMBER	600ø PLASTIC 'B125'
NFMH6	100.57	99.75	99.75	820	100ø	1:70	600ø	DISCHARGE CHAMBER	600ø PLASTIC 'B125'

ANNOTATIONS		MANHOLE COVERS TO BS EN 124		
UIC	UNIVERSAL INSPECTION CHAMBER	CLASS A	LIGHT DUTY	PEDESTRIAN ONLY
NEIC	NON-ENTRY INSPECTION CHAMBER	CLASS B	MEDIUM DUTY	LIGHT VEHICLES
TRAD./ P.C. RING	TRADITIONAL BRICK OR PRECAST CONCRETE CHAMBER CONSTRUCTION	CLASS C	HEAVY DUTY	CARRIAGEWAY <0.5m FROM KERB
		CLASS D	HEAVY DUTY	CARRIAGEWAY & HARD SHOULDERS
NOTE:	ALL CATCHPIT MANHOLES ARE 200mm DEEPER THAN INVERT LEVELS SHOWN TO ALLOW FOR SILT PIT			

PUMP CHAMBER SCHEDULE

TANK N°	STORAGE CAPACITY (l)	PUMP CAPACITY (l/s)	APPROX. RISE (m)	LOCATION
NFPC1	1000	3.0	4.5	BURIED IN COURTYARD
NFPC2	1000	3.0	4.5	BURIED IN COURTYARD
NFPC3	1000	3.0	4.5	BURIED IN COURTYARD
NFPC4	1000	3.0	4.5	BURIED IN COURTYARD
NFPC5	1000	3.0	4.5	BURIED IN COURTYARD
NFPC6	1000	3.0	4.5	BURIED IN COURTYARD
NSPC1	1000	6.0	4.5	BURIED IN COURTYARD

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DRAINAGE NOTES

NOTATION KEY

SVP:	SOIL AND VENT PIPE
RWP:	RAIN WATER PIPE
SS:	STUB STACK
AAV:	AIR ADMITTANCE VALVE
YG:	YARD GULLY
RE:	RODDING EYE
VBD:	VERTICAL BACKDROP
NFMH:	NEW FOUL WATER MANHOLE
NSMH:	NEW SURFACE WATER MANHOLE
NCMH:	NEW COMBINED WATER MANHOLE
NFPC:	NEW FOUL WATER PUMP CHAMBER
NSPC:	NEW SURFACE WATER PUMP CHAMBER

COMBINED WATER PIPE RUN

COMBINED WATER MANHOLE OR INSPECTION CHAMBER

FOUL WATER PIPE RUN

FOUL WATER RISING MAIN

FOUL WATER MANHOLE OR INSPECTION CHAMBER

FOUL WATER PUMPING CHAMBER

SURFACE WATER PIPE RUN

SURFACE WATER RISING MAIN

SURFACE WATER MANHOLE OR INSPECTION CHAMBER

SURFACE WATER PUMPING CHAMBER

SPECIFICATION

1. FOUL DRAINS ARE TO BE 100mm NOMINAL DIAMETER LAID AT A GRADIENT NOT FLATTER THAN 1:70. U.N.O.
2. DRAINS ARE TO BE CONSTRUCTED USING VITRIFIED CLAY PIPES TO BS 65 OR FLEXIBLE UPVC PIPES TO BS4660 WITH FLEXIBLE JOINTS BEDDED AND BACKFILLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND BS 8301.
3. 100mm RIGID PIPES WITH LESS THAN 300mm COVER OR PIPES OF 150mm OR GREATER DIAMETER WITH LESS THAN 600mm COVER ARE TO BE SURROUNDED BY 150mm OF CONCRETE WITH MOVEMENT JOINTS PROVIDED AT EVERY PIPE JOINT.
4. FLEXIBLE PIPES WITH LESS THAN 600mm COVER ARE TO BE SURROUNDED WITH CONCRETE OR TO HAVE CONCRETE PAVING SLABS LAID AS BRIDGING ABOVE THE PIPE. PIPES UNDER BUILDINGS ARE TO BE SURROUNDED WITH 100mm MIN. OF GRANULAR MATERIAL.
5. ACCESS TO DRAINS MAY PROVIDED BY VITRIFIED CLAY, GRP OR POLYPROPYLENE INSPECTION CHAMBERS TO BS 7158, OR MANHOLES CONSTRUCTED USING CLASS B ENGINEERING BRICKS TO BS 3921, OR PRECAST CONCRETE SECTIONS TO BS 5911, SURROUNDED WITH 150mm OF CONCRETE MINIMUM DIMENSIONS TO CONFORM TO TABLE 8 OF BS 8301. COVERS AND FRAMES FOR MANHOLES/ INSPECTION CHAMBERS MUST COMPLY WITH THE APPROPRIATE LOADING GRADE OF BS 497 OR BS 5911.
6. PROVIDE GULLIES AND RWP'S WITH RODDABLE ACCESS.
7. ALL PIPES THAT CONNECT TO MAIN RUN DRAINAGE MANHOLES TO BE FIXED 'CROWNS ADJACENT'
8. CONCRETE BEDDING & SURROUND TO BE MIX TYPE GEN 1 TO TABLE 6 OF BS 5328-PART 2 U.N.O.. IF A DIFFERENT 'GEN' MIX IS SPECIFIED IT WILL BE TO THE ABOVE TABLE.
9. ALL RWP'S TO CONNECT INTO RODDABLE GULLIES.

NOT FOR CONSTRUCTION

REV	DETAIL	DATE
P1	Preliminary	08/07/19

Status: PRELIMINARY

Client: Space Free Ltd.

Project: 138-140 Highgate Road, London, NW5 1PB

Title: Drainage G.A. Sheet 1

Project N°:	Drawing N°:	Rev:
18035	D100	P1

Date: Jul 2019

Scale @A1: 1:100

Drawn: JL

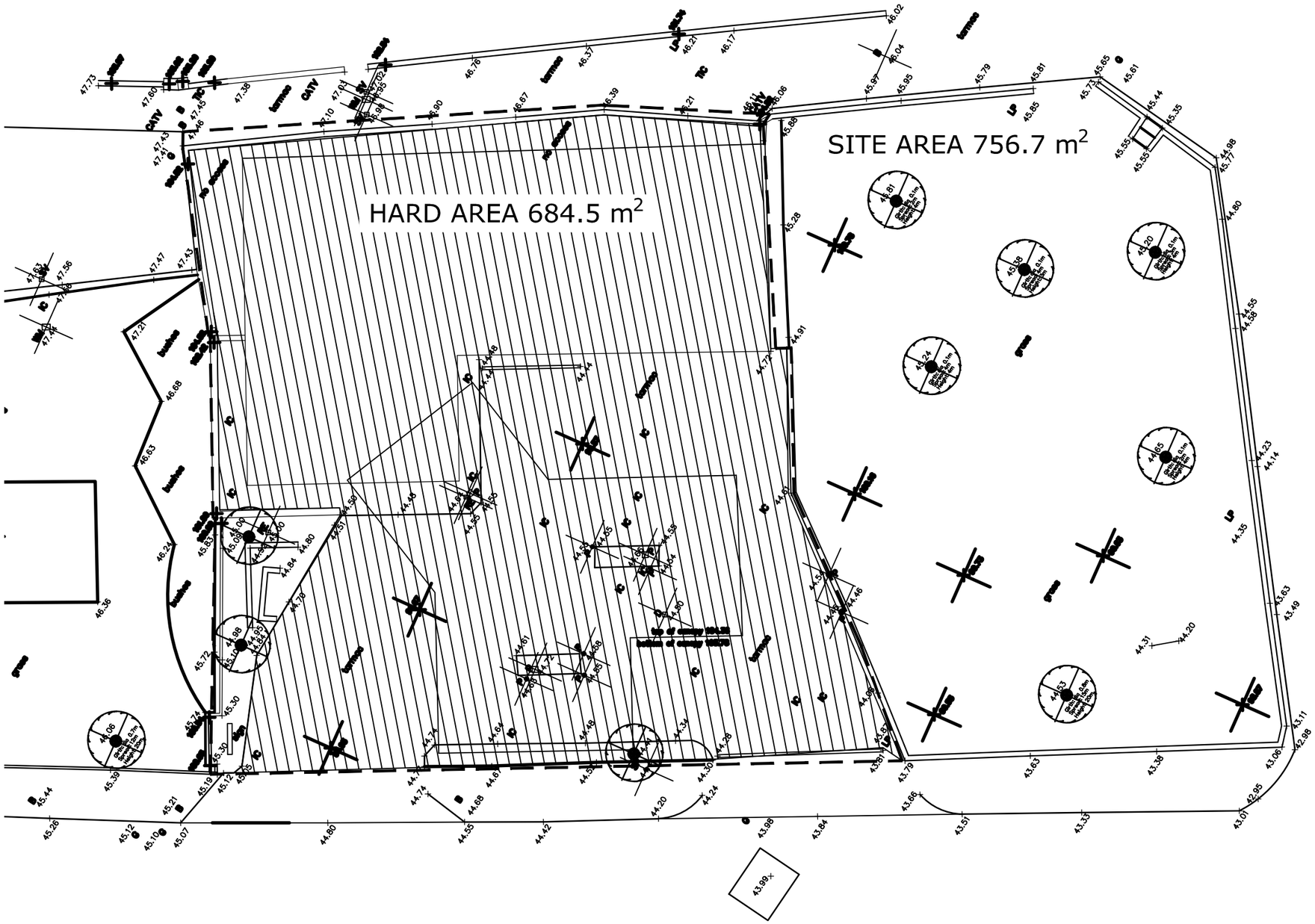
Engineer: NK

AMA Consulting Engineers
3 Marconi Place, London, N11 1PE
+44(0)20 8361 6827
www.amaci.co.uk

Drawing Status

CALCULATION

REV	DETAIL	DATE
P1	Preliminary	00/10/17



Client:

Project: 140 HIGHGATE ROAD
LONDON NW5 1PB

Title: SW Areas
Before Development

Project N°: 18035

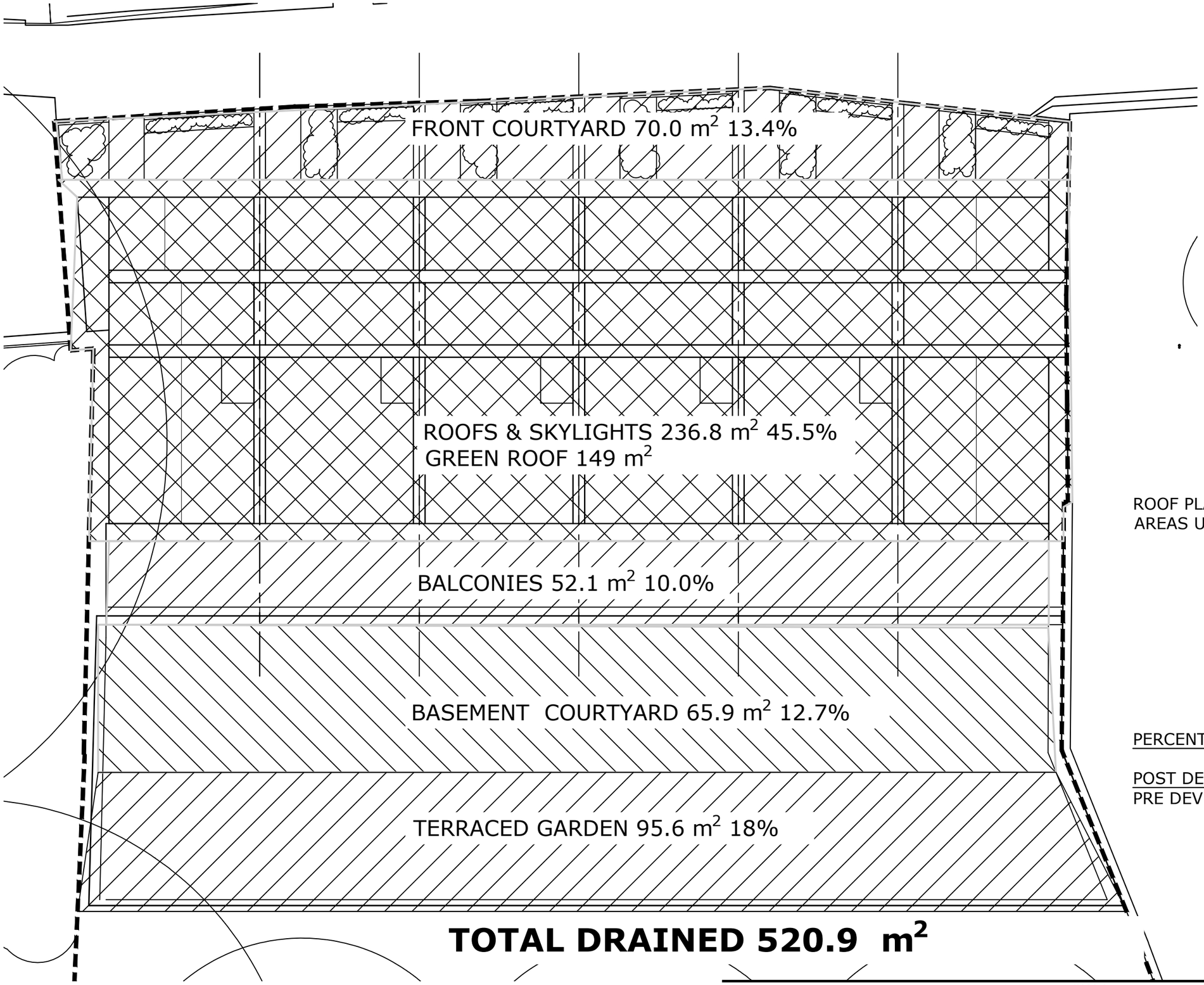
Drawing N°: C-SW-SK 001
Rev: --
Date: 5-2019
Drawn: nk
Scale: 1:100@A3
Engineer: nk

AMA Consulting Engineers
3 Marconi Place, London, N11 1PE
+44(0)20 8361 6827
www.amaci.co.uk

Drawing Status

CALCULATION

REV	DETAIL	DATE
	VER 01	17/05/19
A	AREAS TO REV DRGS	2/7/19



TOTAL DRAINED 520.9 m²

ROOF PLAN BASED ON EARLIER PROPOSAL
AREAS UPDATED TO PROPOSALS AS AT 13 06 2019

PERCENTAGE

POST DEVELOPMENT / PRE DEVELOPMENT = 100 x 520.9 / 684.5 = 76%

Client:

Project: 140 HIGHGATE ROAD
LONDON NW5 1PB

Title: SW Areas Development

Project N°: 18035

Drawing N°: C-SW-SK 002
Date: 5-2019
Scale: 1:100@A3

Rev: A
Drawn: nk
Engineer: nk

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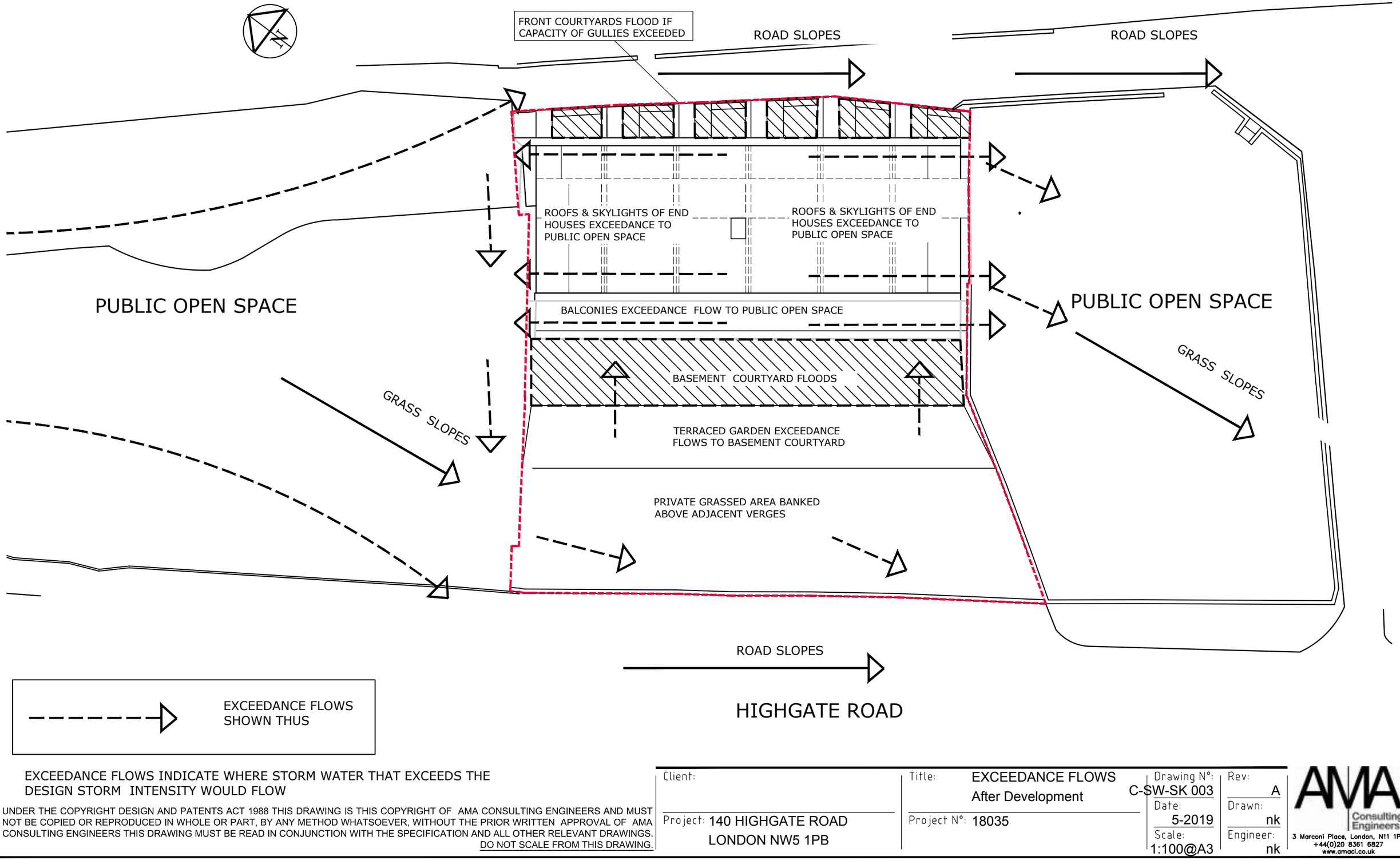
Drawing Status

CALCULATION

REV	DETAIL	DATE
P1	Preliminary	05/19
A	REVISED AFTER MEETING	8/7/19



EXCEEDANCE FLOWS INDICATE WHERE STORM WATER THAT EXCEEDS THE DESIGN STORM INTENSITY WOULD FLOW

Client:

Project: 140 HIGHGATE ROAD
LONDON NW5 1PB

Title: EXCEEDANCE FLOWS
After Development

Project N°: 18035

Drawing N°: C-SW-SK 003
Date: 5-2019
Scale: 1:100@A3

Rev: A
Drawn: nk
Engineer: nk

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3 Marconi Place, London, N11 1PE
+44(0)20 8361 6827
www.amacl.co.uk

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e: ama@amacl.co.uk
w: www.amacl.co.uk
t: +44 (0)20 8361 6827

Project: HIGHGATE ROAD

Job no. 18035

drg/page no. C-SW-1

Title: SUDS CALCULATIONS

Scale:

Date:

Drawn:

Checked:

LOCATION. 135-140 HIGHGATE ROAD.
POSTCODE NW5 1PB GRID REF.
SUB-SOIL CLAY.

CAMDEN POLICY CC3

SUDS HIERARCHY GREEN ROOF TREATMENT (5mm)
INFILTRATION - NOT APPLICABLE
OPEN WATER BODIES & WATER COURSES NONE
SURFACE SUDS SWALES BUNDS & LAKES NOT POSSIBLE
ATTENUATION & FLOW CONTROL
ANTI-BACK SURGE - NON RETURN VALVE.

LB CAMDEN SUDS Remitted Discharge

Proposed Greenfield Rate for 8mm intensity
Website } Not Major Development.

ARCHITECT → AOD - 55.070.

LGF BASEMENT. FFL 96.163 - 55.070 = 41.09. AOD

EXISTING SW. 41.81 AOD
FW. 42.85 AOD

So Now lateral to Combined Sewer Required.

EXISTING & HARD AREA A = 0.0684.5 ha (684.5 m²)

$\bar{Q}$ = 0.30 l/sec.

Proposed Hard Area

$\bar{Q}$ = 0.23 l/sec.

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e: ama@amacl.co.uk
w: www.amacl.co.uk
t: +44 (0)20 8361 6827

Project: 138 -140 HIGHGATE ROAD.

Job no. 18035

drg/page no. C-SW-2

Title: SuDS
OPTION 2 Roof Parapets etc

Scale:

Date: 7/2019

Drawn: UK

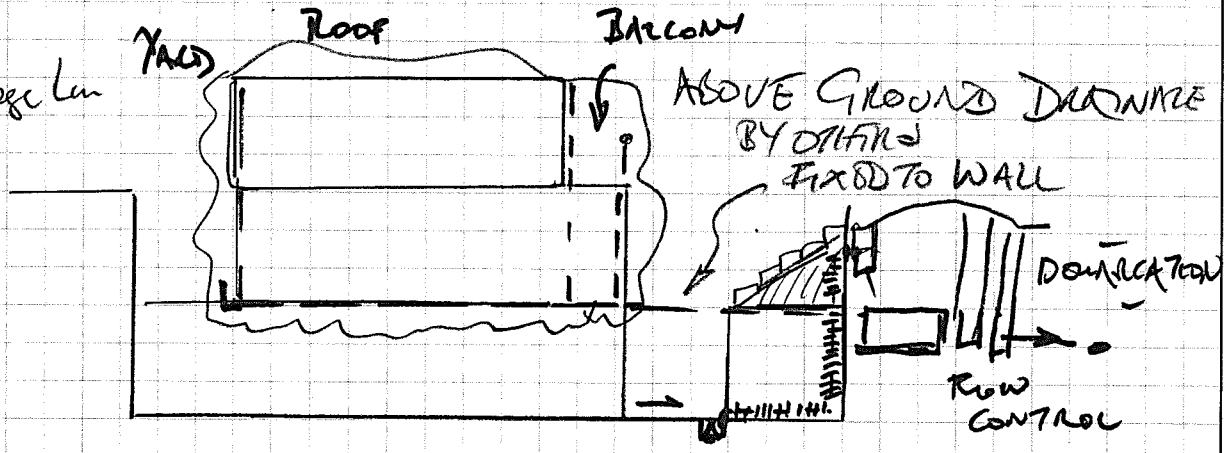
Checked:

1. AREAS SEE PLAN ATTACHED
GRAVITY

		m²	%
FRONT COURTYARDS	=	70	13.4
ROOFS (HARD GREEN & SKYLIGHTS)	=	236.8	46.5 (GREEN = 169 m²)
BALCONIES		52.6	10.1
STEPPED TERRACE		65.9	12.7
		425.8	82%
PUMPED - BASEMENT TERRACES	=	95.6	18%

TOTAL INTERCEPTION 5mm x (149 + 65.9) = 11 cu m.

PRINCIPLE



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w: www.amacl.co.uk
t: +44 (0)20 8361 6827

Project: HIGHGATE ROAD

Job no. 18035

drg/page no. C-SW-3

Title: SUDS CONT.

Scale:

Date: 17/2019

Drawn: DK

Checked:

PERMITTED DISCHARGE 2 l/sec. (TW)

1 in 1 Yer Discharge $Q = 2.78\ C_v A i$

i = 50 mm/hr
A in ha.
$C_v = 1.0$

EXISTING $Q = 2.78 \times 1 \times .0685 \times 50 = 9.35$ l/s

PROPOSED Q $2.78 \times 1 \times 0.0521 \times 50 = 7.11$ l/s

Betterment $= (2/9.35) \times 100 = 88.6\ \%$. >> LONDON PLAN

Greenfield Runoff

Qbar (l/s) Drained Area. DUCKLING VL.

Qbar rural = 0.21 l/s.

1 in 1 Qbar	= 0.18 l/s.	30 mins	32 m³.
1 in 30	= 0.49 l/s.	3 hrs.	5.3 m³.
1 in 100	= 0.66 l/s.	6 hrs.	11.4.2 m³.
1 in 100 + CC (30%)	= l/s.	6 hrs	18.5 m³

Increase for CC based on Drayt Cardin.

Existing Hard Area. 684.5 m².

PEAK FLOWS

Q 1 in 1 9.35 l/s (50 mm/hr)

Time of Entry 4 mins Dist of Flow to entry 48m

1 in 30 26.73 l/s

1 in 100 33.71 l/s.

Proposed 2 l/s.

1 in 1 = 21%.
1 in 30 = 7.5%
1 in 100 = 6 %.

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Project: Highgate Rd

Title: SuDS

Job no. 18035

drg/page no. C-SW-4

Scale:

Date: 11/7/19

Drawn: NU

Checked:

Run off Volumes.

EXISTING

$V = Q \times t$

1 in 1	30 mins	$V = 9.35 \times 0.5 \times 3600/1000 = 16.8$ cu m.
1 in 30	3hrs	$V = 1.99 \times 3 \times 3600/1000 = 21.5$ cu m
1 in 100	6hrs	$V = 1.96 \times 6 \times 3600/1000 = 42.3$ cu m

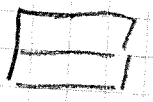
DISCHARGE VOLUMES.

PROPOSED SEE SPREADSHEETS $A = 520.9$ Sq m.

1 in 1	30 mins	13.04 cu m
1 in 30	3 hrs	21.45 cu m
1 in 100	6 hr	32.59 cu m
1 in 100 + cc	6 hr.	42.37 cu m.

Attenuation Stage (Excluding losses due to evaporation & transpiration)

Storage Volume = 20.26 cu m.



USING .8 deep tanks 95% Voids Ratio

$$\text{Area} = \frac{20.26}{.8 \times .95} = 26.7 \text{ Sq m.}$$

6m x 6m or 3m x 12m.

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e: ama@amacl.co.uk
w: www.amacl.co.uk
t: +44 (0)20 8361 6827

Project: HIGHGATE K5

Job no. 18055

drg/page no. C-SW-5.

Title: SUDS.

Scale:

Date: 1/7/19

Drawn: NK

Checked:

Pump & Pump Storage.

Area Drained = 956.

Pump Rate 6 l/sec.

From Spread Sheet:

Storage Required .03 l/sec

But use 1 cu m for safety.

Project Name **140 Highgate Road** 02/07/2019

Location **Gospel Oak** **Hydrometric Area** **6/7**

Area of For Qbar Determination		**521**	m^2	
	SAAR	**590**	mm	
	SOIL	**0.47**		ii

Hydrometric Area	6/7
1 Year Growth Factor	**0.88**
30 Year Growth Factor	**2.38**
100 Year Growth Factor	**3.19**

Suds Manual Fig 24.1 and Table 24.4

km	kilometer	
ha	Hectare	= 10,000 sq metres
Q	Flow rate	l/sec
i	Rainfall intensity in mm / hr	
QBAR	Mean Annual greenfield runoff rate as ref i and ref iii.	
SAAR	Annual Rainfall Parameter ref i	
SOIL	Soil type parameter see ref i & ii	

SOIL als called SPR

QBAR has return period of 2.3 Years

Greenfield Site A_{site} < 200 ha Ref

Calculate the annual mean Run off QBAR

$QBAR_{rural}=0.00108 \times A^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$ i

\Where A = total site area in km^2

If A_{site} < 50 ha, set A= 0.5 km^2 [=50 ha] and iii
interpolate QBAR linearly so equation becomes

$QBAR=(A_{site}/0.5) \times 0.00108 \times 0.5^{0.89}$

$\times SAAR^{1.17} \times SOIL^{2.17}$

For SAAR = 590 mm i

SOIL = 0.47 ii

$QBAR_{rural}$= 0.000206 m^3 /s

= **0.21** l/s

For 1 in 1 Year Storm apply Growth Factor

Growth Factor **0.88**

$QBAR_{1Yr}$= $QBAR_{rural}$ x Growth Factor

$QBAR_{1Yr}$= **0.18** l/s

For 1 in 30 Year Storm apply Growth Factor

Growth Fa **2.38**

$QBAR_{30}$= QBARrural x Growth Factor

$QBAR_{30}$= **0.49** l/s

For 1 in 100 Year Storm apply Growth Factor

Growth Factor **3.19** l/s

$QBAR_{100}$= $QBAR_{rural}$ x Growth Factor

$QBAR_{100}$= **0.66** l/s

Units

1	ha =	10,000	sq m
1	km^2=	1,000,000	sq m
1	ha =	0.01	km^2
50	ha =	0.50	km^2
1	Cu m=	1000	l

References

i "Flood estimation for small catchments", Marshall DCW and Bayliss AC. IOH Report No.124. Institute of hydrology, Wallingford, 1994

ii FSR map of Winter Rain Acceptance Potential (NERC, 1975, Vol V1.4.18(S), revised 1978: FSSR 7)

iii CIRIA SUDS MANUAL

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Project	**140 Highgate Road**	Job ref.	**18035**
Date	**2-Jul-19**	Page No.	
		Calc by	

Basic data:

Return Period T (years)= **1**

M5-60 (mm)= **20**

r = **0.4**

Area **0.052** ha

Allow. Dischg. Va (l/sec)= **2** .

D	Z1	M5-D	Z2	M1-D	i	i + %age	Q_{peak}	Run Off	Allow. Disch.	Stor. Vol.
mins		mm		mm	mm/hr	mm/hr	l/sec	cu m	cu m	cu m
2					50.00	65.00	9.40	1.13	0.24	**0.89**
4					50.00	65.00	9.40	2.26	0.48	**1.78**
6					50.00	65.00	9.40	3.38	0.72	**2.66**
8					50.00	65.00	9.40	4.51	0.96	**3.55**
10					50.00	65.00	9.40	5.64	1.20	**4.44**
12					50.00	65.00	9.40	6.77	1.44	**5.33**
14					50.00	65.00	9.40	7.89	1.68	**6.21**
16					50.00	65.00	9.40	9.02	1.92	**7.10**
18					50.00	65.00	9.40	10.15	2.16	**7.99**
20					50.00	65.00	9.40	11.28	2.40	**8.88**
22					50.00	65.00	9.40	12.40	2.64	**9.76**
24					50.00	65.00	9.40	13.53	2.88	**10.65**
26					50.00	65.00	9.40	14.66	3.12	**11.54**
28					50.00	65.00	9.40	15.79	3.36	**12.43**
30					50.00	65.00	9.40	16.91	3.60	**13.31**
					0.05	0.07	0.01	0.00	0.00	**0.00**
					0.05	0.07	0.01	0.00	0.00	**0.00**
					0.05	0.07	0.01	0.00	0.00	**0.00**
					0.05	0.07	0.01	0.00	0.00	**0.00**
					0.05	0.07	0.01	0.00	0.00	**0.00**
					0.05	0.07	0.01	0.00	0.00	**0.00**
Allowance for Climate Change					**None**	30%		Max Volume to be Stored		**13.31**

1] T= Return Period of Storm (Years)
2] D= Duration of Storm (Mins)
3] i =[MT-D]*60/D
4] Q = 2.78 * Area * i
5] Run Off = Q *D *60/1000
6] Allowable Discharge = Va * D / 1000

7] M5-D=Z1 * M5-60
8] MT-D=Z2 * M5-D
9]Z1 & Z2 Wallingford Procedure Vols 1 and 4

NPPF/EA UPLIFT FOR CC

Central	**0.2**
High (Upp	**0.4**

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Project	**140 Highgate Road**	Job ref.	**18035**
Date	**2-Jul-19**	Page No.	
		Calc by	**nk**

Basic data:

Return Period T (years)=	**30**
M5-60 (mm)=	**20**
r =	**0.4**

A **0.052** ha

Allow. Dischg. Va (l/sec)= **2**

D	Z1	M5-D	Z2	M30-D	i	i + %age	Q_{peak}	Run Off	Allow. Disch.	Stor. Vol.
mins		mm		mm	mm/hr	mm/hr	l/sec	cu m	cu m	cu m
5	0.37	7.41	1.45	10.78	129.32	129.32	18.69	5.61	0.60	**5.01**
10	0.53	10.59	1.49	15.82	94.93	94.93	13.72	8.23	1.20	**7.03**
15	0.63	12.59	1.51	19.01	76.03	76.03	10.99	9.89	1.80	**8.09**
20	0.70	14.06	1.52	21.35	64.06	64.06	9.26	11.11	2.40	**8.71**
25	0.76	15.22	1.53	23.21	55.70	55.70	8.05	12.08	3.00	**9.08**
30	0.81	16.18	1.53	24.75	49.50	49.50	7.16	12.88	3.60	**9.28**
35	0.85	17.01	1.53	26.07	44.69	44.69	6.46	13.57	4.20	**9.37**
40	0.89	17.73	1.54	27.22	40.84	40.84	5.90	14.17	4.80	**9.37**
45	0.92	18.38	1.54	28.25	37.67	37.67	5.45	14.70	5.40	**9.30**
50	0.95	18.97	1.54	29.18	35.02	35.02	5.06	15.19	6.00	**9.19**
55	0.98	19.50	1.54	30.03	32.76	32.76	4.74	15.63	6.60	**9.03**
60	1.00	20.00	1.54	30.81	30.81	30.81	4.45	16.03	7.20	**8.83**
90	1.12	22.39	1.54	34.52	23.01	23.01	3.33	17.97	10.80	**7.17**
120	1.21	24.19	1.54	37.23	18.61	18.61	2.69	19.37	14.40	**4.97**
180	1.34	26.87	1.53	41.15	13.72	13.72	1.98	21.41	21.60	-0.19
240	1.45	28.91	1.52	43.98	10.99	10.99	1.59	22.89	28.80	-5.91
								Max Volume to be Stored		**9.37**

Notes

1] T= Return Period of Storm (Years)
2] D= Duration of Storm (Mins)
3] i =[MT-D]*60/D
4] Q = 2.78 * Area * i
5] Run Off = Q *D *60/1000
6] Allowable Discharge = Va * D / 1000
Valid Range for T is 5 to 100 Years

7] M5-D=Z1 * M5-60
8] MT-D=Z2 * M5-D
9]Z1 & Z2 Wallingford Procedure Vols 1 and 4

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Project	**140 Highgate Road**	Job ref.	**18035**
Date	**2-Jul-19**	Page No.	
		Calc by	**nk**

Basic data:

Return Period T (years)=	**30**
M5-60 (mm)=	**20**
r =	**0.4**

A **0.052** ha

Allow. Dischg. Va (l/sec)= **2**

D	Z1	M5-D	Z2	M30-D	i	i + %age	Q_{peak}	Run Off	Allow. Disch.	Stor. Vol.
mins		mm		mm	mm/hr	mm/hr	l/sec	cu m	cu m	cu m
5	0.37	7.41	1.45	10.78	129.32	129.32	18.69	5.61	0.60	**5.01**
10	0.53	10.59	1.49	15.82	94.93	94.93	13.72	8.23	1.20	**7.03**
15	0.63	12.59	1.51	19.01	76.03	76.03	10.99	9.89	1.80	**8.09**
20	0.70	14.06	1.52	21.35	64.06	64.06	9.26	11.11	2.40	**8.71**
25	0.76	15.22	1.53	23.21	55.70	55.70	8.05	12.08	3.00	**9.08**
30	0.81	16.18	1.53	24.75	49.50	49.50	7.16	12.88	3.60	**9.28**
35	0.85	17.01	1.53	26.07	44.69	44.69	6.46	13.57	4.20	**9.37**
40	0.89	17.73	1.54	27.22	40.84	40.84	5.90	14.17	4.80	**9.37**
45	0.92	18.38	1.54	28.25	37.67	37.67	5.45	14.70	5.40	**9.30**
50	0.95	18.97	1.54	29.18	35.02	35.02	5.06	15.19	6.00	**9.19**
55	0.98	19.50	1.54	30.03	32.76	32.76	4.74	15.63	6.60	**9.03**
60	1.00	20.00	1.54	30.81	30.81	30.81	4.45	16.03	7.20	**8.83**
90	1.12	22.39	1.54	34.52	23.01	23.01	3.33	17.97	10.80	**7.17**
120	1.21	24.19	1.54	37.23	18.61	18.61	2.69	19.37	14.40	**4.97**
180	1.34	26.87	1.53	41.15	13.72	13.72	1.98	21.41	21.60	-0.19
240	1.45	28.91	1.52	43.98	10.99	10.99	1.59	22.89	28.80	-5.91
								Max Volume to be Stored		**9.37**

Notes

1] T= Return Period of Storm (Years)
2] D= Duration of Storm (Mins)
3] i =[MT-D]*60/D
4] Q = 2.78 * Area * i
5] Run Off = Q *D *60/1000
6] Allowable Discharge = Va * D / 1000
Valid Range for T is 5 to 100 Years

7] M5-D=Z1 * M5-60
8] MT-D=Z2 * M5-D
9]Z1 & Z2 Wallingford Procedure Vols 1 and 4

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Project	**140 Highgate Road**	Job ref.	**18035**
Date	**2-Jul-19**	Page No.	
		Calc by	

Basic data:

Return Period T (years)= **30**

M5-60 (mm)= **20**

r = **0.4**

Area **0.052** ha

Allow. Dischg. Va (l/sec)= **2** .

D	Z1	M5-D	Z2	M30-D	i	i + %age	Q_{peak}	Run Off	Allow. Disch.	Stor. Vol.
mins		mm		mm	mm/hr	mm/hr	l/sec	cu m	cu m	cu m
5	0.37	7.41	1.45	10.78	129.32	168.11	24.30	7.29	0.60	**6.69**
10	0.53	10.59	1.49	15.82	94.93	123.41	17.84	10.70	1.20	**9.50**
15	0.63	12.59	1.51	19.01	76.03	98.85	14.29	12.86	1.80	**11.06**
20	0.70	14.06	1.52	21.35	64.06	83.27	12.04	14.45	2.40	**12.05**
25	0.76	15.22	1.53	23.21	55.70	72.41	10.47	15.70	3.00	**12.70**
30	0.81	16.18	1.53	24.75	49.50	64.35	9.30	16.74	3.60	**13.14**
35	0.85	17.01	1.53	26.07	44.69	58.10	8.40	17.64	4.20	**13.44**
40	0.89	17.73	1.54	27.22	40.84	53.09	7.67	18.42	4.80	**13.62**
45	0.92	18.38	1.54	28.25	37.67	48.97	7.08	19.12	5.40	**13.72**
50	0.95	18.97	1.54	29.18	35.02	45.53	6.58	19.74	6.00	**13.74**
55	0.98	19.50	1.54	30.03	32.76	42.59	6.16	20.32	6.60	**13.72**
60	1.00	20.00	1.54	30.81	30.81	40.05	5.79	20.84	7.20	**13.64**
90	1.12	22.39	1.54	34.52	23.01	29.92	4.32	23.35	10.80	**12.55**
120	1.21	24.19	1.54	37.23	18.61	24.20	3.50	25.19	14.40	**10.79**
180	1.34	26.87	1.53	41.15	13.72	17.83	2.58	27.84	21.60	**6.24**
240	1.45	28.91	1.52	43.98	10.99	14.29	2.07	29.75	28.80	**0.95**
270	1.49	29.77	1.52	45.15	10.03	13.04	1.89	30.54	32.40	-1.86
300	1.53	30.57	1.51	46.25	9.25	12.02	1.74	31.29	36.00	-4.71
330	1.57	31.30	1.51	47.26	8.59	11.17	1.61	31.98	39.60	-7.62
360	1.60	31.98	1.51	48.21	8.03	10.44	1.51	32.61	43.20	-10.59
390	1.63	32.62	1.50	49.09	7.55	9.82	1.42	33.21	46.80	-13.59
Allowance for Climate Change					**None**	30%		Max Volume to be Stored		**13.74**

1] T= Return Period of Storm (Years)
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4] Q = 2.78 * Area * i
5] Run Off = Q *D *60/1000
6] Allowable Discharge = Va * D / 1000

7] M5-D=Z1 * M5-60
8] MT-D=Z2 * M5-D
9]Z1 & Z2 Wallingford Procedure Vols 1 and 4

NPPF/EA UPLIFT FOR CC

Central	**0.2**
High (Upp	**0.4**

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Pump Storage	Project	**140 Highgate Road**	Job ref.	**18035**
Basement Terrace Pump	Date	**2-Jul-19**	Page No.	
Basic data:			Calc by	

Return Period T (years)= **100**
M5-60 (mm)= **20**
r = **0.4**

Area **0.0096** ha

Q (l/sec)= **5** .

D	Z1	M5-D	Z2	M100-D	i	i + %age	Q_{peak}	Run Off	Allow. Disch.	Stor. Vol.
mins		mm		mm	mm/hr	mm/hr	l/sec	cu m	cu m	cu m
1	0.12	2.32	1.73	4.02	240.96	313.25	8.36	0.50	0.30	**0.20**
2	0.20	4.04	1.77	7.12	213.73	277.85	7.42	0.89	0.60	**0.29**
3	0.27	5.38	1.79	9.66	193.19	251.15	6.70	1.21	0.90	**0.31**
4	0.32	6.48	1.82	11.80	177.03	230.14	6.14	1.47	1.20	**0.27**
5	0.37	7.41	1.84	13.66	163.91	213.09	5.69	1.71	1.50	**0.21**
6	0.41	8.21	1.86	15.30	153.02	198.92	5.31	1.91	1.80	**0.11**
7	0.45	8.91	1.88	16.78	143.79	186.92	4.99	2.10	2.10	0.00
8	0.48	9.53	1.90	18.11	135.86	176.61	4.71	2.26	2.40	-0.14
10	0.53	10.59	1.93	20.40	122.40	159.12	4.25	2.55	3.00	-0.45
20	0.70	14.06	1.98	27.82	83.46	108.50	2.90	3.47	6.00	-2.53
25	0.76	15.22	1.99	30.32	72.77	94.60	2.52	3.79	7.50	-3.71
30	0.81	16.18	2.00	32.39	64.79	84.23	2.25	4.05	9.00	-4.95
35	0.85	17.01	2.01	34.17	58.57	76.15	2.03	4.27	10.50	-6.23
60	1.00	20.00	2.03	40.51	40.51	52.66	1.41	5.06	18.00	-12.94
180	1.34	26.87	2.01	53.89	17.96	23.35	0.62	6.73	54.00	-47.27
240	1.45	28.91	1.98	57.37	14.34	18.64	0.50	7.17	72.00	-64.83
300	1.53	30.57	1.97	60.11	12.02	15.63	0.42	7.51	90.00	-82.49
360	1.60	31.98	1.95	62.51	10.42	13.54	0.36	7.81	108.00	-100.19
Allowance for Climate Change					**None**	30%		Max Volume to be Stored		**0.31**

1] T= Return Period of Storm (Years)
2] D= Duration of Storm (Mins)
3] i =[MT-D]*60/D
4] Q = 2.78 * Area * i
5] Run Off = Q *D *60/1000
6] Allowable Discharge = Va * D / 1000

7] M5-D=Z1 * M5-60
8] MT-D=Z2 * M5-D
9]Z1 & Z2 Wallingford Procedure Vols 1 and 4

NPPF/EA UPLIFT FOR CC

Central	**0.2**
High (Upp	**0.4**

AMA Consulting Engineers

AMA Pipeline System Calc

Surface Water

Colebrook White Formula Full Bore Flow Velocity $= -2\sqrt{(2gDS)}\log\left(\frac{k}{3.7D}+\frac{2.51\nu}{D\sqrt{(2gDS)}}\right)$

Project	**140 Highgate Road**	Job ref.	**118035**
Date	**2-Jul-19**	Page No.	
		Calc by	**NK**

Wallingford Rational Method

Return Period T (years)= **30**

M5-60 (mm)= **20**

r = **0.4**

Tc **4** min — Tc Time of Concentration

k_s **0.6** mm — Te Time of Entry

k_s Surface Roughness Coefficient in mm

Reasons for Adjusting MH Invert

NA	No Adjustment
BD	Back Drop
CA	Crowns Adjoining/Change in Dia
MinD	Min Depth / Ground Level

Run 1- clipped to wall

Ref	**U/S MH**	**D/S MH**	**L**	**Tc +∑Te**	**M30-D**	**i**	**Area**	**Q_{peak}**	**Pipe Dia**	**Pipe Gradient**	**Velocity.** Full Bore	**Time Te**	**Discharge Capacity**	**U/S Invert**	**D/S Invert**	**MH Adjustment And Reason**		**D/S MH Invert**	**D/S MH GL**	**Depth**
No	No	No	m	mins	mm	mm/hr	Ha	l/sec	mm	1 in G	m/sec	Mins	l/sec	m	m	m	--	m		m
1	n/a	corner	12	4.00	9.36	140.35	0.0163	6.36	150	1 : 100	1.003	0.20	17.728		-0.120			**-0.120**		**0.120**
1	corner	neic	9	4.20	9.66	137.97	0.0163	6.25	150	1 : 100	1.003	0.15	17.728	-0.120	-0.210			**-0.210**		**0.210**

Project Name **140 Highgate Road NW5 1PB** 17/05/2019

Location **Gospel Oak London** **Hydrometric Area** **6/7**

Area of For Qbar Determination		**700**	m^2
EXISTING HARD SITE			
	SAAR	**641**	mm
	SOIL	**0.47**	ii

Hydrometric Area	6/7
1 Year Growth Factor	**0.88**
30 Year Growth Factor	**2.38**
100 Year Growth Factor	**3.19**

Suds Manual Fig 24.1 and Table 24.4

km	kilometer	
ha	Hectare	= 10,000 sq metres
Q	Flow rate	l/sec
i	Rainfall intensity in mm / hr	
QBAR	Mean Annual greenfield runoff rate as ref i and ref iii.	
SAAR	Annual Rainfall Parameter ref i	
SOIL	Soil type parameter see ref i & ii	

SOIL als called SPR

QBAR has return period of 2.3 Years

Greenfield Site A_{site} < 200 ha

Calculate the annual mean Run off QBAR — Ref

$QBAR_{rural}=0.00108 \times A^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$ — i

\Where A = total site area in km^2

If A_{site} < 50 ha, set A= 0.5 km^2 [=50 ha] and interpolate QBAR linearly so equation becomes — iii

$QBAR=(A_{site}/0.5) \times 0.00108 \times 0.5^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

For	SAAR =	641	mm	i
	SOIL =	0.47		ii
	$QBAR_{rural}$=	0.000305	m^3 /s	
	=	**0.30**	l/s	

For 1 in 1 Year Storm apply Growth Factor

Growth Factor **0.88**

$QBAR_{1Yr}$= $QBAR_{rural}$ x Growth Factor

$QBAR_{1Yr}$= **0.27** l/s

For 1 in 30 Year Storm apply Growth Factor

Growth Fa **2.38**

$QBAR_{30}$= QBARrural x Growth Factor

$QBAR_{30}$= **0.73** l/s

For 1 in 100 Year Storm apply Growth Factor

Growth Factor **3.19** l/s

$QBAR_{100}$= $QBAR_{rural}$ x Growth Factor

$QBAR_{100}$= **0.97** l/s

Units

1	ha =	10,000	sq m
1	km^2=	1,000,000	sq m
1	ha =	0.01	km^2
50	ha =	0.50	km^2
1	Cu m=	1000	l

References

i Flood estimation for small catchments", Marshall DCW and Bayliss AC. IOH Report No.124. Institute of hydrology, Wallingford, 1994

ii FSR map of Winter Rain Acceptance Potential (NERC, 1975, Vol V1.4.18(S), revised 1978: FSSR 7)

iii CIRIA SUDS MANUAL

AMA Consulting Engineers

Existing No Attenuation

Project	**140 Highgate Road NW5 1PB**	Job ref.	**18035**
Date	**17-May-19**	Page No.	
		Calc by	**nk**

Basic data:

Return Period T (years)=	**100**
M5-60 (mm)=	**20**
r =	**0.4**

A **0.0684** ha

Allow. Dischg. Va (l/sec)= **0**

1 in 1 rate 0.18

Vol 11.9

D	Z1	M5-D	Z2	M100-D	i	i + %age	Q_{peak}	Run Off	Allow. Disch.	Stor. Vol.
mins		mm		mm	mm/hr	mm/hr	l/sec	cu m	cu m	cu m
1	0.12	2.32	1.73	4.02	240.96	240.96	45.82	2.75	0.01	**2.74**
2.5	0.24	4.75	1.78	8.45	202.80	202.80	38.56	5.78	0.03	**5.76**
5	0.37	7.41	1.84	13.66	163.91	163.91	31.17	9.35	0.05	**9.30**
7.5	0.46	9.23	1.89	17.46	139.68	139.68	26.56	11.95	0.08	**11.87**
10	0.53	10.59	1.93	20.40	122.40	122.40	23.27	13.96	0.11	**13.86**
15	0.63	12.59	1.96	24.67	98.68	98.68	18.76	16.89	0.11	**16.78**
30	0.81	16.18	2.00	32.39	64.79	64.79	12.32	22.18	0.11	**22.07**
40	0.89	17.73	2.01	35.72	53.58	53.58	10.19	24.45	0.11	**24.34**
45	0.92	18.38	2.02	37.10	49.47	49.47	9.41	25.40	0.11	**25.29**
50	0.95	18.97	2.02	38.34	46.01	46.01	8.75	26.25	0.11	**26.14**
55	0.98	19.50	2.02	39.47	43.06	43.06	8.19	27.02	0.11	**26.91**
60	1.00	20.00	2.03	40.51	40.51	40.51	7.70	27.73	0.11	**27.62**
90	1.12	22.39	2.03	45.40	30.27	30.27	5.76	31.08	0.11	**30.97**
120	1.21	24.19	2.02	48.92	24.46	24.46	4.65	33.49	0.11	**33.38**
360	1.60	31.98	1.95	62.51	10.42	10.42	**1.98**	42.79	0.11	**42.68**
								Max Volume to be Stored		**42.68**

Notes

1] T= Return Period of Storm (Years)
2] D= Duration of Storm (Mins)
3] i =[MT-D]*60/D
4] Q = 2.78 * Area * i
5] Run Off = Q *D *60/1000
6] Allowable Discharge = Va * D / 1000
Valid Range for T is 5 to 100 Years

7] M5-D=Z1 * M5-60
8] MT-D=Z2 * M5-D
9]Z1 & Z2 Wallingford Procedure Vols 1 and 4

AMA Consulting Engineers

Existing No Attenuation	Project	**140 Highgate Road NW5 1PB**	Job ref.	**18035**
	Date	**17-May-19**	Page No.	
			Calc by	

Basic data:

Return Period T (years)= **100**

M5-60 (mm)= **20**

r = **0.4**

Area **0.0684** ha

Allow. Dischg. Va (l/sec)= **0** .

1 in 30 Year 15.51 0.51

1 in 1 Year 11.9 0.18

D	Z1	M5-D	Z2	M100-D	i	i + %age	Q_{peak}	Run Off	Allow. Disch.	Stor. Vol.
mins		mm		mm	mm/hr	mm/hr	l/sec	cu m	cu m	cu m
1	0.12	2.32	1.73	4.02	240.96	240.96	45.82	2.75	0.00	**2.75**
2.5	0.24	4.75	1.78	8.45	202.80	202.80	38.56	5.78	0.03	**5.76**
5	0.37	7.41	1.84	13.66	163.91	163.91	31.17	9.35	0.05	**9.30**
7.5	0.46	9.23	1.89	17.46	139.68	139.68	26.56	11.95	0.08	**11.87**
10	0.53	10.59	1.93	20.40	122.40	122.40	23.27	13.96	0.11	**13.86**
15	0.63	12.59	1.96	24.67	98.68	98.68	18.76	16.89	0.11	**16.78**
25	0.76	15.22	1.99	30.32	72.77	72.77	13.84	20.76	0.41	**20.34**
40	0.89	17.73	2.01	35.72	53.58	53.58	10.19	24.45	0.87	**23.58**
45	0.92	18.38	2.02	37.10	49.47	49.47	9.41	25.40	1.03	**24.37**
50	0.95	18.97	2.02	38.34	46.01	46.01	8.75	26.25	1.18	**25.07**
55	0.98	19.50	2.02	39.47	43.06	43.06	8.19	27.02	1.33	**25.69**
60	1.00	20.00	2.03	40.51	40.51	40.51	7.70	27.73	1.49	**26.25**
90	1.12	22.39	2.03	45.40	30.27	30.27	5.76	31.08	2.40	**28.68**
120	1.21	24.19	2.02	48.92	24.46	24.46	4.65	33.49	3.32	**30.17**
180	1.34	26.87	2.01	53.89	17.96	17.96	3.42	36.89	5.16	**31.73**
240	1.45	28.91	1.98	57.37	14.34	14.34	2.73	39.27	6.99	**32.28**
270	1.49	29.77	1.97	58.76	13.06	13.06	2.48	40.23	7.91	**32.32**
300	1.53	30.57	1.97	60.11	12.02	12.02	2.29	41.15	8.83	**32.32**
330	1.57	31.30	1.96	61.36	11.16	11.16	2.12	42.00	9.75	**32.25**
360	1.60	31.98	1.95	62.51	10.42	10.42	1.98	42.79	10.67	**32.12**
390	1.63	32.62	1.95	63.58	9.78	9.78	1.86	43.52	11.58	**31.94**
Allowance for Climate Change					**None**	0%		Max Volume to be Stored		**32.32**

1] T= Return Period of Storm (Years)
2] D= Duration of Storm (Mins)
3] i =[MT-D]*60/D
4] Q = 2.78 * Area * i
5] Run Off = Q *D *60/1000
6] Allowable Discharge = Va * D / 1000

7] M5-D=Z1 * M5-60
8] MT-D=Z2 * M5-D
9]Z1 & Z2 Wallingford Procedure Vols 1 and 4

NPPF/EA UPLIFT FOR CC

Central	**0.2**
High (Upp	**0.4**

From: [redacted]
Sent: 31 January 2019 12:35
To: Planning [redacted]
Subject: 3rd Party Planning Application - 2018/1528/P

London Borough of Camden Our DTS Ref: 60626
Camden Town Hall Your Ref: 2018/1528/P
Argyle Street
Euston Road
London
WC1H 8EQ

31 January 2019

Dear Sir/Madam

Re: 138-140, HIGHGATE ROAD, LONDON, GREATER LONDON , NW5 1PB

Waste Comments
The proposed development is located within 15m of a strategic sewer. Thames Water request that the following condition be added to any planning permission.No piling shall take place until a piling method statement (detailing the depth and type of piling to be undertaken and the methodology by which such piling will be carried out, including measures to prevent and minimise the potential for damage to subsurface sewerage infrastructure, and the programme for the works) has been submitted to and approved in writing by the local planning authority in consultation with Thames Water. Any piling must be undertaken in accordance with the terms of the approved piling method statement. Reason: The proposed works will be in close proximity to underground sewerage utility infrastructure. Piling has the potential to impact on local underground sewerage utility infrastructure. Please read our guide 'working near our assets' to ensure your workings will be in line with the necessary processes you need to follow if you're considering working above or near our pipes or other structures.https://developers.thameswater.co.uk/Developing-a-large-site/Planning-your-development/Working-near-or-diverting-our-pipes. Should you require further information please contact Thames Water. Email: developer.services@thameswater.co.uk Phone: 0800 009 3921 (Monday to Friday, 8am to 5pm) Write to: Thames Water Developer Services, Clearwater Court, Vastern Road, Reading, Berkshire RG1 8DB

Thames Water requests that the Applicant should incorporate within their proposal, protection to the property by installing a positive pumped device (or equivalent reflecting technological advances) to avoid the risk of backflow at a later date, on the assumption that the sewerage network may surcharge to ground level during storm conditions. Fitting only a non-return valve could result in flooding to the property should there be prolonged surcharge in the public sewer. If as part of the basement development there is a proposal to discharge ground water to the public network, this would require a Groundwater Risk Management Permit from Thames Water. Any discharge made without a permit is deemed illegal and may result in prosecution under the provisions of the Water Industry Act 1991. We would expect the developer to demonstrate what measures he will undertake to minimise groundwater discharges into the public sewer. Permit enquiries should be directed to Thames Water's Risk Management Team by telephoning 02035779483 or by emailing

wwqriskmanagement@thameswater.co.uk. Application forms should be completed on line via www.thameswater.co.uk/wastewaterquality

'We would expect the developer to demonstrate what measures he will undertake to minimise groundwater discharges into the public sewer. Groundwater discharges typically result from construction site dewatering, deep excavations, basement infiltration, borehole installation, testing and site remediation. Any discharge made without a permit is deemed illegal and may result in prosecution under the provisions of the Water Industry Act 1991. Should the Local Planning Authority be minded to approve the planning application, Thames Water would like the following informative attached to the planning permission:"A Groundwater Risk Management Permit from Thames Water will be required for discharging groundwater into a public sewer. Any discharge made without a permit is deemed illegal and may result in prosecution under the provisions of the Water Industry Act 1991. We would expect the developer to demonstrate what measures he will undertake to minimise groundwater discharges into the public sewer. Permit enquiries should be directed to Thames Water's Risk Management Team by telephoning 02035779483 or by emailing wwqriskmanagement@thameswater.co.uk. Application forms should be completed on line via www.thameswater.co.uk/wastewaterquality."

With regard to surface water drainage, Thames Water would advise that if the developer follows the sequential approach to the disposal of surface water we would have no objection. Where the developer proposes to discharge to a public sewer, prior approval from Thames Water Developer Services will be required. Should you require further information please refer to our website. https://developers.thameswater.co.uk/Developing-a-large-site/Apply-and-pay-for-services/Wastewater-services

Thames Water would advise that with regard to waste water network and waste water process infrastructure capacity, we would not have any objection to the above planning application, based on the information provided

Water Comments
If you are planning on using mains water for construction purposes, it's important you let Thames Water know before you start using it, to avoid potential fines for improper usage. More information and how to apply can be found online at thameswater.co.uk/buildingwater.

On the basis of information provided, Thames Water would advise that with regard to water network and water treatment infrastructure capacity, we would not have any objection to the above planning application. Thames Water recommends the following informative be attached to this planning permission. Thames Water will aim to provide customers with a minimum pressure of 10m head (approx 1 bar) and a flow rate of 9 litres/minute at the point where it leaves Thames Waters pipes. The developer should take account of this minimum pressure in the design of the proposed development.

Yours faithfully
Development Planning Department

Development Planning,
Thames Water,
[redacted]

[redacted]

Nick Kramer

From: Nicolas Nicolaou <spacefreeltd@hotmail.com>
Sent: 24 June 2019 10:32
To: abeischer@awalimited.co.uk
Cc: david.grunberg@thedhaus.com; Daniel Woolfson; Vidos Newplant; Chris Christou
Subject: Pre-planning enquiry: DS6060704 138-140 Highgate NW5 1PB
Attachments: DS6060704 - NW5 1PB 138-140 Highgate Road.pdf; Wastewater FAQs for pre-planning enquiries.pdf

Dear All,

For you information.

RE: Response from Thames Water regarding foul water and surface water confirmation of sufficient capacity.

Kind Regards,

Andrew Neophytou
Space Free Ltd
Regent House
Studio 1
72-76 Eversholt Street
London
NW1 1BY
(M) 07790002731

From: Siva Rajaratnam <Siva.Rajaratnam@thameswater.co.uk>
Sent: 24 June 2019 01:29
To: Nicolas Nicolaou
Cc: Vidos Newplant; Developer Services
Subject: RE: Pre-planning enquiry: DS6060704 138-140 Highgate NW5 1PB

Dear Andrew,

Sorry for the delay in responding. Please find attached Thames Water's response to your Pre-planning enquiry.

There is sufficient capacity for the foul water but we would require surface water to be restricted to greenfield rates as per The London Plan – Policy 5.13. For a site of your size we can accept 2l/s.

Regards

Siva Rajaratnam
Developer Services – Adoptions Engineer
Mobile 07747 640477 Landline 0203 577 9811
siva.rajaratnam@thameswater.co.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

From: Nicolas Nicolaou [mailto:spacefreeltd@hotmail.com]
Sent: 21 June 2019 10:14

To: Siva Rajaratnam
Cc: Vidos Newplant
Subject: Pre-planning enquiry: DS6060704 138-140 Highgate NW5 1PB

Dear Siva,

Hope you are well.

Can you please provide an update with reference to the below email I sent to you on 13/06/19?

Andrew Neophytou
Space Free Ltd
Regent House
Studio 1
72-76 Eversholt Street
London
NW1 1BY
(M) 07790002731

From: Nicolas Nicolaou
Sent: 13 June 2019 02:22
To: siva.rajaratnam@thameswater.co.uk
Cc: Chris Engineer; Daniel Woolfson; david.grunberg@thedhaus.com; Vidos Newplant
Subject: Pre-planning enquiry: DS6060704 138-140 Highgate NW5 1PB

Dear Siva,

Please see answers to the questions you had in relation to 138-140 Highgate Road, NW5 1PB development sent on 23 April 2019 at 16:32:00.

Am hoping that this information is suffice for you to use and progress the application.

Please confirm what happens next.

Kind Regards,

Andrew
Space Free Ltd
07790002731

From: Chris Christou <chris.christou@amacl.co.uk>
Sent: 11 June 2019 08:21
To: Nicolas Nicolaou
Cc: Daniel Woolfson; david.grunberg@thedhaus.com; Vidos Newplant
Subject: RE: Pre-planning enquiry: DS6060704 138-140 Highgate NW5 1PB

see below

1 – Can you confirm the proposed connection points for both the foul and surface water.

It is proposed to connect to the existing Combined Sewer in Highgate Road which appears from The Thames Water Asset Survey to be a 1375 x 800 mm brick sewer. We would propose a crowns adjoining lateral connection. Possibly using the existing connection with a new lateral to avoid if at all possible pumping the surface water.

2- Have all surface water disposal routes been explored and has the London Plan Drainage Hierarchy (Policy 5.13) been followed. Only when it has been proven that infiltration to the ground or a connection into a watercourse is not possible would we consider a restricted discharge into the public combined sewer network of 5 litres per second per hectare or limited to the equivalent Greenfield run-off rate.

2 Application of the Hierarchy of Drainage Control & Treatment

2.1 *Store rainwater for later use.*
The scale of the development is not conducive to re-use other than domestic water butts.

2.2 Use infiltration techniques, such as porous surfaces in non-clay areas.

The subsoil is clay which is impervious so infiltration is not viable.

2.3 *Attenuate rainwater in ponds or open water features for gradual release.*
There are no ponds or open water features in or adjacent to the development.

2.4 *Attenuate rainwater by storing in tanks or sealed water features for gradual release.*
The option of attenuating on site and discharging to the public sewer is adopted.
We need not consider options lower down the hierarchy.

2.5 The attenuated surface water will be controlled by a vortex flow control with integral bypass, discharging to a penultimate inspection chamber meeting Sewers for Adoption before being combined with the foul water at a demarcation chamber, and discharging to the combined sewer under Highgate Road. This allows for future connection to a surface water sewer.

3 – Please provide the surface water run-off rates for the existing and proposed site for the range of storms (1:1, 1:10, 1:30 and 1:100).

2.6 Discharge Rates before and after development, with a discharge rate reflecting the London Plan requirement for 50% betterment

Return Period for Storm	**Duration**	**Existing Rate l/sec**	**Attenuated Rate l/sec**	**%age Reduction**
1 in 1 year storm	30 Mins	9.35	4.6	50%
1 in 30 year storm	3 Hours	26.73	4.6	83%
1 in 100 year storm	6 Hours	33.71	4.6	86%
1 in 100 year storm +Climate Change	6 Hours	43.8	4.6	90%

2.7 The drained area is less than the pre development drained area. This gives a reduction on discharge from the site as follows.

Return Period for Storm	**Duration**	**Existing Volume cu m**	**Development Volume cu m**	**%age Reduction**
1 in 1 year storm	30 Mins	16.8	12.8	24%
1 in 30 year storm	3 Hours	33.0	21.5	24%
1 in 100 year storm	6 Hours	42.8	32.7	24%
1 in 100 year storm +Climate Change	6 Hours	55.64	42.5	24%

Note that after development, the discharge is over a longer time frame for any given storm so reducing the load on the surface water infrastructure.

Christos Christou
BEng CEng MIStructE
Director

AMA CONSULTING ENGINEERS
3 Marconi Place
London
N11 1PE

t: +44(0)20 8361 6827
m: +44(0)7932 638 930
w: www.amacl.co.uk

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Registered in England No. 5800563

From: Nicolas Nicolaou [mailto:spacefreeltd@hotmail.com]
Sent: 07 June 2019 13:49
To: Chris Christou <chris.christou@amacl.co.uk>
Cc: Daniel Woolfson <daniel.woolfson@thedhaus.com>; david.grunberg@thedhaus.com; Vidos Newplant <neoneophytou@yahoo.co.uk>
Subject: Pre-planning enquiry: DS6060704 138-140 Highgate NW5 1PB

Dear Chris,

Please can you provide us with answers to the below 3 questions Thames Water have in relation to 138-140 Highgate Road?

Kind Regards,

Andrew

From: don.brooks <don.brooks@wyg.com>
Sent: 24 April 2019 02:14
To: spacefreeltd@hotmail.com; neoneophytou@yahoo.co.uk; manager@sureinvestmentspm.co.uk
Subject: Fwd: Pre-planning enquiry: DS6060704 138-140 Highgate NW5 1PB

Nic,

Please see below.

The architect should be able to help us answer these 3 questions.

Regards

Don

Sent from my iPhone

Begin forwarded message:

From:
"DEVELOPER.SERVICES@THAMESWATER.CO.U<mailto:DEVELOPER.SERVICES@THAMESWATER.CO.U>"
<DEVELOPER.SERVICES@THAMESWATER.CO.UK<mailto:DEVELOPER.SERVICES@THAMESWATER.CO.UK>>
Date: 23 April 2019 at 16:32:00 BST
To: <don.brooks@wyg.com<mailto:don.brooks@wyg.com>>
Cc: <siva.rajaratnam@thameswater.co.uk<mailto:siva.rajaratnam@thameswater.co.uk>>
Subject: Pre-planning enquiry: DS6060704 138-140 Highgate NW5 1PB

Dear Don,

Thank you for your Pre-planning application. In order for me to process this further can you confirm the following details to complete the capacity assessment;

1 – Can you confirm the proposed connection points for both the foul and surface water.

2- Have all surface water disposal routes been explored and has the London Plan Drainage Hierarchy (Policy 5.13) been followed. Only when it has been proven that infiltration to the ground or a connection into a watercourse is not possible would we consider a restricted discharge into the public combined sewer network of 5 litres per second per hectare or limited to the equivalent Greenfield run-off rate.

3 – Please provide the surface water run-off rates for the existing and proposed site for the range of storms (1:1, 1:10, 1:30 and 1:100).

Should you have any queries please feel free to contact me on 0203 577 9811.

Regards

Siva Rajaratnam

Developer Services – Adoptions Engineer

Mobile 07747 640477 Landline 0203 577 9811

siva.rajaratnam@thameswater.co.uk<mailto:siva.rajaratnam@thameswater.co.uk>

Clearwater Court, Vastern Road, Reading, RG1 8DB

Find us online at developers.thameswater.co.uk<https://developers.thameswater.co.uk/>

Original Text

From: "don.brooks" <don.brooks@wyg.com<mailto:don.brooks@wyg.com>>
To: developer.services@thameswater.co.u<mailto:developer.services@thameswater.co.u>
<developer.services@thameswater.co.uk<mailto:developer.services@thameswater.co.uk>>
CC:
Sent: 08.04.19 16:01:23
Subject: Petrol Station Pre-Planning

Please see attached - application form.

[image1.jpeg]

[image2.jpeg]

[image3.jpeg]

[image4.jpeg]

[image5.jpeg]

[image6.jpeg]

[image7.jpeg]

[image8.jpeg]

MmSent

from my iPhone

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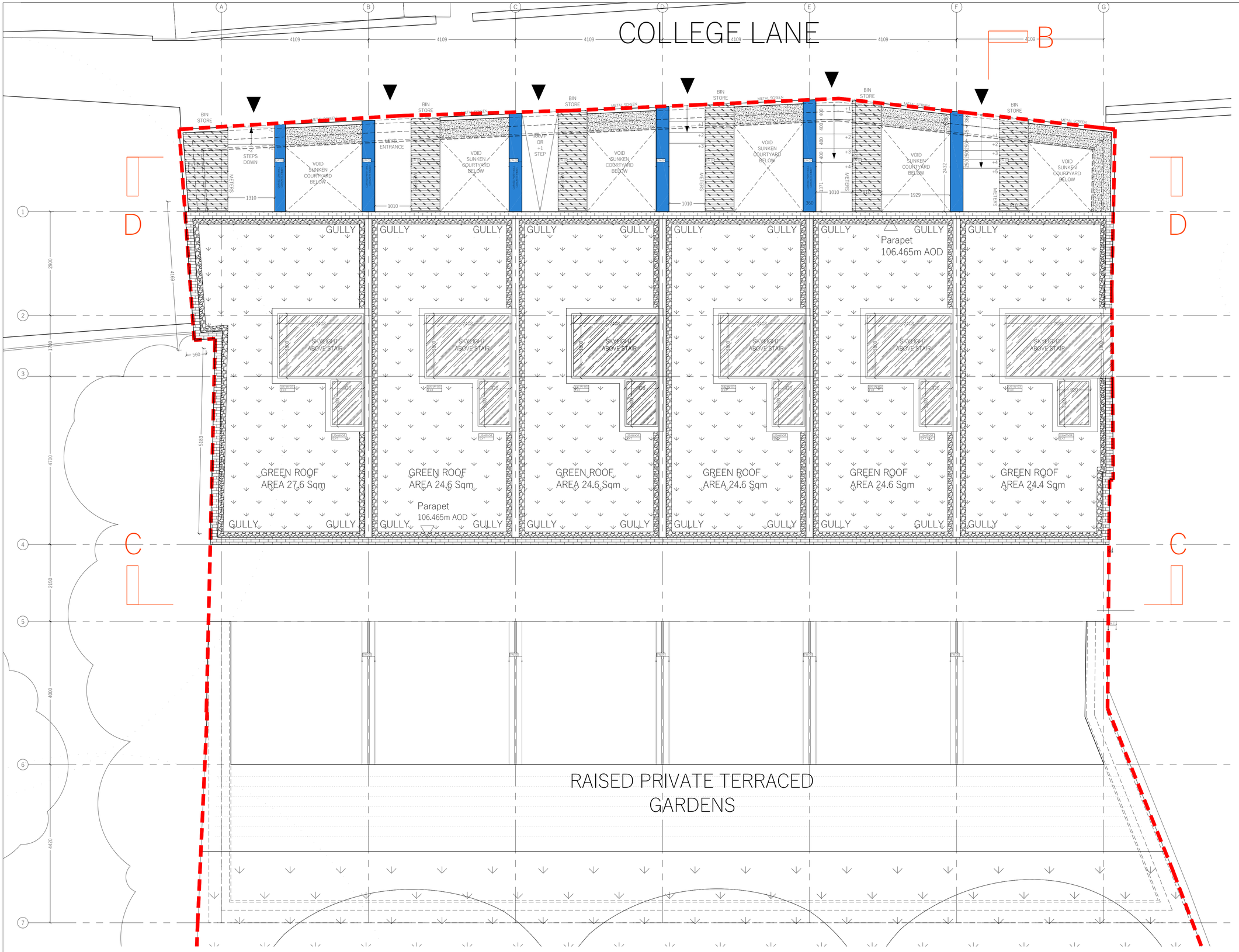

01
UPPER GROUND PLAN
1:50

DO NOT SCALE FROM THIS DRAWING
The contractor shall check and verify all dimensions on site and report any descrepancies in writting to the architect before proceeding with work.

FOR ELECTRONIC DATA USE
Electronic data/drawings are issued as "read only" and should not be interrogated for measurement. All dimensions and levels should be read only from those values stated in text, on the drawing.

AREA MEASUREMENT
The areas are approximate and can only be verified by a detailed dimensional survey of the completed building. Any decisions to be made on the basis of these predictions whether as to project viability, pre-letting, lease agreements or the like should include due allowance for the increases and decreases inherent in the design development and building processes. Figures relate to the likely areas of the building at the current state of the design and using Gross External Area (GEA), Gross Internal Area (GIA) and Net Internal Area (NIA) method of measurement from the Code of Measuring Practice, 5th edition (RICS code of practice). All areas are subject to Town Planning and Conservation Area Consent, and detailed Rights to Light analysis.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
GA_000 Top floor	33	32.8	32.8	32.8	32.8	32.5
GA_B01 Middle Floor	41.9	42.9	43.2	43.4	43.6	39.3
GA_B02 Basement	46.3	47.5	48.6	49.1	49.3	43.4
Total	121.2	123.2	124.6	125.3	125.7	115.2
Garden Room	12.4	12.8	12.8	12.8	12.8	16.1
Total (with Garden Room)	133.6	136	137.4	138.1	138.5	131.3

KEY
- 350 MM SHEET PILE FOUNDATIONS
- 225 MM REIN FORCED CONCRETE
- TIMBER (MAPLE)
- BRICK
- BLACK METAL CLADDING

REVISION	DATE	COMMENT

PROJECT:
138 - 140 HIGHGATE ROAD
LONDON, NW5 1PB

CLIENT:
DESIGN VENTURES HIGHGATE LTD

DRAWING:
ROOF PLAN

SCALE BAR:
0.5m 2.5m 5.0m

DATE:	SCALE:	DRAWN:	CHECK:
13.06.2019	1:50	DW	DG

REASON FOR ISSUE: TENDER
NORTH:
DRAWING NO: 0067_GA_100
REV: -

THE D*HAUS COMPANY LIMITED
UNIT 13, OLD DAIRY COURT
17 CROUCH HILL
LONDON N4 4AP
thedhaus.com

ADDITIONAL INFO

Coordinates XY are related to OS using GPS.
Coordinates Z (height vaules) are related to Newlyn Datum.

6	E 528606.80
	N 185831.61
	Ht 47.79
5	E 528601.76
	N 185819.39
	Ht 46.59
4	E 528607.86
	N 185801.19
	Ht 45.05
3	E 528619.07
	N 185785.32
2	E 528641.17
	N 185781.70
	Ht 44.93
1	E 528650.89
	N 185798.14
	Ht 45.97
7	E 528622.05
	N 185832.46
	Ht 48.30

CONTRACTOR

3Deling — 6 Artichoke Mews, Artichoke Place, London SE5 8TS, WWW.3DELING.COM

CLIENT: The Dhaus

OBJECT: Highgate Road

PROJECT NAME: 19118-29033-Highgate-Road

DRAWN BY: A. Górecka - Amanowicz

CHECKED BY: T. Bell

DRAWING NAME: Topo 2d

DATE: 02.2019

SCALE: 1:100

DRAWING NUMBER: 19019-01

Scale 1:100 — 0, 2.5, 5, 7.5, 10m

SCALE WITH CAUTION AS DISTORTION CAN OCCUR
All dimensions to be checked on site prior to the commencement of works

JOMAS ASSOCIATES LTD
T: 0843 289 2187

Project Name	140 Highgate Road	**Client**	Design Ventures Highgate Ltd
Project No.	P1323J1303	**Date**	15/2/18
Title	GI Plan		

JOMAS ASSOCIATES LTD

Project Name	Highgate Road	**Client**	Design Ventures Highgate Ltd
Title	WS Drilling Photographic Log	**Project No.**	P1323J1303

Photo 1: WS1

Photo 2: WS2

Project Name	Highgate Road	**Client**	Design Ventures Highgate Ltd
Title	WS Drilling Photographic Log	**Project No.**	P1323J1303

Photo 3: WS3

Photo 4: WS5

Project Name	Highgate Road	**Client**	Design Ventures Highgate Ltd
Title	WS Drilling Photographic Log	**Project No.**	P1323J1303

Photo 5: