Sustainable Drainage Strategy

5 Dagmar Road, London

26 February 2021

Prepared for

Inicio Homes

MARKIDES ASSOCIATES

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Project Number: 21004-00
Doc Number: 21004-MA-XX-XX-RP-C-DS01

Rev	Issue Purpose	Author	Checked	Reviewed	Approved	Date
P01	Issued for information	DR	DM	DR	AKS	26.02.21

Contents

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Appendices

1. Introduction

1.1.1 Markides Associates has been appointed by Inicio Homes to prepare a Sustainable Drainage Strategy for the proposed residential development at 5 Dagmar Road, London, SE25 6HZ.

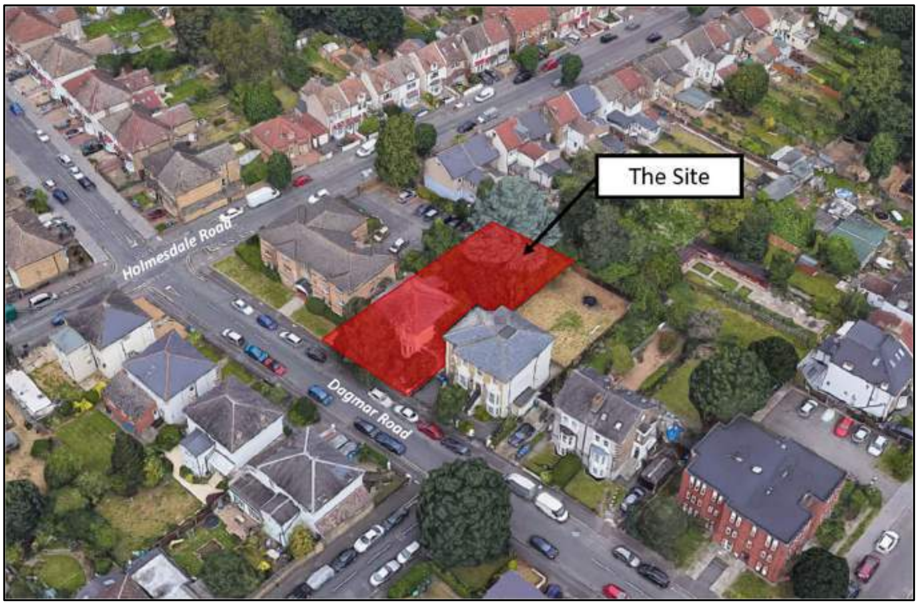
1.1 Site Location

1.1.1 Refer to **Table 1.1** below for details of the site, and the site location plan shown in **Figure 1.1** below.

Table 1.1 Site Details

Site Address	5 Dagmar Road, London, SE25 6HZ
Grid reference	533125mE, 167995mN (TQ 33125 67995)
Topography	Generally flat
Geology	Lambeth Group
Site Area	615m^2
Existing Use	Residential
Access	Dagmar Road

Figure 1.1 Site Location Plan



1.2 Development Proposals

1.2.1 The development proposals are comprised of the demolition of the existing building, to provide 8no. residential units. The full plan is included in **Appendix A**.

2. Baseline Conditions

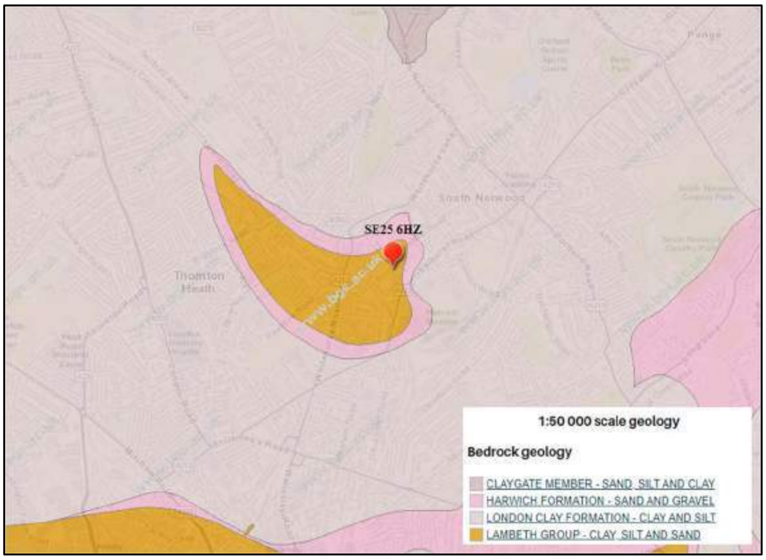
2.1 Topography

2.1.1 Based on the available Lidar data, the site appears to fall from north east to south west. Refer to **Appendix B** for Topographical Levels Data

2.2 Geology

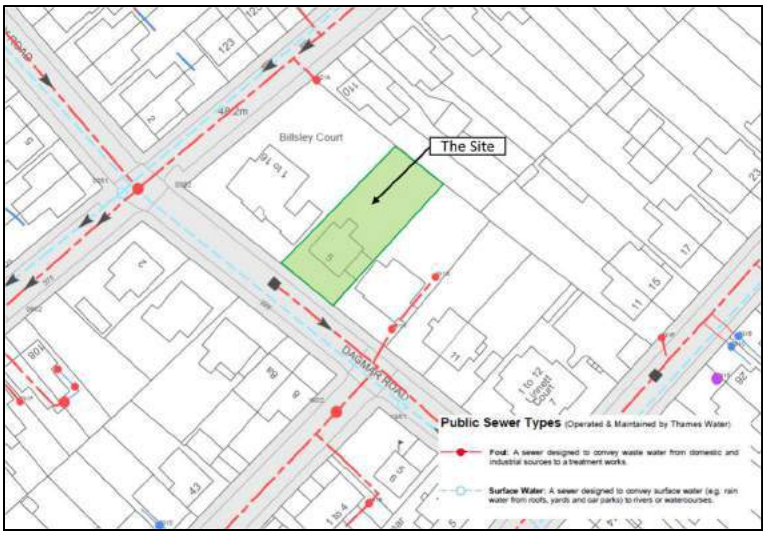
2.2.1 Based on the British Geology Survey (BGS) online data, the site appears to be underlain by Lambeth Group bedrock with no superficial deposits. Refer to **Figure 2.1** below.

Figure 2.1 BGS Bedrock geology



2.2.2 Based on the Thames Water Asset Location Search there appears to be a surface water sewer, conveying flows in a north westerly direction in Dagmar Road, and a foul sewer conveying flows in south easterly direction in Dagmar Road. Refer to **Figure 2.2** below.

Figure 2.2 Thames Water Asset Location Search

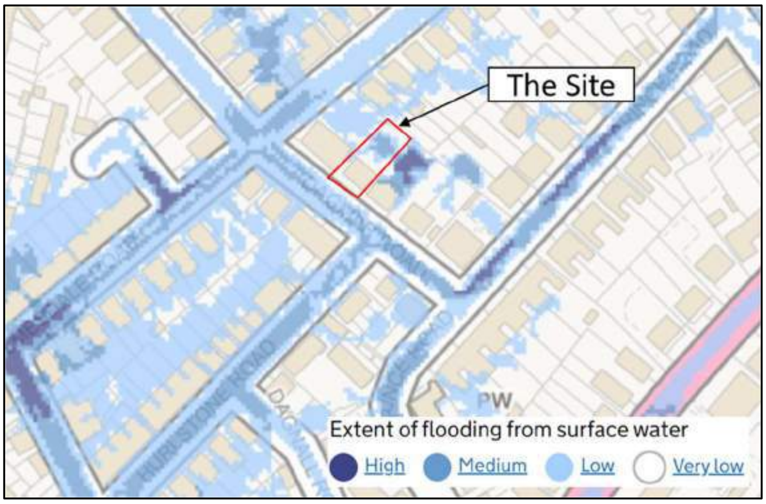


3. Surface Water Management

3.1 Pluvial Flooding

3.1.1 Based on the EA Flood risk from surface water map, the site appears to have a Low to High risk of surface water flooding. Refer to **Figure 3.1** for the EA flood risk from surface water map.

Figure 3.1 Flood risk from surface water



3.1.2 There appears to be a risk of surface water flooding as a result of localised low points in the rear garden area. Based on a site visit and review of Lidar data, it is unlikely that surface water in this area accumulate as although it is overgrown, it is relatively flat. Refer to **Figure 3.2** below and **Appendix B** for photographs of the garden area.

Figure 3.2 Photo of the rear garden

3.1.3 There are also a large number of mature trees in the garden, and therefore the Lidar data on which the flood map is based should be seen as indicative. The Environment Agency also note the following limitations of the flood risk data:

"It is our best estimate of the areas of land at risk of flooding, when the presence of flood defences are ignored and covers the extent of the flooding from rivers or the sea.

This dataset is designed to support flood risk assessments in line with Planning Practice Guidance; and raise awareness of the likelihood of flooding to encourage people living and working in areas prone to flooding to find out more and take appropriate action.

The information provided is largely based on modelled data and is therefore indicative rather than specific.

The information indicates the flood risk to areas of land and is not sufficiently detailed to show whether an individual property is at risk of flooding, therefore properties may not always face the same chance of flooding as the areas that surround them. This is because we do not hold details about properties and their floor levels. Information on flood depth, speed or volume of flow is not included."

3.1.4 This risk will be managed post-development through the surface water drainage network and levels strategy. Permeable paving, sedum roofs, and channel drains (as appropriate) will be provided as source control measures to manage surface water runoff.

3.1.5 Therefore, the risk of surface water flooding is assessed as low.

3.2 Flood risk from Sewer surcharge

3.2.1 Based on the Strategic Flood Assessment, the site is not located in a Critical Drainage Area.

3.2.2 Based on Thames Water's sewer flooding history records, there have been no incidents of flooding from sewer surcharge at the site. Refer to **Appendix C** for Thames Water sewer flooding history records.

3.2.3 Therefore, the risk of flooding from sewer surcharge is assessed as low.

3.3 Overland Flow Routes

3.3.1 The proposed surface water drainage network within the Site will be designed to contain the critical duration of the 1 in 100 year return period storm with a 40% allowance for climate change.

3.3.2 Levels across the site will be designed so that exceedance flows above the 1 in 100 year, including climate change rainfall event will be conveyed away from the building northbound towards the garden and southbound towards the public highway. Refer to drawing **21004-MA-XX-XX-DR-C-0502** in **Appendix D** for an indicative exceedance flow route plan.

3.4 Finished Floor Levels

3.4.1 It is proposed that finished floor levels on the ground floor be set a minimum of 150mm above existing ground level to protect the dwellings from surface water flooding.

4. Sustainable Drainage Strategy

4.1.1 Defra's Non-statutory Technical Guidance for Sustainable Drainage Systems and CIRIA Guidance C753 "The SuDS Manual" has been used to determine the appropriate Surface Water Management Strategy, which considers the spatial and environmental constraints of the site.

4.1.2 In accordance with the Building Act 2000 Clause H3.3 and Thames Water guidance, surface water run off not collected for re-use must be discharged in the following hierarchy:

- To ground (infiltration techniques);
- To a surface water body;
- To a surface water sewer; or
- To the combined sewer.

4.1.3 Refer to **Table 4.1** for an assessment of the drainage hierarchy.

Table 4.1 Drainage Hierarchy Assessment

Disposal method	Feasible	Comments
1st) Infiltration	×	The site appears to be underlain by impermeable Clay geology.
2nd) Watercourse	×	No watercourses in close proximity to site.
3rd) Surface Water sewer	✓	225mm surface water sewer in Dagmar Road.
4th) Combined sewer	N/A	-

4.1.4 Based on the drainage hierarchy assessment, the proposed drainage strategy will seek to discharge surface water runoff from the site to the existing Thames Water 225mm surface water sewer in Dagmar Road.

4.2 Sustainable Drainage Systems

4.2.1 The proposed strategy will seek to maximise the use of Sustainable Drainage Systems (SuDS) to increase the biodiversity, provide amenity, control discharge volumes, and manage water quality.

4.2.2 The opportunities and constraints for the use of SuDS within the site are assessed in **Table 4.2**. The assessment is based on the management train approach outlined in CIRIA C753 "The SuDS Manual".

Table 4.2 SuDS Hierarchy

SuDS Component	Feasible	Comment
Green Roofs	✓	Sedum roofs could be used on flat roof areas and cycle / refuse store areas.
Ponds / Basins	✗	Limited space to provide large attenuation features
Rain gardens	✓	Raingardens could be incorporated and integrated with the landscape strategy.
Permeable Surfacing	✓	Opportunities to utilise permeable paving will be maximised in hard standing areas to improve the water quality of the surface water runoff.
Tanked systems	✓	Should attenuation be required this could be achieved by use of oversized sewers or geo-cellular storage attenuation below the surface.

4.2.3 Based on the SuDS Hierarchy, the most appropriate SuDS for this development are permeable paving, green roofs, raingardens, and tanked systems.

4.2.4 The green roofs and raingardens will increase the biodiversity on site, and the areas permeable paving throughout the site will provide public amenity benefits.

4.3 Peak Flow Control

4.3.1 The existing site area is 615m^2 ,and 150m^2 is comprised of impermeable area. It is assumed that surface water runoff from the existing impermeable areas are currently conveyed to the Thames Water sewer unrestricted.

4.3.2 To ensure that pre-development runoff rates are not exceeded, the brownfield runoff rates from the site were determined using the Wallingford procedure rational method for an assumed critical 5-minute storm: Q = 2.78 x C x i x A

Where: Q = Peak discharge (l/s)
C = Dimensionless Runoff coefficient
i = Rainfall intensity (mm/hr)
A = Contributing impermeable areas (ha)

4.3.3 The proposed drainage strategy will seek to restrict surface water runoff using vortex flow controls or orifice plates to a maximum rate of 2.0 l/s for all events up to the 1 in 100 year plus 40% climate change rainfall event, which is less than the pre-development 1 in 1 year runoff rate. It would not be feasible to restrict to greenfield rates in the order of 0.3 l/s due to the risk of blockages and the volume of storage required.

4.3.4 The peak surface water run-off generated from the Site for the 1 year, 30 year and 100 year rainfall events, for the pre and post-development scenarios, is detailed in Table 4.3 below. Refer to **Appendix D** for full MicroDrainage calculations.

Table 4.3 Comparison of runoff rates

Return Period	Greenfield Rate (l/s)	Existing Brownfield Rate (l/s)	Proposed Rate (l/s)	Reduction
1 in 1 year	0.1	2.1	2.0	-
1 in 30 year	0.2	4.0	2.0	-50%
1 in 100 year	0.3	6.0	2.0	-66%
1 in 100 year + 40% CC	-	-	3.0	-

4.3.5 In accordance with the Non-statutory Technical Guidance for Sustainable Drainage Systems, the post-development discharge rate does not exceed the rate of discharge from the development prior to redevelopment. Therefore, the risk of flooding from impermeable areas is assessed as low for the post-development scenario.

4.4 Storage Requirements

4.4.1 The proposed drainage will be designed to ensure that flooding does not occur on any part of the site for the 1 in 30 year rainfall event, and any flooding up to the 1 in 100 year plus 40% for climate change will be contained on site.

4.4.2 The proposed development impermeable areas on site will be approximately 0.028ha (45% PIMP overall). Runoff from the impermeable areas across the site would be managed by source control techniques including permeable paving, raingardens, water butts, and permeable paving with a geo-cellular sub-base. Refer to **Figure 4.1** for an indicative illustration of permavoid permeable paving.

Figure 4.1 Permeable Paving with Geo-cellular sub-base

4.4.3 Refer to drawing **21004-MA-XX-XX-DR-C-0500** for the Indicative Drainage Strategy illustrating how the Site could be drained in **Appendix D**.

4.5 Urbanisation

4.5.1 The proposed development is comprised of 8no. units, therefore it is unlikely that residents will extend any part of the building. Therefore, the hydraulic calculations will include an allowance for urban creep.

4.6 Water Quality Management

4.6.1 SuDS will be provided to form a management train in line with the best practice outlined in CIRIA C753 “The SuDS Manual”. Source control techniques including sedum roofs and permeable paving could be provided to manage runoff and reduce the time of concentration within the pipe network, reducing the risk of sewer surcharge and flash flooding, and provide water quality benefits. Refer to **Figure 4.2** for an indicative illustration of a green roof.

Figure 4.2 Green roof

1.1 

1.2 In line with CIRIA C753 The SuDS Manual (Tables 26.2 and 26.3), the pollution hazards indices associated with a residential development are mitigated by the proposed permeable paving with geo-cellular sub-base. Refer to **Table 4.4** for the simple index method assessment.

Table 4.4 Simple Index Method Assessment

Pollution Hazard Indices			
Pollution hazard	**TSS**	**Metals**	**Hydrocarbons**
Low - Residential driveway	0.5	0.4	0.4
Pollution Mitigation Indices provided			
SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Permeable paving with Permavoid	0.7	0.6	0.7
Check	*+0.2*	*+0.2*	*+0.3*

4.7 Maintenance

1.3 The maintenance of all SuDS components will be in accord with the best practices and CIRIA C753 The SuDS Manual. A recommended management plan for the drainage system is outlined in **Table 4.5** below and a full Management Plan is included in **Appendix E**.

Table 4.5 SuDS Management Plan

Maintenance Task	Description	Frequency
Regular Maintenance		
Litter management	Pick up all litter in landscape areas and remove from site	Monthly
Inlets and outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	Monthly
Hard surfaces	Sweep all paving regularly.	As required
Occasional tasks		
Inspection and control chambers	Annual inspection, remove silt and check free flow	Annually
Remedial work		
Repairs	Inspect drainage system regularly to check for damage or failure. Undertake remedial work as required.	As required

Foul Drainage

1.4 The post-development foul water flows will be conveyed to the existing foul sewer in Dagmar Road. The peak foul flow rate for the proposed development is estimated to be 0.37 l/s, based on 8no. residential units.

1.5 It is assumed that there is an existing connecting to the Thames Water sewer serving the existing residential dwelling.

1.6 Thames Water has been consulted on the proposals and confirmed there is sufficient capacity to accept flows from the site under Pre-planning enquiry ref. DS6081564. Refer to **Appendix C** for Thames Water correspondence.

5. Conclusions

5.0.1 Markides Associates has been appointed by Inicio Homes to prepare a Sustainable Drainage Strategy to support a planning application for the proposed redevelopment at 5 Dagmar Road, London, SE25 6HZ.

5.0.2 The development proposals are comprised of the demolition of the existing buildings, to provide 8no. residential units.

5.0.3 The site is located in Flood Zone 1, with low risk of tidal/fluvial flooding. Areas within Flood Zone 1 are considered to have a less than 1 in 1,000 year annual probability of flooding (0.1%). The flood risk from all other sources is assessed as low.

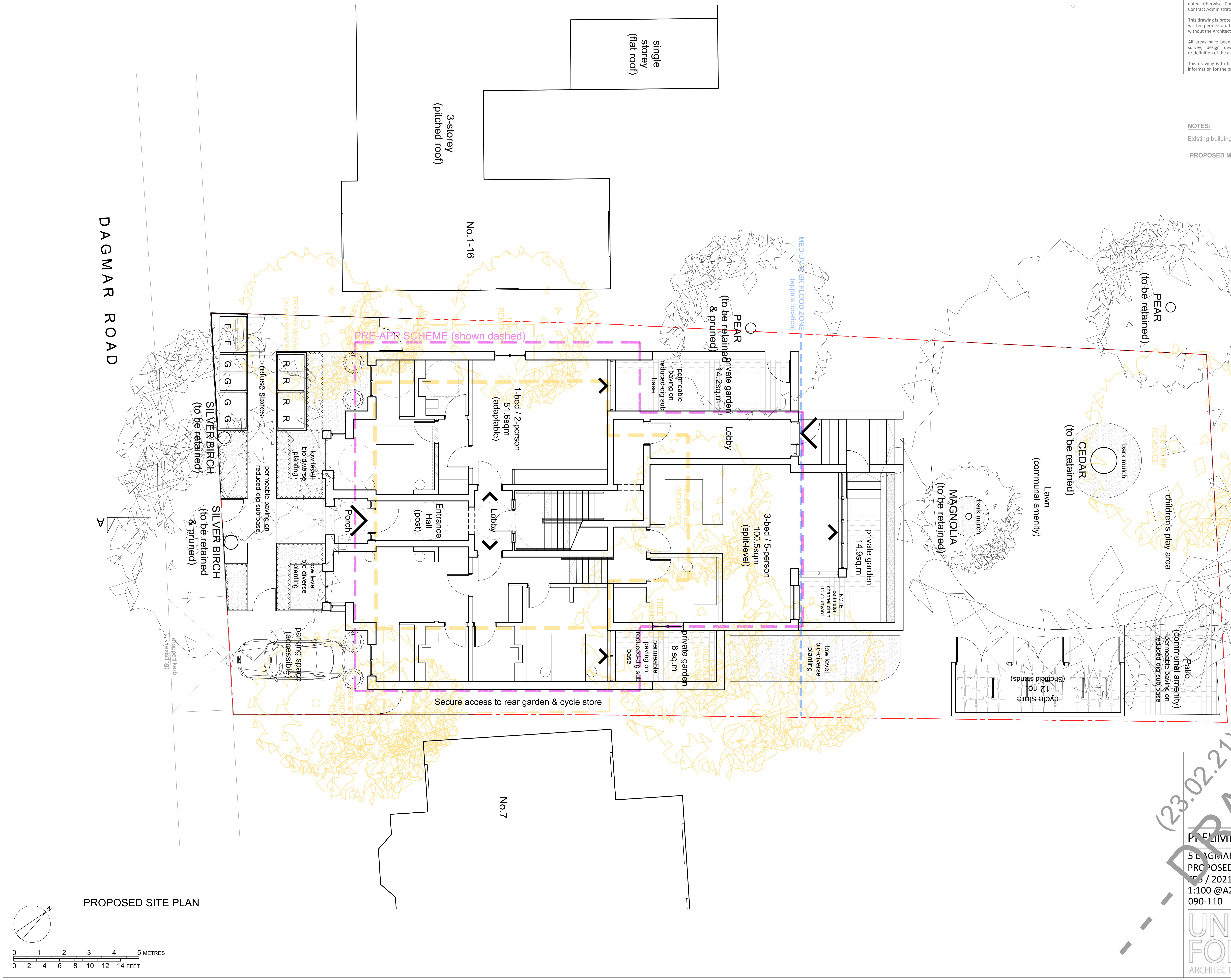
5.0.4 The surface water drainage strategy will seek to convey flows to the existing Thames Water surface water sewer conveying flows in Dagmar Road. Surface water runoff will be restricted to 2.0 l/s for all rainfall events up to and including the 1 in 100 year critical event (including a 40% allowance for climate change).

5.0.5 The post-development discharge rate does not exceed the rate of discharge from the development prior to redevelopment. Therefore, the risk of flooding from impermeable areas is assessed as low for the post-development scenario.

5.0.6 The surface water management strategy could seek to incorporate sustainable drainage systems, including sedum roofs, permeable paving and raingardens.

5.0.7 In conclusion, this report demonstrates that the proposals are consistent with the aims of the NPPF, the Non-statutory Technical Guidance for Sustainable Drainage Systems and the Local Flood Risk Management Strategy. The site can be developed without increasing the risk of flooding on site or elsewhere.

APPENDIX A – PROPOSED SITE PLAN



NOTE:

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All areas have been measured from current drawings. They may vary because of (eg) survey, design development, construction tolerances, statutory requirements or re-definition of the areas to be measured.

This drawing is to be read in conjunction with all relevant details and other consultants information for the project

NOTES:

Existing building elements removed

PROPOSED MATERIALS KEY:

PRELIMINARY ISSUE
5 DAGMAR ROAD, SE25
PROPOSED GROUND FLOOR / SITE PLAN
FEB / 2021
1:100 @A2
090-110

UNFOLD ARCHITECTURE + DESIGN

info@un-fold.co.uk
www.un-fold.co.uk
(+44) 02035192182 ©

PROPOSED ROOF PLAN

0 1 2 3 4 5 METRES
0 2 4 6 8 10 12 14 FEET

NOTE:

Do not scale (apart from when issued for Planning Application purposes). Figured dimensions only to be taken from this drawing. Dimensions are shown in millimeters unless noted otherwise. Check dimensions on site and report discrepancies to the Architect or Contract Administrator. Not to be used for Construction purposes unless stated.

All areas have been measured from current drawings. They may vary because of (eg) survey, design development, construction tolerances, statutory requirements or re-definition of the areas to be measured.

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NOTES:

Existing building elements removed

PROPOSED MATERIALS KEY:

PRELIMINARY ISSUE

5 DAGMAR ROAD, SE25
PROPOSED ROOF PLAN
FEB / 2021
1:100 @A3
090-104

UN FOLD
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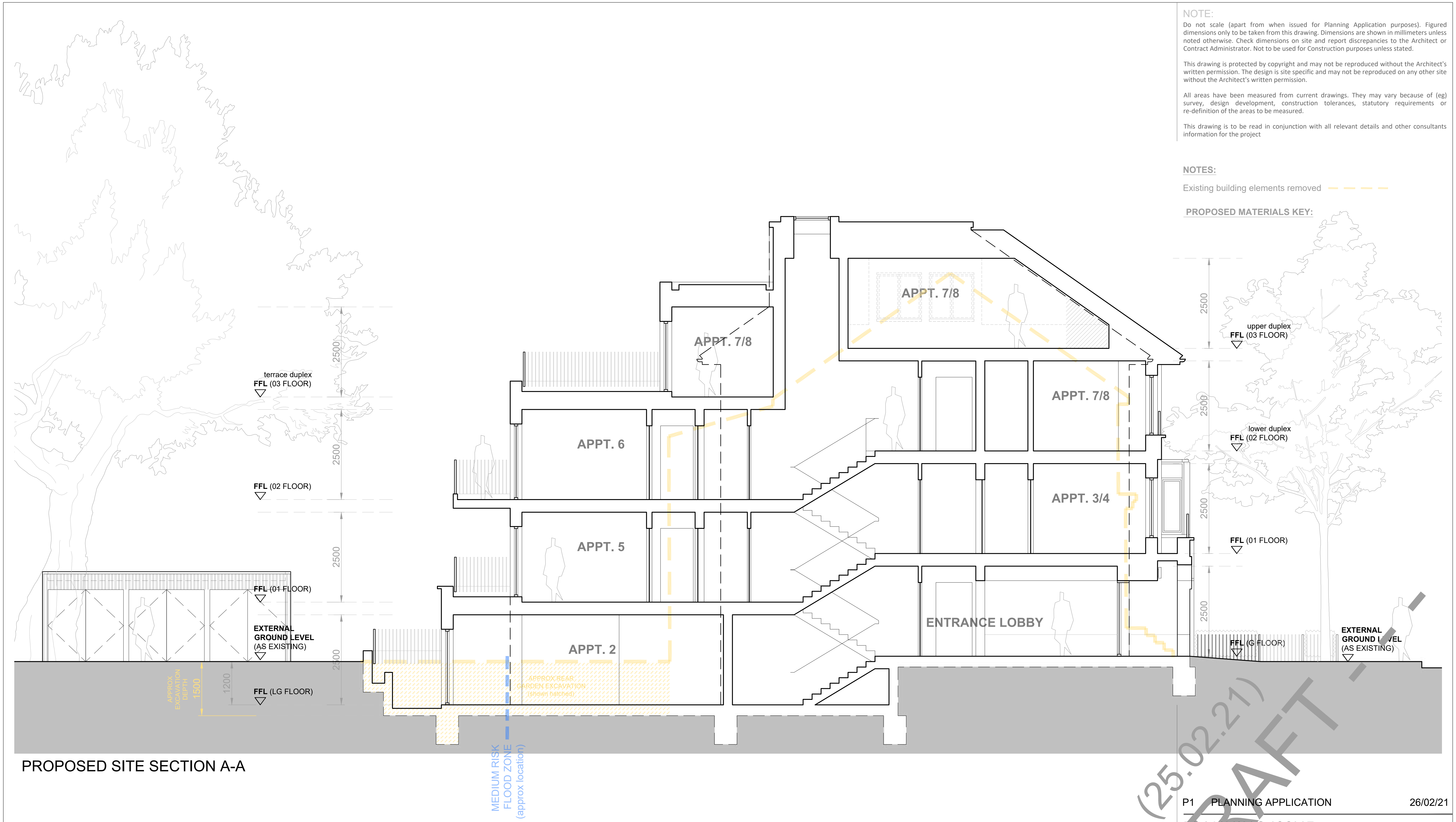

PROPOSED SITE SECTION A-A

0 1 2 3 4 5 METRES
0 2 4 6 8 10 12 14 FEET

NOTE:
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This drawing is to be read in conjunction with all relevant details and other consultants information for the project

NOTES:

Existing building elements removed

PROPOSED MATERIALS KEY:

P1 PLANNING APPLICATION 26/02/21

PLANNING ISSUE

5 DAGMAR ROAD, SE25
PROPOSED SITE SECTION A-A
FEB / 2021
1:100 @A3
090-300

(25.02.21) DRAFT

UN FOLD ARCHITECTURE + DESIGN

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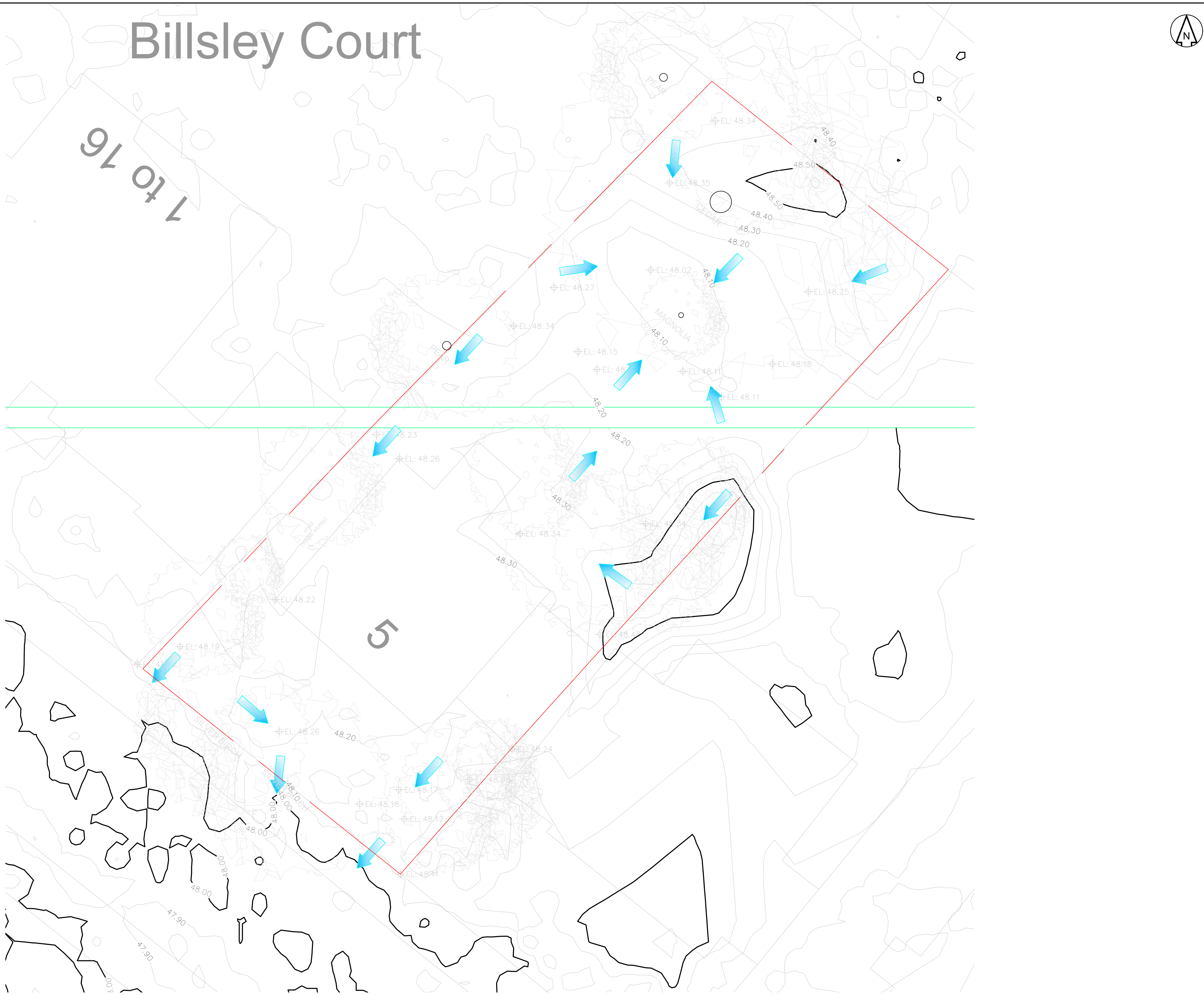
APPENDIX B – TOPOGRAPHICAL DATA & SITE INFORMATION



DO NOT SCALE OFF THIS DRAWING

NOTES

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2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. THIS DRAWING HAS BEEN BASED ON LIDAR DATA (LIDAR-DTM-2017-1M-TQ36nw) DOWNLOADED FROM GOV.UK ON 29.01.2021.
6. LEVELS SHOWN INDICATIVELY ONLY BASED ON LIDAR DATA, AND MAY NOT ACCURATELY REPRESENT THE EXISTING TOPOGRAPHY.

KEY

INDICATIVE SITE BOUNDARY

INDICATIVE EXCEEDENCE FLOW ROUTE

Revision History

Rev	Comment	By	Chkd	Appr	Date
P01	ISSUED FOR PLANNING	DR	DM	AKS	26.02.21

Current Revision

Rev	Comment	By	Chkd	Appr	Date
P01	ISSUED FOR PLANNING	DR	DM	AKS	26.02.21

S2 - INFORMATION

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Project

5 DAGMAR ROAD, LONDON, SE25 6HZ

Drawing Title

TOPOGRAPHICAL LEVELS DATA

Scale 1:100 @ A1 - 1:200 @ A3

2m 0 2m 4m 6m 8m 10m

Markides Associates reference: 21004-00 1:100 @ A1

21004-MA-XX-XX-DR-C-0001 - P01

TQ 36 NW / 87

N.G.R. 3312. 6803

Site Investigation at Croydon 'B' Job 3293

LOG OF BOREHOLE No. P10

Type of equipment Pilcon Wayfarer

Diameter of hole 12"(300mm) to 10.00m, 10"(250mm) to 20.00m, 8"(200mm) to 34.35m.

DEPTH SCALE	DAILY PROGRESS	DEPTH TO WATER (m)	DEPTH OF CASING (m)	SAMPLING DATA DEPTH FROM (m)	DEPTH TO (m)	No.	TYPE	LEGEND	CHANGE OF STRATA DEPTH (m)	REDUCED LEVEL (m)	DESCRIPTION OF STRATA
											GROUND LEVEL: 48.11m O.D.
											FIRM to STIFF mottled grey, brown and yellow silty CLAY with numerous shell fragments. (Woolwich and Reading Beds).
1 m					1.00	1	D				
	8.4.74 (a)			1.50	1.95	2	U4				
2 m					2.20	3	D				---grey clayey, sandy SILT.
					2.60	4	D				
3 m			3.00	3.00	3.45	5	U4				
4 m					4.00	6	D				
					4.20	8,9	W				---predominantly shell fragments
			3.00	4.50	4.95	7	U4				---FIRM to STIFF grey CLAY
5 m	5.00	DRY	4.75								
	9.4.74	4.20			5.15	10	D				---sandy CLAY
6 m				6.00	6.45	11	U4		6.05	42.06	VERY STIFF to HARD mottled brown, purple and grey highly fissured CLAY with numerous coarse sand-sized pellets of CLAYSTONE.
7 m					7.00	12	D				
				7.50	7.95	13	U4				---brown, orange, yellow, green and purple mottled
8 m					8.50	14	D				
9 m				9.00	9.45	15	U4				---highly fissured
10 m	10.00	DRY		9.90	10.00	16	D		9.80	38.31	Light brown clayey SAND binding sub-rounded to rounded well-graded GRAVEL.
	10.4.74	DRY			10.20	17	D		10.00	38.11	VERY DENSE green, brown, grey, red and yellow fine to medium SAND (Woolwich and Reading Beds).
			10.50	10.50	10.95	18	U4				
11 m		(e)			11.50	19	D				
12 m				12.00	12.45	20	U4				
13 m					13.00	21	D				

continued on next sheet

Key

- ▨ sampling depth, soils
- U4 4 in. dia. undisturbed sample (102 mm)
- U3 3 in. dia. undisturbed sample (73 mm)
- D disturbed jar sample
- B disturbed bulk sample
- W water sample
- SP ( ) standard penetration test
- CP ( ) cone penetration test
- (25) number of blows e.g. 25
- * no recovery
- ▮ 80 core drilling, 80% recovery
- RQD rock quality designation

Notes

a) Inspection pit to 1.50m. Started to drill at 1.50m.

e) Water added to assist boring.

q) Piezometer installed at 34.0m on 22.4.74. 1.35m sand cell from 33.00m to 34.35m.

b) Permeability test performed at 25.40m, Apparent coefficient of permeability, $Ka = 2.2 \times 10^{-6}$ m/s.

APPENDIX C – THAMES WATER RECORDS & CORRESPONDENCE

Asset location search

Thames Water Property Searches

Markides Associates
81 Southwark Bridge Road
LONDON
SE1 0NQ

Search address supplied 5
Dagmar Road
London
SE25 6HZ

Your reference Dagmar Road

Our reference ALS/ALS Standard/2021_4340650

Search date 15 January 2021

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

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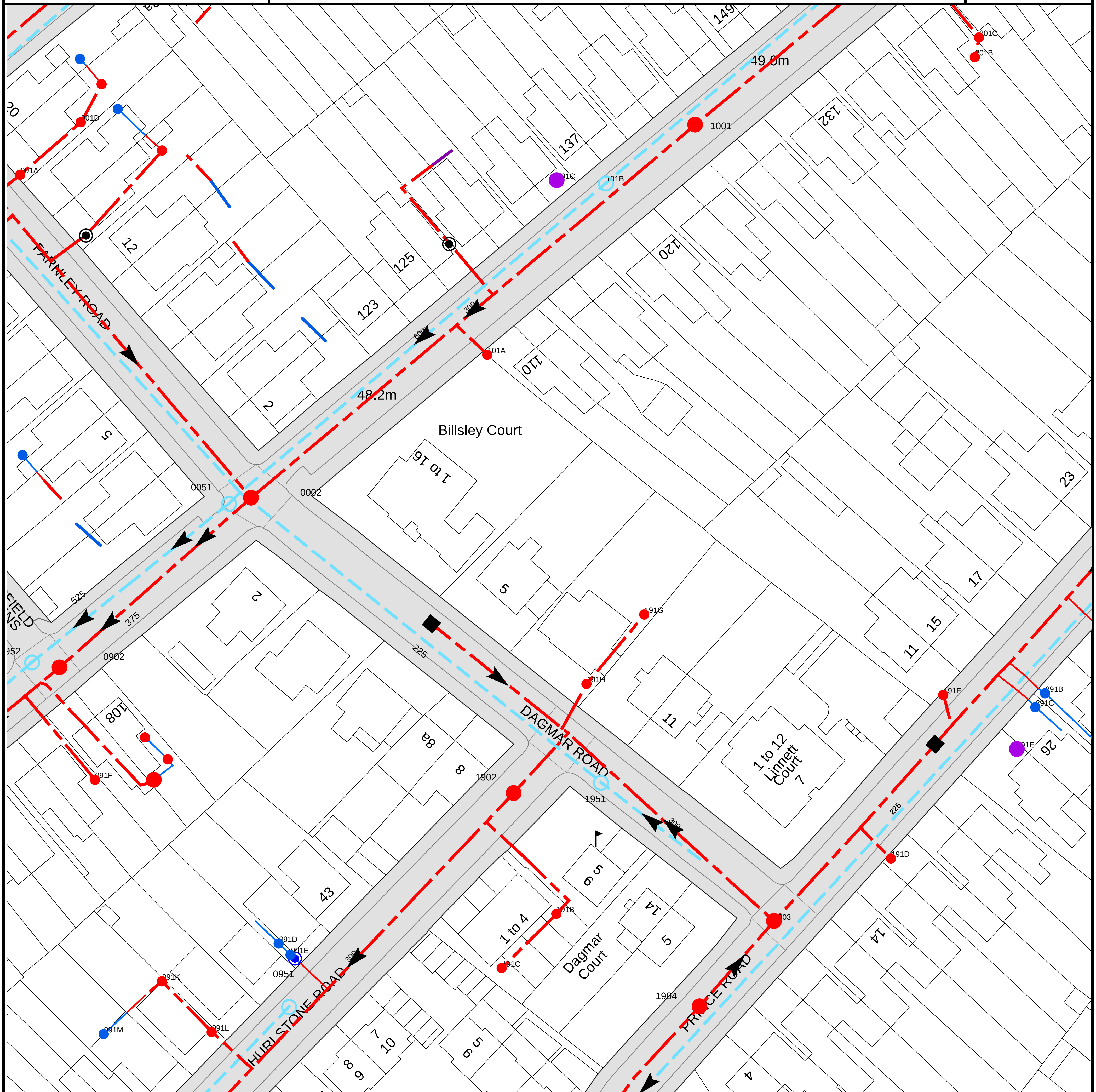
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Asset Location Search Sewer Map - ALS/ALS Standard/2021_4340650



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 533125,167997

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
191D	n/a	n/a
191F	n/a	n/a
291E	n/a	n/a
291C	n/a	n/a
291B	n/a	n/a
n/a	n/a	n/a
0053	n/a	n/a
0054	n/a	n/a
101A	n/a	n/a
101C	n/a	n/a
101B	n/a	n/a
1001	n/a	n/a
201B	n/a	n/a
201C	n/a	n/a
001A	n/a	n/a
0055	n/a	n/a
001D	n/a	n/a
0056	n/a	n/a
091M	n/a	n/a
091C	n/a	n/a
091A	n/a	n/a
091K	n/a	n/a
091B	n/a	n/a
091L	n/a	n/a
0051	47.97	46.48
0002	48.07	45.12
091D	n/a	n/a
0951	47.54	46.71
091E	n/a	n/a
191C	n/a	n/a
1902	47.99	45.85
191B	n/a	n/a
191H	n/a	n/a
1951	48.14	47.1
191G	n/a	n/a
1904	48.3	46.27
1903	48.47	46.11
0952	47.67	46.41
0902	47.81	45.11
091F	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Trunk Surface Water
- Trunk Foul
- Storm Relief
- Trunk Combined
- Vent Pipe
- Bio-solids (Sludge)
- Proposed Thames Surface Water Sewer
- Proposed Thames Water Foul Sewer
- Gallery
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Sludge Rising Main
- Proposed Thames Water Rising Main
- Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

- Air Valve
- Dam Chase
- Fitting
- Meter
- Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

- Control Valve
- Drop Pipe
- Ancillary
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Outfall
- Undefined End
- Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

- Public/Private Pumping Station
- Change of characteristic indicator (C.O.C.I.)
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Operational Site
- Chamber
- Tunnel
- Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

- Foul Sewer
- Surface Water Sewer
- Combined Sewer
- Gulley
- Culverted Watercourse
- Proposed
- Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Searches on 0800 009 4540.

Sewer Flooding
History Enquiry

Thames Water Property Searches

Markides Associates

81 Southwark Bridge Road

Search address supplied	5 Dagmar Road London SE25 6HZ

Your reference	Dagmar Road
Our reference	SFH/SFH Standard/2021_4340654
Received date	**15 January 2021**
Search date	**15 January 2021**

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

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www.thameswater-propertysearches.co.uk

0800 009 4540

Markides Associates Ltd
81 Southwark Bridge Road
London
SE1 0NQ

Wastewater pre-planning
Our ref DS6081564

18 February 2021

Pre-planning enquiry: Confirmation of sufficient capacity

Dear Mr Ramdeen,

Thank you for providing information on your development.

Site: 5 Dagmar Road, Croydon, SE25 6HZ.

Proposed site: Redevelopment of site for nine flats.
Proposed foul water: To discharge via gravity to public foul water sewer in Dagmar Road.
Proposed surface water: Surface water discharge via gravity limited to 2l/s to connect to 225mm public surface water sewer in Dagmar Road.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Please note that the public foul water sewer that you intend to connect to is classified as a trunk sewer. All connection requests are subject to a full Section 106 (Water Industry Act 1991) application before the Company can confirm approval to the connection itself. Please also note that capacity in the public sewerage system cannot be reserved.

Connecting to trunk sewers can be complex and dangerous, which means we often refuse permission. In this case, you'd need to find an alternative sewer or method of discharge. Further details can be found on our website : www.developerservices.co.uk. If we permit a connection to the trunk sewer, we'll insist on doing this ourselves under Section 107 of the Water Industry Act.

Surface Water

When developing a site, policy 5.13 of the London Plan and Policy 3.4 of the Supplementary Planning Guidance (Sustainable Design And Construction) states that every attempt should be made to use flow attenuation and SuDS/Storage to reduce the surface water discharge from the site as much as possible.

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1. store rainwater for later use.
2. use infiltration techniques where possible.
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.
8. discharge rainwater to the foul sewer

Where connection to the public sewerage network is still required to manage surface water flows we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a rate of 2l/s then Thames Water would not have any objections to the proposal.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 020 3577 9223.

Yours sincerely

Alan Dovey
Development Engineer
Developer Services – Sewer Adoptions Team

APPENDIX D – PRELIMINARY DRAINAGE CALCULATIONS & LAYOUT DRAWING

PROJECT	5 DAGMAR ROAD		
SUBJECT	PRELIMINARY DRAINAGE CALCULATIONS		
JOB NO.	21004	**PAGE NO.**	1
DATE	17/02/21	**REV NO.**	P01
PREPARED	DR	**CHECKED**	SF

EXISTING SITE INFORMATION

Total Site Area	0.0615	ha
Impermeable Area	0.0150	ha
PIMP	24	%

MODIFIED RATIONALE METHOD

$$Q_n = 2.78\ CiA$$

where:

C	*Runoff Coefficients*	=	1	(in this case 1 as using impermeable area)
i_n	*Rainfall Intensity for n return period (mm/hr)*			
A	*Impermeable Area (Ha)*			
Q_n	*Runoff for n return period (l/s)*			

Rainfall Intensity

The rainfall intensities for various return periods were extracted from Table 1(a) of the Transport and Road Research Laboratory Report - Estimated rainfall for drainage calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young. For the 5 min duration.

i_1	50.80	*mm/hr*
i_{10}	94.90	*mm/hr*
i_{30}	113.02	*mm/hr*
i_{100}	143.90	*mm/hr*

PRE-DEVELOPMENT SURFACE WATER RUNOFF

		C	i_n	*A*		Q_n	
Q_1	2.78	1	50.8	0.015	=	**2.12**	**l/s**
Q_{10}	2.78	1	94.9	0.015	=	**3.96**	**l/s**
Q_{30}	2.78	1	113.0	0.015	=	**4.71**	**l/s**
Q_{100}	2.78	1	143.9	0.015	=	**6.00**	**l/s**
$Q_{100+40\%\ CC}$	2.78	1	201.5	0.015	=	**8.40**	**l/s**

ICP SUDS Mean Annual Flood

Input

Return Period (years)	5	SAAR (mm)	670	Urban	0.000
Area (ha)	0.062	Soil	0.300	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.1
QBAR Urban	0.1
Q5 years	0.1
Q1 year	0.1
Q30 years	0.2
Q100 years	0.3

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.200	Shortest Storm (mins)	15
Ratio R	0.432	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.028

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.028

Model Details

Storage is Online Cover Level (m) 48.200

Cellular Storage Structure

Invert Level (m)	46.800	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	12.5	0.0	3.600	0.0	0.0	7.200	0.0	0.0
0.400	12.5	0.0	4.000	0.0	0.0	7.600	0.0	0.0
0.800	12.5	0.0	4.400	0.0	0.0	8.000	0.0	0.0
0.801	0.0	0.0	4.800	0.0	0.0	8.400	0.0	0.0
1.600	0.0	0.0	5.200	0.0	0.0	8.800	0.0	0.0
2.000	0.0	0.0	5.600	0.0	0.0	9.200	0.0	0.0
2.400	0.0	0.0	6.000	0.0	0.0	9.600	0.0	0.0
2.800	0.0	0.0	6.400	0.0	0.0	10.000	0.0	0.0
3.200	0.0	0.0	6.800	0.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0061-2000-1500-2000
Design Head (m)	1.500
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	46.700
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	2.0	Kick-Flo®	0.545	1.3
Flush-Flo™	0.269	1.6	Mean Flow over Head Range	-	1.5

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)	Depth (m)	Flow (l/s)
0.100	1.3	0.800	1.5	2.000	2.3	4.000	3.1	7.000	4.1
0.200	1.5	1.000	1.7	2.200	2.4	4.500	3.3	7.500	4.2
0.300	1.6	1.200	1.8	2.400	2.5	5.000	3.5	8.000	4.3
0.400	1.5	1.400	1.9	2.600	2.6	5.500	3.6	8.500	4.5
0.500	1.4	1.600	2.1	3.000	2.7	6.000	3.8	9.000	4.6
0.600	1.3	1.800	2.2	3.500	3.0	6.500	3.9	9.500	4.7

Summary of Results for 1 year Return Period

Half Drain Time : 5 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	46.858	0.058	0.0	1.5	1.5	0.7	O K
30 min Summer	46.854	0.054	0.0	1.5	1.5	0.6	O K
60 min Summer	46.837	0.037	0.0	1.4	1.4	0.4	O K
120 min Summer	46.810	0.010	0.0	1.4	1.4	0.1	O K
180 min Summer	46.800	0.000	0.0	1.3	1.3	0.0	O K
240 min Summer	46.800	0.000	0.0	1.1	1.1	0.0	O K
360 min Summer	46.800	0.000	0.0	0.8	0.8	0.0	O K
480 min Summer	46.800	0.000	0.0	0.7	0.7	0.0	O K
600 min Summer	46.800	0.000	0.0	0.6	0.6	0.0	O K
720 min Summer	46.800	0.000	0.0	0.5	0.5	0.0	O K
960 min Summer	46.800	0.000	0.0	0.4	0.4	0.0	O K
1440 min Summer	46.800	0.000	0.0	0.3	0.3	0.0	O K
2160 min Summer	46.800	0.000	0.0	0.2	0.2	0.0	O K
2880 min Summer	46.800	0.000	0.0	0.2	0.2	0.0	O K
4320 min Summer	46.800	0.000	0.0	0.1	0.1	0.0	O K
5760 min Summer	46.800	0.000	0.0	0.1	0.1	0.0	O K
7200 min Summer	46.800	0.000	0.0	0.1	0.1	0.0	O K
8640 min Summer	46.800	0.000	0.0	0.1	0.1	0.0	O K
10080 min Summer	46.800	0.000	0.0	0.1	0.1	0.0	O K
15 min Winter	46.868	0.068	0.0	1.5	1.5	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	32.124	0.0	1.7	13
30 min Summer	20.729	0.0	2.2	21
60 min Summer	12.944	0.0	2.7	38
120 min Summer	7.911	0.0	3.3	66
180 min Summer	5.900	0.0	3.7	0
240 min Summer	4.786	0.0	4.0	0
360 min Summer	3.547	0.0	4.5	0
480 min Summer	2.857	0.0	4.8	0
600 min Summer	2.415	0.0	5.1	0
720 min Summer	2.105	0.0	5.3	0
960 min Summer	1.695	0.0	5.7	0
1440 min Summer	1.250	0.0	6.3	0
2160 min Summer	0.921	0.0	7.0	0
2880 min Summer	0.743	0.0	7.5	0
4320 min Summer	0.547	0.0	8.3	0
5760 min Summer	0.440	0.0	8.9	0
7200 min Summer	0.372	0.0	9.4	0
8640 min Summer	0.325	0.0	9.8	0
10080 min Summer	0.289	0.0	10.2	0
15 min Winter	32.124	0.0	1.9	14

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	46.859	0.059	0.0	1.5	1.5	0.7	O K
60 min Winter	46.831	0.031	0.0	1.4	1.4	0.4	O K
120 min Winter	46.800	0.000	0.0	1.3	1.3	0.0	O K
180 min Winter	46.800	0.000	0.0	1.0	1.0	0.0	O K
240 min Winter	46.800	0.000	0.0	0.8	0.8	0.0	O K
360 min Winter	46.800	0.000	0.0	0.6	0.6	0.0	O K
480 min Winter	46.800	0.000	0.0	0.5	0.5	0.0	O K
600 min Winter	46.800	0.000	0.0	0.4	0.4	0.0	O K
720 min Winter	46.800	0.000	0.0	0.3	0.3	0.0	O K
960 min Winter	46.800	0.000	0.0	0.3	0.3	0.0	O K
1440 min Winter	46.800	0.000	0.0	0.2	0.2	0.0	O K
2160 min Winter	46.800	0.000	0.0	0.2	0.2	0.0	O K
2880 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K
4320 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K
5760 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K
7200 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K
8640 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K
10080 min Winter	46.800	0.000	0.0	0.0	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	20.729	0.0	2.5	22
60 min Winter	12.944	0.0	3.0	38
120 min Winter	7.911	0.0	3.7	0
180 min Winter	5.900	0.0	4.2	0
240 min Winter	4.786	0.0	4.5	0
360 min Winter	3.547	0.0	5.0	0
480 min Winter	2.857	0.0	5.4	0
600 min Winter	2.415	0.0	5.7	0
720 min Winter	2.105	0.0	5.9	0
960 min Winter	1.695	0.0	6.4	0
1440 min Winter	1.250	0.0	7.1	0
2160 min Winter	0.921	0.0	7.8	0
2880 min Winter	0.743	0.0	8.4	0
4320 min Winter	0.547	0.0	9.3	0
5760 min Winter	0.440	0.0	9.9	0
7200 min Winter	0.372	0.0	10.5	0
8640 min Winter	0.325	0.0	11.0	0
10080 min Winter	0.289	0.0	11.4	0

Summary of Results for 30 year Return Period

Half Drain Time : 22 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	47.033	0.233	0.0	1.6	1.6	2.8	O K
30 min Summer	47.046	0.246	0.0	1.6	1.6	2.9	O K
60 min Summer	47.030	0.230	0.0	1.6	1.6	2.7	O K
120 min Summer	46.975	0.175	0.0	1.6	1.6	2.1	O K
180 min Summer	46.923	0.123	0.0	1.5	1.5	1.5	O K
240 min Summer	46.881	0.081	0.0	1.5	1.5	1.0	O K
360 min Summer	46.828	0.028	0.0	1.4	1.4	0.3	O K
480 min Summer	46.803	0.003	0.0	1.4	1.4	0.0	O K
600 min Summer	46.800	0.000	0.0	1.2	1.2	0.0	O K
720 min Summer	46.800	0.000	0.0	1.0	1.0	0.0	O K
960 min Summer	46.800	0.000	0.0	0.8	0.8	0.0	O K
1440 min Summer	46.800	0.000	0.0	0.6	0.6	0.0	O K
2160 min Summer	46.800	0.000	0.0	0.4	0.4	0.0	O K
2880 min Summer	46.800	0.000	0.0	0.3	0.3	0.0	O K
4320 min Summer	46.800	0.000	0.0	0.2	0.2	0.0	O K
5760 min Summer	46.800	0.000	0.0	0.2	0.2	0.0	O K
7200 min Summer	46.800	0.000	0.0	0.2	0.2	0.0	O K
8640 min Summer	46.800	0.000	0.0	0.1	0.1	0.0	O K
10080 min Summer	46.800	0.000	0.0	0.1	0.1	0.0	O K
15 min Winter	47.074	0.274	0.0	1.6	1.6	3.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	78.861	0.0	4.1	16
30 min Summer	50.688	0.0	5.3	25
60 min Summer	31.124	0.0	6.5	42
120 min Summer	18.553	0.0	7.8	76
180 min Summer	13.571	0.0	8.5	106
240 min Summer	10.827	0.0	9.1	136
360 min Summer	7.851	0.0	9.9	194
480 min Summer	6.250	0.0	10.5	248
600 min Summer	5.233	0.0	11.0	0
720 min Summer	4.525	0.0	11.4	0
960 min Summer	3.596	0.0	12.1	0
1440 min Summer	2.598	0.0	13.1	0
2160 min Summer	1.875	0.0	14.2	0
2880 min Summer	1.487	0.0	15.0	0
4320 min Summer	1.072	0.0	16.2	0
5760 min Summer	0.849	0.0	17.1	0
7200 min Summer	0.708	0.0	17.8	0
8640 min Summer	0.611	0.0	18.5	0
10080 min Summer	0.539	0.0	19.0	0
15 min Winter	78.861	0.0	4.6	16

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	47.093	0.293	0.0	1.6	1.6	3.5	O K
60 min Winter	47.064	0.264	0.0	1.6	1.6	3.1	O K
120 min Winter	46.976	0.176	0.0	1.6	1.6	2.1	O K
180 min Winter	46.900	0.100	0.0	1.5	1.5	1.2	O K
240 min Winter	46.846	0.046	0.0	1.5	1.5	0.5	O K
360 min Winter	46.800	0.000	0.0	1.3	1.3	0.0	O K
480 min Winter	46.800	0.000	0.0	1.0	1.0	0.0	O K
600 min Winter	46.800	0.000	0.0	0.9	0.9	0.0	O K
720 min Winter	46.800	0.000	0.0	0.7	0.7	0.0	O K
960 min Winter	46.800	0.000	0.0	0.6	0.6	0.0	O K
1440 min Winter	46.800	0.000	0.0	0.4	0.4	0.0	O K
2160 min Winter	46.800	0.000	0.0	0.3	0.3	0.0	O K
2880 min Winter	46.800	0.000	0.0	0.2	0.2	0.0	O K
4320 min Winter	46.800	0.000	0.0	0.2	0.2	0.0	O K
5760 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K
7200 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K
8640 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K
10080 min Winter	46.800	0.000	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	50.688	0.0	6.0	27
60 min Winter	31.124	0.0	7.3	46
120 min Winter	18.553	0.0	8.7	80
180 min Winter	13.571	0.0	9.6	112
240 min Winter	10.827	0.0	10.2	140
360 min Winter	7.851	0.0	11.1	0
480 min Winter	6.250	0.0	11.8	0
600 min Winter	5.233	0.0	12.3	0
720 min Winter	4.525	0.0	12.8	0
960 min Winter	3.596	0.0	13.5	0
1440 min Winter	2.598	0.0	14.7	0
2160 min Winter	1.875	0.0	15.9	0
2880 min Winter	1.487	0.0	16.8	0
4320 min Winter	1.072	0.0	18.1	0
5760 min Winter	0.849	0.0	19.2	0
7200 min Winter	0.708	0.0	20.0	0
8640 min Winter	0.611	0.0	20.7	0
10080 min Winter	0.539	0.0	21.3	0

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 56 minutes.

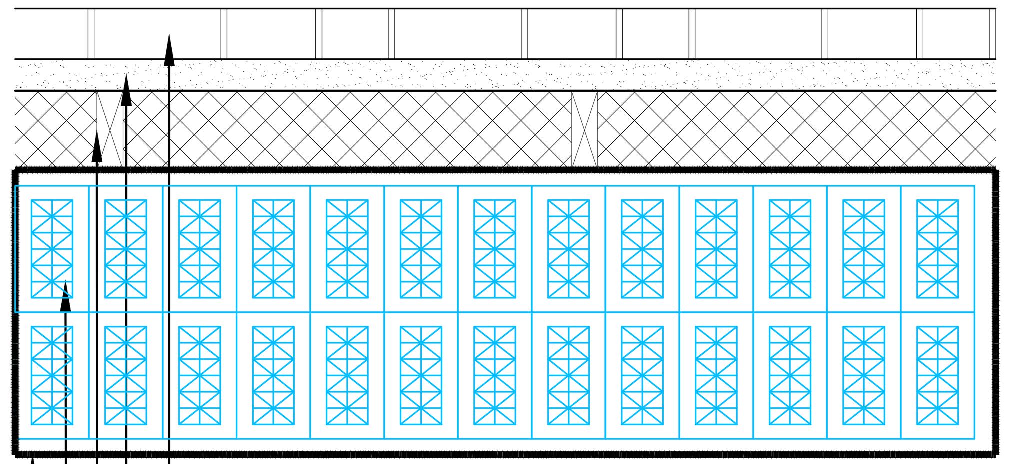
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	47.314	0.514	0.0	1.6	1.6	6.1	O K
30 min Summer	47.401	0.601	0.0	1.6	1.6	7.1	O K
60 min Summer	47.404	0.604	0.0	1.6	1.6	7.2	O K
120 min Summer	47.353	0.553	0.0	1.6	1.6	6.6	O K
180 min Summer	47.289	0.489	0.0	1.6	1.6	5.8	O K
240 min Summer	47.212	0.412	0.0	1.6	1.6	4.9	O K
360 min Summer	47.076	0.276	0.0	1.6	1.6	3.3	O K
480 min Summer	46.977	0.177	0.0	1.6	1.6	2.1	O K
600 min Summer	46.908	0.108	0.0	1.5	1.5	1.3	O K
720 min Summer	46.862	0.062	0.0	1.5	1.5	0.7	O K
960 min Summer	46.811	0.011	0.0	1.4	1.4	0.1	O K
1440 min Summer	46.800	0.000	0.0	1.1	1.1	0.0	O K
2160 min Summer	46.800	0.000	0.0	0.8	0.8	0.0	O K
2880 min Summer	46.800	0.000	0.0	0.6	0.6	0.0	O K
4320 min Summer	46.800	0.000	0.0	0.4	0.4	0.0	O K
5760 min Summer	46.800	0.000	0.0	0.3	0.3	0.0	O K
7200 min Summer	46.800	0.000	0.0	0.3	0.3	0.0	O K
8640 min Summer	46.800	0.000	0.0	0.2	0.2	0.0	O K
10080 min Summer	46.800	0.000	0.0	0.2	0.2	0.0	O K
15 min Winter	47.389	0.589	0.0	1.6	1.6	7.0	O K

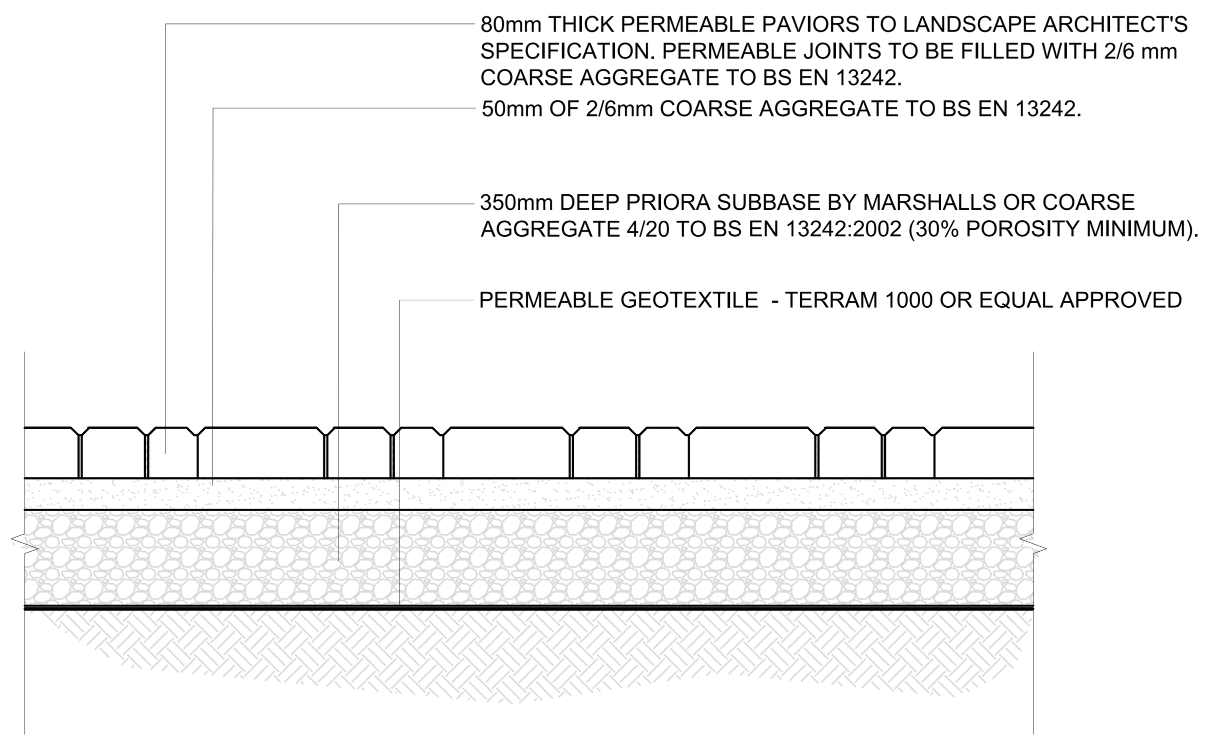
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	143.471	0.0	7.5	17
30 min Summer	92.945	0.0	9.7	31
60 min Summer	57.296	0.0	12.0	52
120 min Summer	34.135	0.0	14.4	86
180 min Summer	24.896	0.0	15.6	120
240 min Summer	19.794	0.0	16.6	154
360 min Summer	14.272	0.0	18.0	214
480 min Summer	11.320	0.0	19.0	272
600 min Summer	9.451	0.0	19.8	328
720 min Summer	8.152	0.0	20.5	384
960 min Summer	6.452	0.0	21.7	492
1440 min Summer	4.634	0.0	23.4	0
2160 min Summer	3.323	0.0	25.1	0
2880 min Summer	2.622	0.0	26.4	0
4320 min Summer	1.876	0.0	28.4	0
5760 min Summer	1.478	0.0	29.8	0
7200 min Summer	1.228	0.0	30.9	0
8640 min Summer	1.055	0.0	31.9	0
10080 min Summer	0.928	0.0	32.7	0
15 min Winter	143.471	0.0	8.4	17

Summary of Results for 100 year Return Period (+40%)

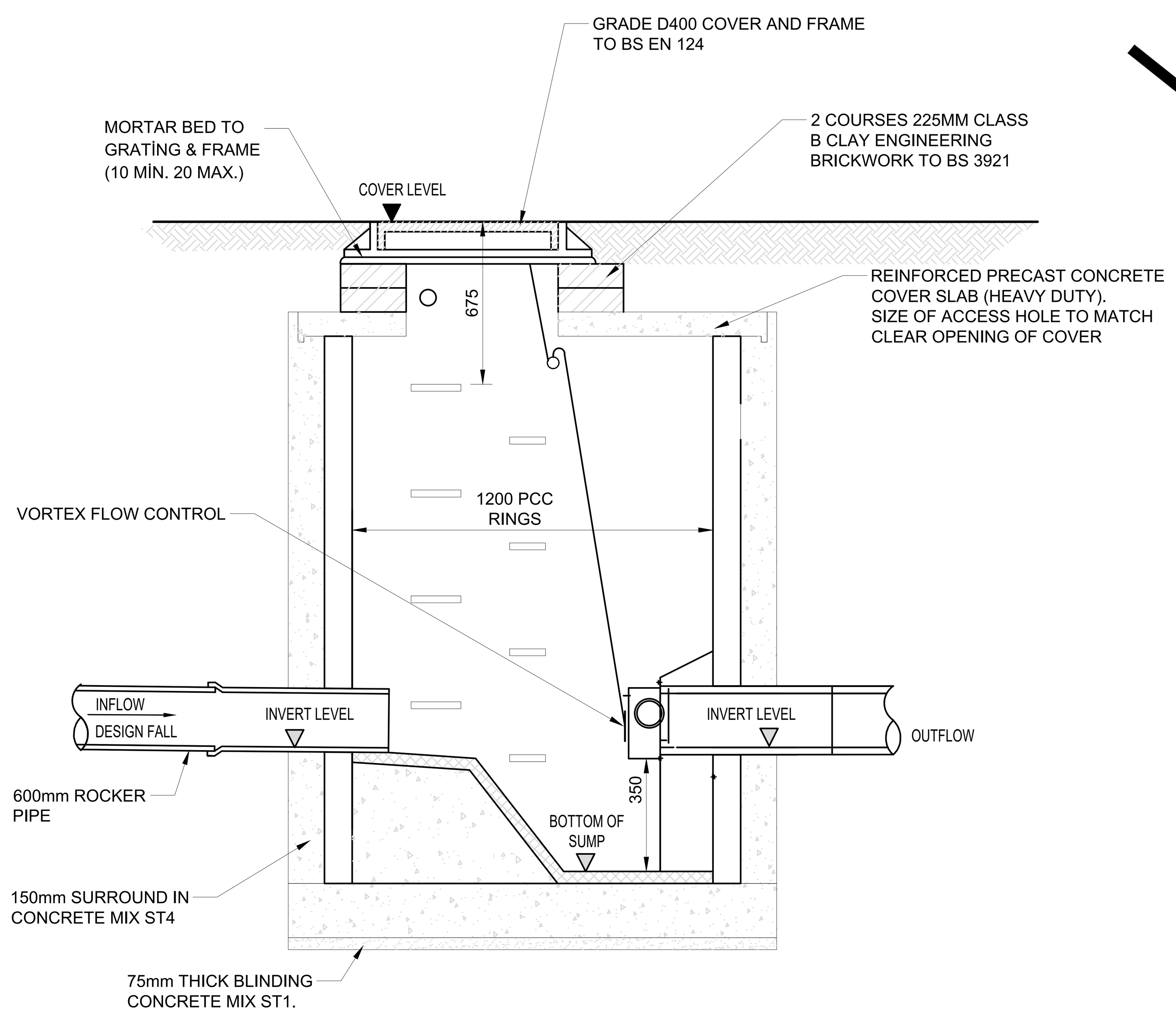
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	47.499	0.699	0.0	1.6	1.6	8.3	O K
60 min Winter	47.516	0.716	0.0	1.6	1.6	8.5	O K
120 min Winter	47.440	0.640	0.0	1.6	1.6	7.6	O K
180 min Winter	47.347	0.547	0.0	1.6	1.6	6.5	O K
240 min Winter	47.234	0.434	0.0	1.6	1.6	5.2	O K
360 min Winter	47.026	0.226	0.0	1.6	1.6	2.7	O K
480 min Winter	46.901	0.101	0.0	1.5	1.5	1.2	O K
600 min Winter	46.833	0.033	0.0	1.4	1.4	0.4	O K
720 min Winter	46.800	0.000	0.0	1.3	1.3	0.0	O K
960 min Winter	46.800	0.000	0.0	1.1	1.1	0.0	O K
1440 min Winter	46.800	0.000	0.0	0.8	0.8	0.0	O K
2160 min Winter	46.800	0.000	0.0	0.5	0.5	0.0	O K
2880 min Winter	46.800	0.000	0.0	0.4	0.4	0.0	O K
4320 min Winter	46.800	0.000	0.0	0.3	0.3	0.0	O K
5760 min Winter	46.800	0.000	0.0	0.2	0.2	0.0	O K
7200 min Winter	46.800	0.000	0.0	0.2	0.2	0.0	O K
8640 min Winter	46.800	0.000	0.0	0.2	0.2	0.0	O K
10080 min Winter	46.800	0.000	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	92.945	0.0	10.9	31
60 min Winter	57.296	0.0	13.5	58
120 min Winter	34.135	0.0	16.1	92
180 min Winter	24.896	0.0	17.5	130
240 min Winter	19.794	0.0	18.5	168
360 min Winter	14.272	0.0	20.1	224
480 min Winter	11.320	0.0	21.3	278
600 min Winter	9.451	0.0	22.2	328
720 min Winter	8.152	0.0	23.0	368
960 min Winter	6.452	0.0	24.3	0
1440 min Winter	4.634	0.0	26.2	0
2160 min Winter	3.323	0.0	28.1	0
2880 min Winter	2.622	0.0	29.6	0
4320 min Winter	1.876	0.0	31.8	0
5760 min Winter	1.478	0.0	33.4	0
7200 min Winter	1.228	0.0	34.7	0
8640 min Winter	1.055	0.0	35.7	0
10080 min Winter	0.928	0.0	36.7	0

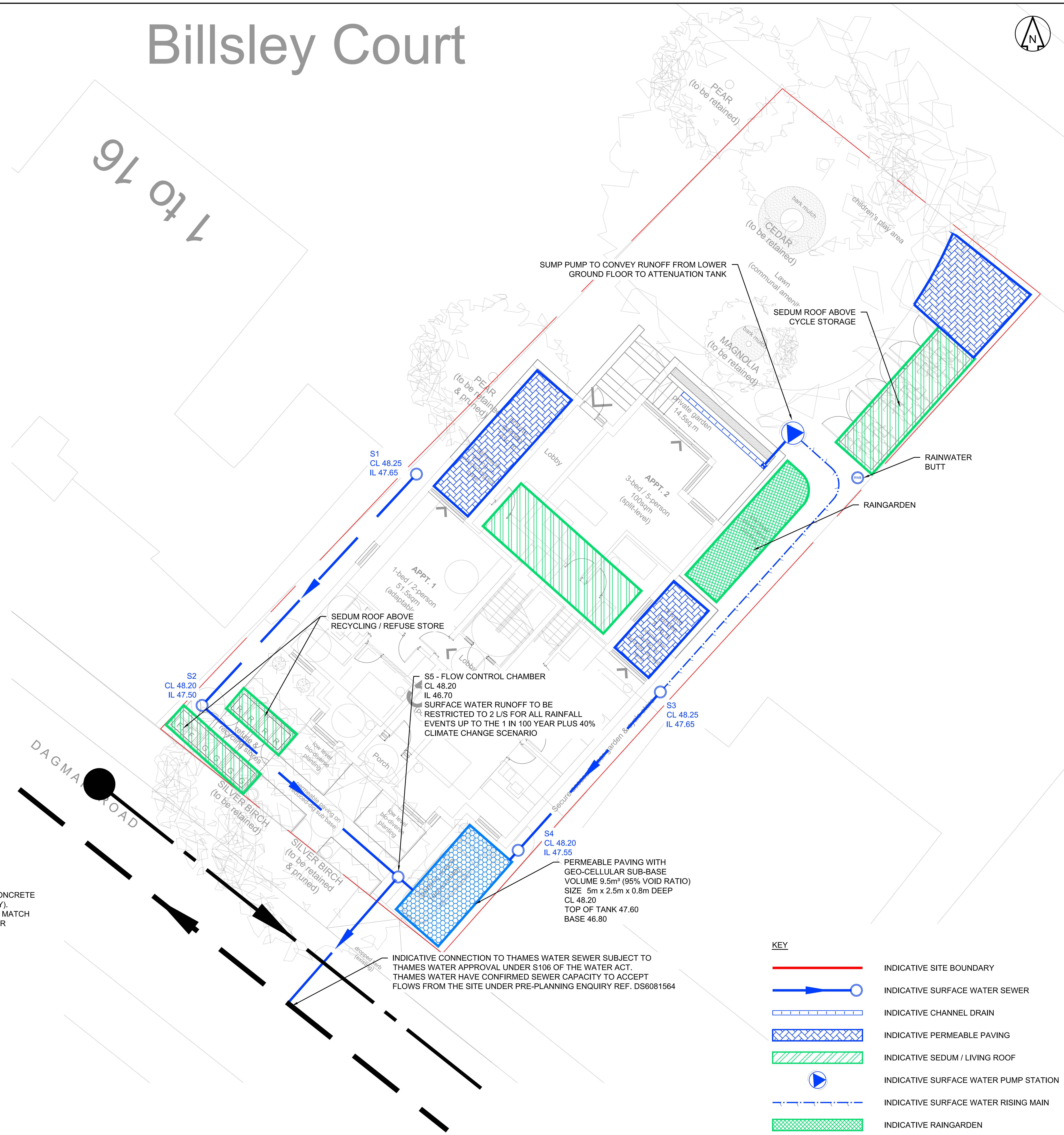




TYPICAL PERMEABLE PAVING DETAIL
(SCALE 1:20)



TYPICAL HYDROBRAKE FLOW CONTROL CHAMBER
(NOT TO SCALE)



KEY

	INDICATIVE SITE BOUNDARY
	INDICATIVE SURFACE WATER SEWER
	INDICATIVE CHANNEL DRAIN
	INDICATIVE PERMEABLE PAVING
	INDICATIVE SEDUM / LIVING ROOF
	INDICATIVE SURFACE WATER PUMP STATION
	INDICATIVE SURFACE WATER RISING MAIN
	INDICATIVE RAINGARDEN
	INDICATIVE GEO-CELLULAR TANK
	INDICATIVE SURFACE WATER FLOW CONTROL
	THAMES WATER SURFACE WATER SEWER
	THAMES WATER FOUL SEWER

Scale 1:100 @ A1 - 1:200 @ A3

2m 0 2m 4m 6m 8m 10m

DO NOT SCALE OFF THIS DRAWING

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
6. ALL WORKS OUTSIDE SITE BOUNDARY ARE FOR INFORMATION PURPOSES ONLY. UNLESS SPECIFICALLY NOTED, ALL WORKS OUTSIDE THE SITE BOUNDARY WILL BE UNDERTAKEN BY OTHERS UNDER A SEPARATE CONTRACT.
7. THIS DRAWING HAS BEEN BASED ON DRAWING No. 090-100 "PROPOSED GROUND FLOOR PLAN" BY UNFOLD ARCHITECTURE + DESIGN, DATED 23.02.21.
8. EXISTING THAMES WATER SEWERS SHOWN INDICATIVELY BASED ON ASSET LOCATION SEARCH, REF. 2021_4340650, DATED 15.01.2021.
9. THE DRAINAGE STRATEGY IS INDICATIVE ONLY, TO DEMONSTRATE DESIGN INTENT AND ATTENUATION STORAGE REQUIREMENTS. DESIGN SUBJECT TO CHANGE AND DESIGN TEAM COORDINATION.
10. INDICATIVE DRAINAGE STRATEGY SUBJECT TO THAMES WATER AND LONDON BOROUGH OF CROYDON (LEAD LOCAL FLOOD AUTHORITY) APPROVAL.

CDM NOTES:

1. THE ATTENTION OF THE CLIENT AND THE PRINCIPAL CONTRACTOR IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:
2. WORKS IN THE VICINITY OF LIVE SERVICES WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
3. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

Revision History

Rev	Comment	By	Chkd	Appr	Date
P01	ISSUED FOR PLANNING	DR	DM	AKS	26.02.21

Current Revision

Rev	Comment	By	Chkd	Appr	Date
P01	ISSUED FOR PLANNING	DR	DM	AKS	26.02.21

S2 - INFORMATION

INICIO HOMES

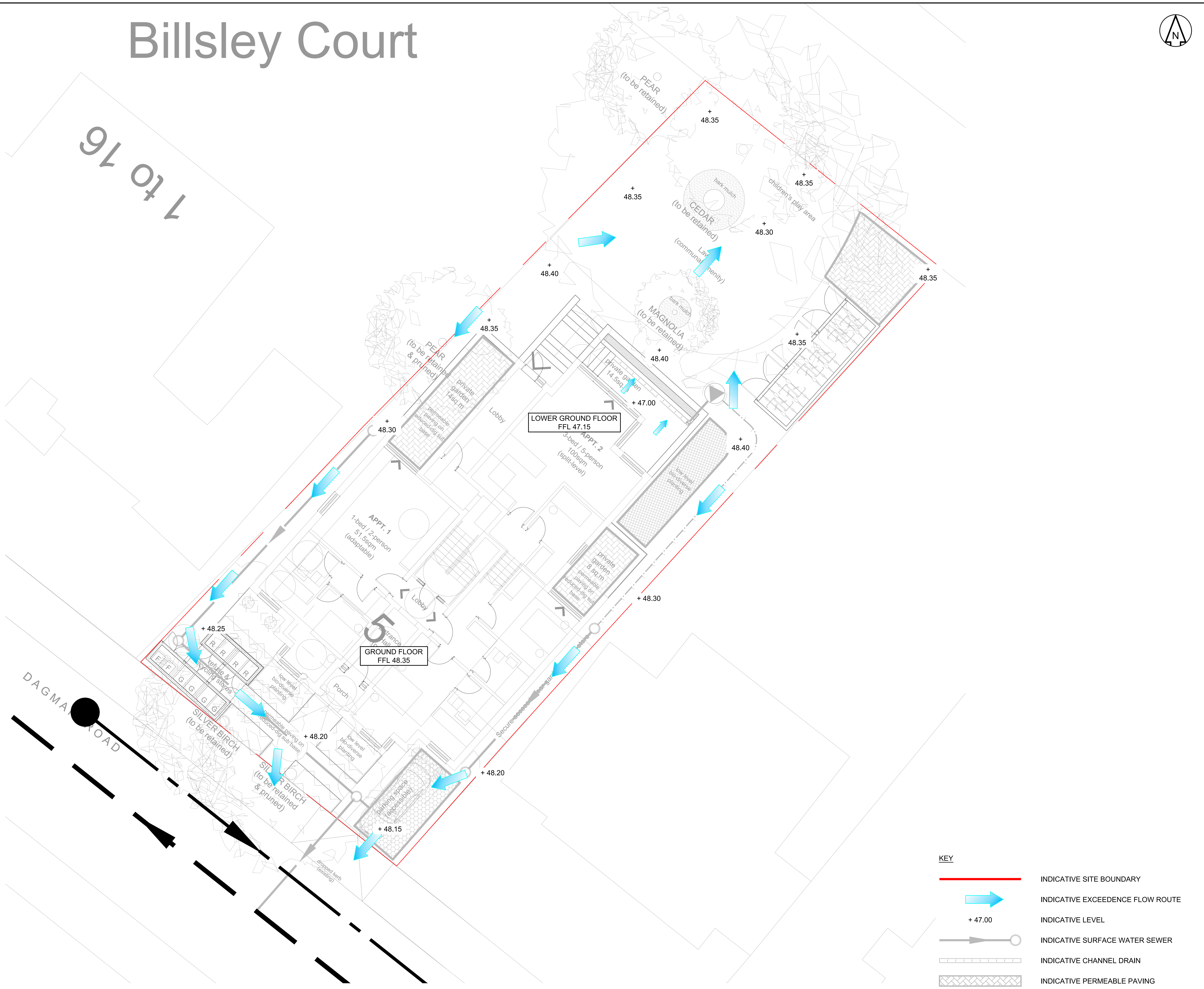
MARKIDES ASSOCIATES
TRANSPORT PLANNING AND ENGINEERING

Project
5 DAGMAR ROAD, LONDON, SE25 6HZ

Drawing Title
INDICATIVE SURFACE WATER DRAINAGE STRATEGY

Markides Associates reference: 21004-00 1:100 @ A1

21004-MA-XX-XX-DR-C-0500 - P01



KEY

- INDICATIVE SITE BOUNDARY
- INDICATIVE EXCEEDENCE FLOW ROUTE
- + 47.00 INDICATIVE LEVEL
- INDICATIVE SURFACE WATER SEWER
- INDICATIVE CHANNEL DRAIN
- INDICATIVE PERMEABLE PAVING
- INDICATIVE SURFACE WATER PUMP STATION
- INDICATIVE SURFACE WATER RISING MAIN
- INDICATIVE RAINGARDEN
- INDICATIVE GEO-CELLULAR TANK
- INDICATIVE SURFACE WATER FLOW CONTROL
- THAMES WATER SURFACE WATER SEWER
- THAMES WATER FOUL SEWER

Scale 1:100 @ A1 - 1:200 @ A3

2m 0 2m 4m 6m 8m 10m

DO NOT SCALE OFF THIS DRAWING

NOTES

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2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
6. ALL WORKS OUTSIDE SITE BOUNDARY ARE FOR INFORMATION PURPOSES ONLY. UNLESS SPECIFICALLY NOTED, ALL WORKS OUTSIDE THE SITE BOUNDARY WILL BE UNDERTAKEN BY OTHERS UNDER A SEPARATE CONTRACT.
7. THIS DRAWING HAS BEEN BASED ON DRAWING No. 090-100 "PROPOSED GROUND FLOOR PLAN" BY UNFOLD ARCHITECTURE + DESIGN, DATED 23.02.21.
8. LEVELS SHOWN INDICATIVELY ONLY, TO DEMONSTRATE DESIGN INTENT AND FEASIBILITY. LEVELS STRATEGY SUBJECT TO CHANGE AND DESIGN TEAM COORDINATION.
9. REFER TO DRAWING 21004-MA-XX-XX-DR-C-0500 FOR INDICATIVE DRAINAGE STRATEGY.

Revision History

Rev	Comment	By	Chkd	Appr	Date
P01	ISSUED FOR PLANNING	DR	DM	AKS	26.02.21

Current Revision

Rev	Comment	By	Chkd	Appr	Date
P01	ISSUED FOR PLANNING	DR	DM	AKS	26.02.21

S2 - INFORMATION

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Drawing Title
INDICATIVE EXCEEDENCE FLOW ROUTE

Markides Associates reference: 21004-00 1:100 @ A1

21004-MA-XX-XX-DR-C-0502 - P01

APPENDIX E – SUDS MANAGEMENT PLAN

SuDS MANAGEMENT PLAN

This long-term Management Plan of the Sustainable Drainage System should be implemented at **5 Dagmar Road, London, SE25 6HZ** to ensure that the drainage network functions as designed. This plan is intended to cover all on-site drainage structures. The Site Management Team should oversee and implement the SuDS Management Plan and designate a qualified person who will be responsible for the proper operation and maintenance of the foul and stormwater structures.

Stormwater Runoff Quality

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, catchpit manholes and silt trapped gullies will reduce the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of bin areas.

Drainage System

Maintenance and cleaning of gullies, channel drains, inspection chambers, manholes, and SuDS components will assure adequate performance. This maintenance program is outlined below;

Maintenance Program

The Site Management Team will conduct the operation and maintenance plan set forth in this document. The Site Management will ensure that inspections and record keeping are timely and accurate. Inspection & Maintenance Log Forms (attached) should include the date and physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Records of maintenance will be kept on file at the property and copies of Inspection & Maintenance Log sheets indicating all work and inspections will be available to the Council upon request.

Concurrent with inspection and cleaning, all litter shall be picked up and removed from the parking areas, external bin store, wetland areas, and soft landscaping.

Regular maintenance should include;

1. Inspect sedum roof inlets/outlets and remove any debris every 6 months or as determined to be reasonable based on experience with the installed systems to ensure that the system continues to work as intended and is free of debris; quarterly, inspect inspection chambers and manholes; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. Excessive sediment shall be removed and properly disposed by a licensed drainage cleaning company.
2. Inspection of external cycle and refuse stores for spillage and scattered litter must be performed on a regular basis to prevent the spread of pollutants into the stormwater management system.
3. Permeable paving and attenuation tank inlets, and roof gully outlets and vents and overflows should be checked annually and after large storms to ensure that they are in good condition and operating as designed. Regular maintenance includes inspection and identification of any areas that are not operating correctly monthly for the first 3 months and then every 6 months after.

Winter Maintenance Program

Ensure that drainage structures are not blocked by ice, snow, debris or rubbish during winter months.

Fertiliser Use

Only slow-release organic low-phosphorous fertilisers will be used in any landscaped areas in order to limit the amount of nutrients that could enter the stormwater system.

Maintenance Task	Description	Frequency
	Regular Maintenance	
Litter management	Pick up all litter in suds and landscape areas and remove from site	Monthly
Landscaped & Vegetated Areas	Trim plants and grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ	As required or monthly
Inlets and outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	Monthly
Hard surfaces	Sweep all paving regularly. Sweep and suction brush permeable paving in autumn after leaf fall.	Annually
	Occasional tasks	
Inspection and control chambers	Annual inspection, remove silt and check free flow	Annually
	Remedial work	
	Inspect suds system regularly to check for damage or failure. Undertake remedial work as required.	As required

Drainage Operation and Maintenance Log

Site Maintenance Supervisor:______________________________ Date:___________

☐ Routine ☐ Response to rainfall event __ in ☐ Other:_______________

BMP	Frequency	Date Performed	Comments
Inlets/outlets and Manholes	Monthly Inspections		
	Maintenance Quarterly and as necessary		
Communal terrace and private patios	Monthly Sweeping		
	Rubbish & Litter Removal as Necessary		
Landscaped & Vegetated Areas	Maintenance as necessary		
Geo-cellular Attenuation Tank	Inspect and identify areas not operating property every 3 months (for the first 3 months) and every 6 months after		
	Full bi-annual inspection		

APPENDIX F – SUDS PRO-FORMA

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www.croydon.gov.uk

GREATERLONDONAUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	5 Dagmar Road
Address & post code	5 Dagmar Road, London SE25 6HZ
OS Grid ref. (Easting, Northing)	E 533125 N 167995
LPA reference (if applicable)	N/A
Brief description of proposed work	Demolition of existing dwelling to provide 8 residential units
Total site Area	615 m^2
Total existing impervious area	150 m^2
Total proposed impervious area	275 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Connection to surface water sewer
Designer Name	Dominic Ramdeen
Designer Position	Principal Engineer
Designer Company	Markides Associates

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	N/A	
Bedrock geology classification	Lambeth Goup	
Site infiltration rate	greater than 10-6	m/s
Depth to groundwater level	25	m below ground level
Is infiltration feasible?	No	

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	Y
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	
6 discharge rainwater to a surface water sewer/drain		
7 discharge rainwater to the combined sewer.		

2c. Proposed Discharge Details

Proposed discharge location	Thames Water surface water sewer
Has the owner/regulator of the discharge location been consulted?	Yes

3. Drainage Strategy

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.1			
1 in 1	0.1	2.1	24	2
1 in 30	0.2	4	21	2
1 in 100	0.3	6	19	2
1 in 100 + CC				2
Climate change allowance used		40%		

3b. Principal Method of Flow Control	Vortex Flow Control

3c. Proposed SuDS Measures			
	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	275		9.5
Total	275	0	9.5

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Page 4, Appendix B
Drainage hierarchy (2b)	Table 4.1, Page 8
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix C
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix D
Proposed SuDS measures & specifications (3b)	Appendix D

4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix D
Detailed drainage design drawings, including exceedance flow routes	Appendix D
Detailed landscaping plans	Appendix A
Maintenance strategy	Appendix E
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	Table 4.4, Page 12
b) biodiversity?	Page 9
c) amenity?	Page 9