Job Number: 1843
Date: 15/02/2022

Channing School – Car Park Drainage Note

Issue	Date	Reason for Issue	Author
0	February 2022	Comment	CLennon

Contents

1. Introduction

This report has been compiled to respond to an email received from the SuDS officer at London Borough of Camden dated 11/01/2022. A copy of this email is contained in Appendix A.

The email sets out various information and clarifications which are required to allow the local authority to fully understand and assess how the proposed car park will drain. An extract from the email is set out below, where the outstanding information is described:

1. *"It should be confirmed whether a soakaway will be provided and detailed designs of the size and position of this should also be provided. This is to ensure that the applicant is adhering to the hierarchy of drainage set out in the London Plan Policy SI 13 and that sufficient features have been provided to drain the site effectively.*
2. *Existing and proposed runoff rates should be provided, even if minimal runoff is not expected, to demonstrate that runoff will be as close as possible to greenfield rates. This is to comply with London Plan Policy SI 13 and Local Plan Policy CC3 which encourages developments to achieve greenfield runoff rates, or as close as possible, wherever possible.*
3. *Evidence and calculations should be provided to demonstrate that the site does not flood in the 1 in 30 year rainfall event, and that no buildings will be flooded in the 1 in 100 year event. Details should also be provided of exceedance flow paths in the case of events above the 1 in 100 year event, managed in a way that minimises risk from flooding on and off site. This is to comply with national planning policy guidance and best practice guidance to ensure that the development will not increase the risk of flooding on site or elsewhere.*
4. *Maintenance tasks and frequencies should be provided for each drainage feature, along with the maintenance owner."*

Each point above will be addressed in turn in this report, with supporting information included in the appendices.

2. Soakaway Design

The permeable car park build up has been confirmed by the architects, refer to Appendix B for the email correspondence. The build-up contains a 150mm layer of hydraulically bound material which is understood to have a void ratio of approximately 10%.

The architects drawings in Appendix B confirm the location of the permeable car park which will act as its own soakaway. The total area of the permeable paving is c. 565m^2.

3. Existing & Proposed Run-off

The SuDS proforma, contained in Appendix C has been updated to include this information, as requested. The existing run-off rate has been calculated using the modified rational method, the proposed run-off rate is listed as "NA" as the car park will infiltrate to the ground.

4. Detailed Design & Exceedance

A source control model has been built in MicroDrainage which is based on the following parameters:

- Catchment area: 565 m^2
- Permeable paving extent: 565 m^2
- Infiltration rate: 1.148 x 10^{-4} m/s
- Effective storage volume (150mm deep at 10% void ratio): 8.5 m^3

These calculations found that there will be no flooding in the 1 in 30 year and no flooding of buildings in the 1 in 100 year event. A copy of the calculations are contained in Appendix D.

It's worth noting that the rate of infiltration on site is very fast and far exceeds the requirements for the rainfall expected to fall on the car park, even in the 1 in 100 +40% climate change rainfall event. The calculations show that, in the worst case, the depth of water in the sub-base is less than 50% of the available depth.

An exceedance plan has also been compiled and is contained in Appendix E of this report.

5. Maintenance Schedule

A copy of the maintenance schedule is contained in Appendix F.

Appendix A

Letter from London Borough of Camden

Carmel Lennon

Subject: RE: 2021/3234/P - Channing Junior School

From: Ewan Campbell <Ewan.Campbell@camden.gov.uk>
Sent: 11 January 2022 16:31
To: Oliver Coleman <oliverc@rolfe-judd.co.uk>
Cc: Philip Dunphy <Philipd@rolfe-judd.co.uk>
Subject: RE: 2021/3234/P - Channing Junior School

Hi Oliver

Hope you are well, I have been liaising with the LLFA regarding this application and I am afraid we still need more information. Below I have set out what was found and what we still need

This application has not sufficiently demonstrated the use of the London Plan's drainage hierarchy and is proposing the following key items:

- Type of development: Minor application – reconfiguration of car park, gate installation and boundary wall alteration
- Flood risk: Low
- Types of conveyance / attenuation features: Infiltration through permeable paving and soakaway
- Runoff rate restriction (l/s): None
- Runoff attenuation volume (m3): Not stated
- Maintenance plan: Not stated

Recommendations and requests:
We require more information and improved proposals before recommending approval of the application for the following reasons:

1. The applicant has followed the drainage hierarchy by proposing drainage through infiltration. They have provided evidence of an appropriate infiltration rate. However, detailed designs of the size and location of the permeable paving has not been provided.
2. Existing and proposed runoff rates for the site area have not been included.
3. Evidence has not been provided to demonstrate that infiltration will be sufficient to drain the site in extreme rainfall events without risk of flooding.
4. Maintenance tasks and frequencies have not been provided for the permeable paving or soakaways to ensure that they continue to function for the foreseeable future. The maintenance owner has also not been stated.

To address the above, please can the applicant submit information which:

1. It should be confirmed whether a soakaway will be provided and detailed designs of the size and position of this should also be provided. This is to ensure that the applicant is adhering to the hierarchy of drainage set out in the London Plan Policy SI 13 and that sufficient features have been provided to drain the site effectively.
2. Existing and proposed runoff rates should be provided, even if minimal runoff is not expected, to demonstrate that runoff will be as close as possible to greenfield rates. This is to comply with London Plan Policy SI 13 and Local Plan Policy CC3 which encourages developments to achieve greenfield runoff rates, or as close as possible, wherever possible.
3. Evidence and calculations should be provided to demonstrate that the site does not flood in the 1 in 30 year rainfall event, and that no buildings will be flooded in the 1 in 100 year event. Details should also

be provided of exceedance flow paths in the case of events above the 1 in 100 year event, managed in a way that minimises risk from flooding on and off site. This is to comply with national planning policy guidance and best practice guidance to ensure that the development will not increase the risk of flooding on site or elsewhere.

4. Maintenance tasks and frequencies should be provided for each drainage feature, along with the maintenance owner.

Hopefully this makes sense, if this is going to take a significant time I would recommend a part discharge of the condition whilst we awaiting these details.

Look forward to hearing from you

Kind regards

Ewan Campbell
Planning Officer
Supporting Communities
London Borough of Camden

Web: camden.gov.uk

5 Pancras Square
London N1C 4AG

Appendix B

Architects Drawings

Carmel Lennon

From: John Bater <jbater@prime-meridian.co.uk>
Sent: 31 January 2022 10:25
To: Carmel Lennon
Cc: Oliver Coleman
Subject: Channing School Fairseat Car Park

Carmel
I have finally received the information you requested.

The site was reduced by 300mm.
Layer of Tarram geotextile fabric.
150mm 6F2 crushed concrete.
150mm of HBW.
It was relayed to the existing levels show on plan

REGARDS

John Bater
Prime Meridian
ARCHITECTS & STRUCTURAL ENGINEERS

T : 020 7287 9917 M : 07730 527079
London Office : 26A Ganton Street, London W1F 7QZ
Somerset Office : The Priory, Draycott Road, Shepton Mallet, Somerset BA4 5HS

No. 343.47/PLC02

Notes: Do not scale from this drawing. Contractor to take and check all dimensions on site before work commences. Discrepancies to be reported to architect. Subcontractors to verify all dimensions on site before making shop drawings or commencing manufacture.

PAVING SPECS:

- **PAVING.** MARSHALLS CONSERVATION PRIORA PERMEABLE FLAG PAVING SYSTEM COLOUR CHARCOL.
- **MARSHALLS TARMAC KERB.** DRIVESETT KERB EDGE TO BE LEVELLED WITH THE TARMAC. COLOUR PENNANT GREY.
- **TARMAC.** TARMAC TOP MIX PERMEABLE. COLOUR BLACK.
- **GRASS.** BS ECO-CLOVER GRASS SEED. TO REPAIR EXISTING LAWN

LIGHTING:
ALL EXTERNAL LIGHTING RETAINED REPLACEMENT LED TO MATCH EXISTING AS REQUIRED.

2.593
112.593
NEW 600X600 BRICK PIER IN BRICKS TO MATCH RETAINED WALL CAPPED WITH RECONSTITUTED STONE CAPS TO MATCH EXISTING ENTRANCE PIERS
EXISTING WALL
112.442
EVCP
112.442
111.729
EXISTING TEMPORARY CROSSOVER TO BE RETAINED SURFACE RELAID WITH YORK STONE ON CONCRETE IN CONSULTATION WITH HIGHWAYS.
PERMEABLE PAVING
111.729
4 ROWS GRANITE SETS BETWEEN PIERS
111.713
ELEC CART
150 X150 DRAINAGE CHANNEL TO SOAKAWAY.
111.713
111.521
111.713
112.217
111.521
112.019
111.521
TEMPORARY SURFACE HYDRAULICALLY BOUND MATERIALS RETAINED AS POROUS SUB-BASE

TO
111.521
RETAINED
D STONE CAPS
EXISTING ENTRANCE
EXISTING WALL
21
PERMEABLE PAVING
111.515
NEW 1000 DIA SOAKAWAY 2.5 M FROM BOUNDARY TO TAKE BIN ENCLOSURE GULLY AND LINIER DRAIN ACROSS ENTRANCE.
PERMEABLE PAVING
111.394
5R
110.536
GEN. WASTE
GULLY
RECYCLE.
GLASS
EXISTING PLANTING AND TREES UNALTERED.
111.778
EVCP
22
21
PERMEABLE
GEN. WASTE
GULLY
RECYCLE.
GLASS

LTERED.
111.549
MINI BUS PARKING
MINI BUS PARKIN
11.863
111.365
111.342
EVCP
EVCP
111.502
16
17
111.196
EXISTING PLANTING UNALTERED.
19
MINI BUS PARKING
111.778
EVCP
EVCP
EXISTING PLANTING AND TREES UNALTERED.
tree line
111.502
EVCP
20
EXISTING BOUNDARY FENCE UNALTERED.

Rev.	Description	Date	Initial
B		22.06.202	B

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Client: **CHANNING SCHOOL**

Project: **PERMANENT ACCESS GATES PARKING AND BINS**

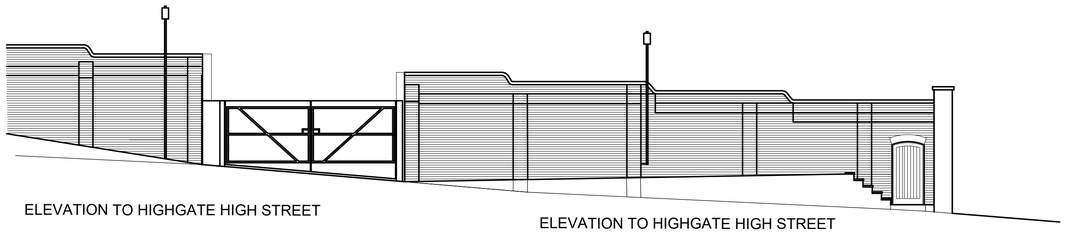
Title: **FAIRSEAT ACCESS AND PARKING**

Date: JUNE 21
Scale: 1/50@A1
Drawn: UB

No. 343.47/PLC/02

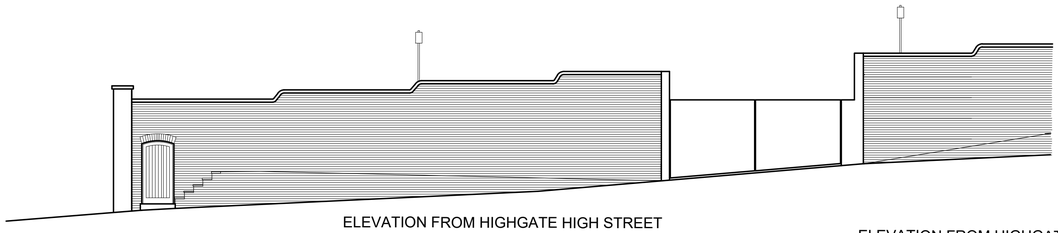
No. 343.47/ PL01 A

Notes: Do not scale from this drawing. Contractor to take and check all dimensions on site before work commences. Discrepancies to be reported to architect. Subcontractors to verify all dimensions on site before making shop drawings or commencing manufacture.



ELEVATION TO HIGHGATE HIGH STREET

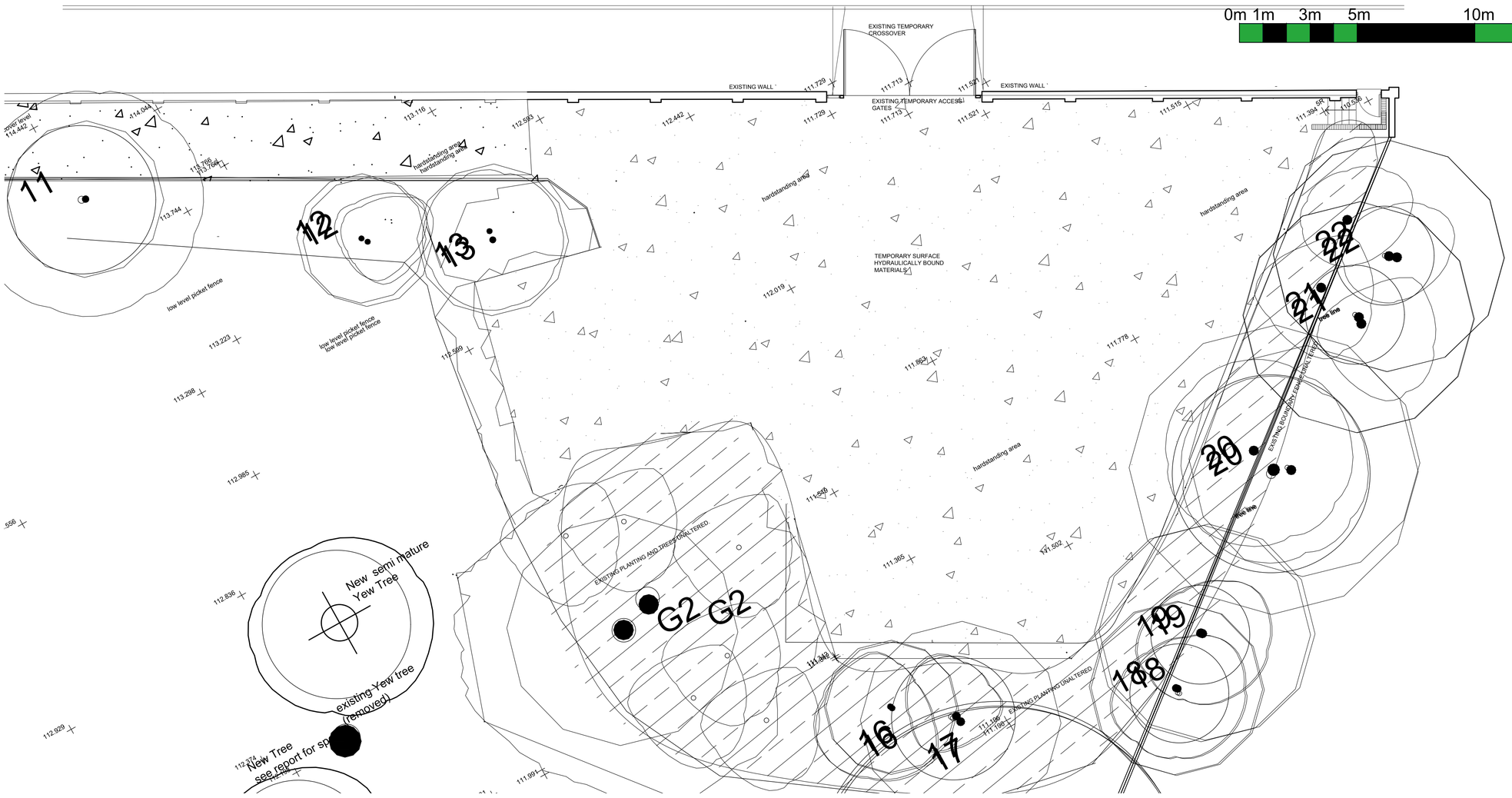
ELEVATION TO HIGHGATE HIGH STREET



ELEVATION FROM HIGHGATE HIGH STREET

ELEVATION FROM HIGHGATE HIGH STREET

0m 1m 3m 5m 10m 15m 20m



Rev	Description	Date	Initial
A	SCALE CHANGED TO 1:100	25/10/2019	JB

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Client: **CHANNING SCHOOL**

Project: **FAIRSEAT ACCESS GATES**

Title: **PROPOSED PERMANENT ACCESS GATES - EXISTING PLAN & ELEVATIONS**

Date: JUNE 19
Scale: 1/100 @A1
Drawn: JB

No. 343.47/PL01 A

No. 343.47/PLC01

Notes: Do not scale from this drawing. Contractor to take and check all dimensions on site before work commences. Discrepancies to be reported to architect. Subcontractors to verify all dimensions on site before making shop drawings or commencing manufacture.

PAVING SPECS:

- **PAVING.** MARSHALLS CONSERVATION PRIORA
- PERMEABLE FLAG PAVING SYSTEM COLOUR CHARCOL.
-
- **MARSHALLS TARMAC KERB.** DRIVESETT KERB EDGE TO BE LEVELLED WITH THE TARMAC. COLOUR PENNANT GREY.
-
- **TARMAC.** TARMAC TOP MIX PERMEABLE. COLOUR BLACK.
-
- **GRASS.** BS ECO-CLOVER GRASS SEED. TO REPAIR EXISTING LAWN

LIGHTING:
ALL EXTERNAL LIGHTING RETAINED
REPLACEMENT LED TO MATCH EXISTING AS REQUIRED.

TARMAC
TOTAL AREA
TH3 235 m²
PLANTING
hardstanding area
cover level
EXISTING LAWN UNALTERED.
EXISTING PLANTING UNALTERED.
EXISTING PLANTING AND TREES UNALTERED.
EXISTING LAWN UNALTERED.
EXISTING LAWN UNALTERED.
EXISTING PLANTING UNALTERED.
EXISTING PLANTING UNALTERED.
EXISTING PLANTING AND TREES UNALTERED.
EXISTING PLANTING AND TREES UNALTERED.
EXISTING PLANTING AND TREES UNALTERED.
EXISTING BOUNDARY FENCE UNALTERED
tree line
tree line
EXISTING WALL
EXISTING WALL
NEW 800X600 BRICK PIER IN BRICKS TO MATCH RETAINED WALL CAPPED WITH RECONSTITUTED STONE CAPS TO MATCH EXISTING ENTRANCE PIERS
NEW 600X600 BRICK PIER IN BRICKS TO MATCH RETAINED WALL CAPPED WITH RECONSTITUTED STONE CAPS TO MATCH EXISTING ENTRANCE PIERS
EXISTING TEMPORARY CROSSOVER TO BE RETAINED SURFACE RELAID WITH STONE ON CONCRETE IN CONSULTATION WITH YORK HIGHWAYS
4 BOLLARDS REMOVABLE TO ALLOW ACCESS
PERMEABLE PAVING
ELEC CART
150 X150 DRAINAGE CHANNEL TO SOAKAWAY
TEMPORARY SURFACE HYDRAULICALLY BOUND MATERIALS RETAINED AS POROUS SUB-BASE
NEW POROUS TARMAC FINISH LAID TO EXISTING FALLS.
NEW 1000 DIA SOAKAWAY 2.5 METRES BOUNDARY TO TAKE BIN ENCLOSURE GULLY AND LINIER DRAIN ACROSS ENTRANCE.
PERMEABLE PAVING
GEN. WASTE
GULLY
RECYCLE.
GLASS
PERMEABLE PAVING
EVCP
ELEC. VEHICLE CHARGE POINT
ELEC CAR PARKING
MINI BUS PARKING
MINI BUS PARKING
EVCP
EVCP
EVCP
EVCP
wire fencing
wire fencing
tennis courts
12
13
G2
16
17
18
19
20
21
22
114.939
114.866
114.812
114.733
114.754
114.442
114.044
113.766
113.744
113.116
112.593
112.442
112.442
111.729
111.713
111.713
111.713
111.521
111.521
112.217
112.019
111.521
111.518
111.394
110.536
111.863
111.549
111.365
111.778
111.342
111.502
111.196
111.091
111.103
111.051
111.003
111.013

B
22.06.20 JB
Rev Description Date Initial

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Client: **CHANNING SCHOOL**

Project: **PERMANENT ACCESS GATES PARKING AND BINS**

Title: **FAIRSEAT ACCESS AND PARKING**

Date: JULY 19
Scale: 1/100 @A1
Drawn: JB

No. 343.47/PLC/01

Appendix C

SuDS Proforma

Camden

GREATERLONDONAUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Channing Junior School - Car Park
Address & post code	Channing Junior School, 1 Highgate High St, London N6 5JR, United Kingdom
OS Grid ref. (Easting, Northing)	E 528712
	N 187290
LPA reference (if applicable)	
Brief description of proposed work	Small area of car park to be resurface
Total site Area	565 m^2
Total existing impervious area	565 m^2
Total proposed impervious area	565 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	to ground
Designer Name	Carmel Lennon
Designer Position	Associate Director
Designer Company	Heyne Tillett Steel

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Made Ground, Bagshot Formation
Bedrock geology classification	Claygate Member
Site infiltration rate	0.000114792 m/s
Depth to groundwater level	c. 4 m below ground level
Is infiltration feasible?	Yes

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	Y	Y
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	N
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	N

2c. Proposed Discharge Details

Proposed discharge location	to ground via permeable paving subbase
Has the owner/regulator of the discharge location been consulted?	NA

Camden GREATERLONDONAUTHORITY LoDEG

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	0.26			
1 in 1	0.22	5.11	31.5	NA
1 in 30	0.59	12.56	24.5	NA
1 in 100	0.81	16.29	22.8	NA
1 in 100 + CC			34.5	NA
Climate change allowance used		40%		
3b. Principal Method of Flow Control		NA		

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	565	565	8.5
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		0
Total	**565**	**565**	**8.5**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Refer to attachments
Drainage hierarchy (2b)	See above
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	NA
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	NA
Proposed SuDS measures & specifications (3b)	Refer to contractors details
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Refer to architects drawings
Detailed drainage design drawings, including exceedance flow routes	Refer to architects drawings
Detailed landscaping plans	Refer to architects drawings
Maintenance strategy	See attachments
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	use of permeable paving
b) biodiversity?	NA
c) amenity?	NA

Appendix D

Calculations

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

Half Drain Time : 1 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	4.907	0.057	32.1	3.2	Flood Risk
30 min Summer	4.899	0.049	31.7	2.7	Flood Risk
60 min Summer	4.885	0.035	22.7	2.0	Flood Risk
120 min Summer	4.873	0.023	14.9	1.3	Flood Risk
180 min Summer	4.868	0.018	11.4	1.0	Flood Risk
240 min Summer	4.864	0.014	9.2	0.8	Flood Risk
360 min Summer	4.860	0.010	6.6	0.6	Flood Risk
480 min Summer	4.858	0.008	5.3	0.5	Flood Risk
600 min Summer	4.857	0.007	4.7	0.4	Flood Risk
720 min Summer	4.856	0.006	4.0	0.3	Flood Risk
960 min Summer	4.855	0.005	3.1	0.3	Flood Risk
1440 min Summer	4.854	0.004	2.4	0.2	Flood Risk
2160 min Summer	4.853	0.003	1.8	0.2	Flood Risk
2880 min Summer	4.852	0.002	1.4	0.1	Flood Risk
4320 min Summer	4.852	0.002	1.1	0.1	Flood Risk
5760 min Summer	4.851	0.001	0.8	0.1	Flood Risk
7200 min Summer	4.851	0.001	0.8	0.1	Flood Risk
8640 min Summer	4.851	0.001	0.8	0.1	Flood Risk
10080 min Summer	4.851	0.001	0.8	0.1	Flood Risk
15 min Winter	4.911	0.061	32.1	3.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	148.105	0.0	11
30 min Summer	95.415	0.0	18
60 min Summer	58.456	0.0	34
120 min Summer	34.606	0.0	64
180 min Summer	25.149	0.0	94
240 min Summer	19.947	0.0	124
360 min Summer	14.347	0.0	184
480 min Summer	11.357	0.0	246
600 min Summer	9.468	0.0	302
720 min Summer	8.157	0.0	364
960 min Summer	6.444	0.0	482
1440 min Summer	4.616	0.0	716
2160 min Summer	3.302	0.0	1072
2880 min Summer	2.601	0.0	1420
4320 min Summer	1.857	0.0	2240
5760 min Summer	1.461	0.0	2768
7200 min Summer	1.212	0.0	3664
8640 min Summer	1.040	0.0	4152
10080 min Summer	0.914	0.0	5160
15 min Winter	148.105	0.0	11

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	4.894	0.044	28.4	2.5	Flood Risk
60 min Winter	4.879	0.029	18.8	1.6	Flood Risk
120 min Winter	4.868	0.018	11.4	1.0	Flood Risk
180 min Winter	4.863	0.013	8.5	0.7	Flood Risk
240 min Winter	4.860	0.010	6.6	0.6	Flood Risk
360 min Winter	4.858	0.008	5.0	0.4	Flood Risk
480 min Winter	4.856	0.006	4.0	0.3	Flood Risk
600 min Winter	4.855	0.005	3.4	0.3	Flood Risk
720 min Winter	4.854	0.004	2.7	0.2	Flood Risk
960 min Winter	4.854	0.004	2.4	0.2	Flood Risk
1440 min Winter	4.853	0.003	1.8	0.1	Flood Risk
2160 min Winter	4.852	0.002	1.1	0.1	Flood Risk
2880 min Winter	4.852	0.002	1.1	0.1	Flood Risk
4320 min Winter	4.851	0.001	0.8	0.1	Flood Risk
5760 min Winter	4.851	0.001	0.8	0.1	Flood Risk
7200 min Winter	4.851	0.001	0.5	0.1	Flood Risk
8640 min Winter	4.851	0.001	0.5	0.1	Flood Risk
10080 min Winter	4.851	0.001	0.5	0.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	95.415	0.0	18
60 min Winter	58.456	0.0	34
120 min Winter	34.606	0.0	64
180 min Winter	25.149	0.0	94
240 min Winter	19.947	0.0	126
360 min Winter	14.347	0.0	188
480 min Winter	11.357	0.0	238
600 min Winter	9.468	0.0	316
720 min Winter	8.157	0.0	356
960 min Winter	6.444	0.0	484
1440 min Winter	4.616	0.0	738
2160 min Winter	3.302	0.0	1092
2880 min Winter	2.601	0.0	1352
4320 min Winter	1.857	0.0	2500
5760 min Winter	1.461	0.0	3328
7200 min Winter	1.212	0.0	3712
8640 min Winter	1.040	0.0	5608
10080 min Winter	0.914	0.0	4464

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)	20.600	Shortest Storm (mins)	15
Ratio R	0.445	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.057

Time (mins) From:	To:	Area (ha)
0	4	0.057

Model Details

Storage is Online Cover Level (m) 5.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.41325	Width (m)	20.0
Membrane Percolation (mm/hr)	1000	Length (m)	28.0
Max Percolation (l/s)	155.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.10	Evaporation (mm/day)	3
Invert Level (m)	4.850	Membrane Depth (m)	0

Summary of Results for 30 year Return Period

Half Drain Time : 2 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	4.877	0.027	17.5	1.5	Flood Risk
30 min Summer	4.876	0.026	16.9	1.5	Flood Risk
60 min Summer	4.869	0.019	12.4	1.1	Flood Risk
120 min Summer	4.863	0.013	8.2	0.7	Flood Risk
180 min Summer	4.860	0.010	6.3	0.5	Flood Risk
240 min Summer	4.858	0.008	5.0	0.4	Flood Risk
360 min Summer	4.856	0.006	3.7	0.3	Flood Risk
480 min Summer	4.855	0.005	3.1	0.3	Flood Risk
600 min Summer	4.854	0.004	2.4	0.2	Flood Risk
720 min Summer	4.853	0.003	2.1	0.2	Flood Risk
960 min Summer	4.853	0.003	1.8	0.2	Flood Risk
1440 min Summer	4.852	0.002	1.4	0.1	Flood Risk
2160 min Summer	4.852	0.002	1.1	0.1	Flood Risk
2880 min Summer	4.851	0.001	0.8	0.1	Flood Risk
4320 min Summer	4.851	0.001	0.8	0.1	Flood Risk
5760 min Summer	4.851	0.001	0.5	0.1	Flood Risk
7200 min Summer	4.851	0.001	0.5	0.1	Flood Risk
8640 min Summer	4.851	0.001	0.5	0.1	Flood Risk
10080 min Summer	4.851	0.001	0.5	0.1	Flood Risk
15 min Winter	4.879	0.029	18.5	1.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	81.322	0.0	11
30 min Summer	52.001	0.0	18
60 min Summer	31.749	0.0	34
120 min Summer	18.815	0.0	64
180 min Summer	13.715	0.0	94
240 min Summer	10.917	0.0	122
360 min Summer	7.895	0.0	186
480 min Summer	6.272	0.0	244
600 min Summer	5.243	0.0	306
720 min Summer	4.528	0.0	370
960 min Summer	3.591	0.0	488
1440 min Summer	2.587	0.0	720
2160 min Summer	1.862	0.0	1076
2880 min Summer	1.474	0.0	1448
4320 min Summer	1.059	0.0	2188
5760 min Summer	0.838	0.0	2856
7200 min Summer	0.698	0.0	3432
8640 min Summer	0.601	0.0	4008
10080 min Summer	0.530	0.0	5448
15 min Winter	81.322	0.0	11

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	4.874	0.024	15.3	1.3	Flood Risk
60 min Winter	4.866	0.016	10.1	0.9	Flood Risk
120 min Winter	4.860	0.010	6.3	0.5	Flood Risk
180 min Winter	4.857	0.007	4.7	0.4	Flood Risk
240 min Winter	4.856	0.006	3.7	0.3	Flood Risk
360 min Winter	4.854	0.004	2.7	0.2	Flood Risk
480 min Winter	4.853	0.003	2.1	0.2	Flood Risk
600 min Winter	4.853	0.003	1.8	0.2	Flood Risk
720 min Winter	4.853	0.003	1.8	0.1	Flood Risk
960 min Winter	4.852	0.002	1.4	0.1	Flood Risk
1440 min Winter	4.852	0.002	1.1	0.1	Flood Risk
2160 min Winter	4.851	0.001	0.8	0.1	Flood Risk
2880 min Winter	4.851	0.001	0.8	0.1	Flood Risk
4320 min Winter	4.851	0.001	0.5	0.0	Flood Risk
5760 min Winter	4.851	0.001	0.5	0.1	Flood Risk
7200 min Winter	4.851	0.001	0.5	0.1	Flood Risk
8640 min Winter	4.850	0.000	0.2	0.1	Flood Risk
10080 min Winter	4.850	0.000	0.0	0.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	52.001	0.0	18
60 min Winter	31.749	0.0	34
120 min Winter	18.815	0.0	62
180 min Winter	13.715	0.0	92
240 min Winter	10.917	0.0	120
360 min Winter	7.895	0.0	186
480 min Winter	6.272	0.0	236
600 min Winter	5.243	0.0	308
720 min Winter	4.528	0.0	352
960 min Winter	3.591	0.0	496
1440 min Winter	2.587	0.0	730
2160 min Winter	1.862	0.0	976
2880 min Winter	1.474	0.0	1556
4320 min Winter	1.059	0.0	2232
5760 min Winter	0.838	0.0	3016
7200 min Winter	0.698	0.0	3256
8640 min Winter	0.601	0.0	4712
10080 min Winter	0.530	0.0	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.600	Shortest Storm (mins)	15
Ratio R	0.445	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.057

Time (mins) From:	To:	Area (ha)
0	4	0.057

Model Details

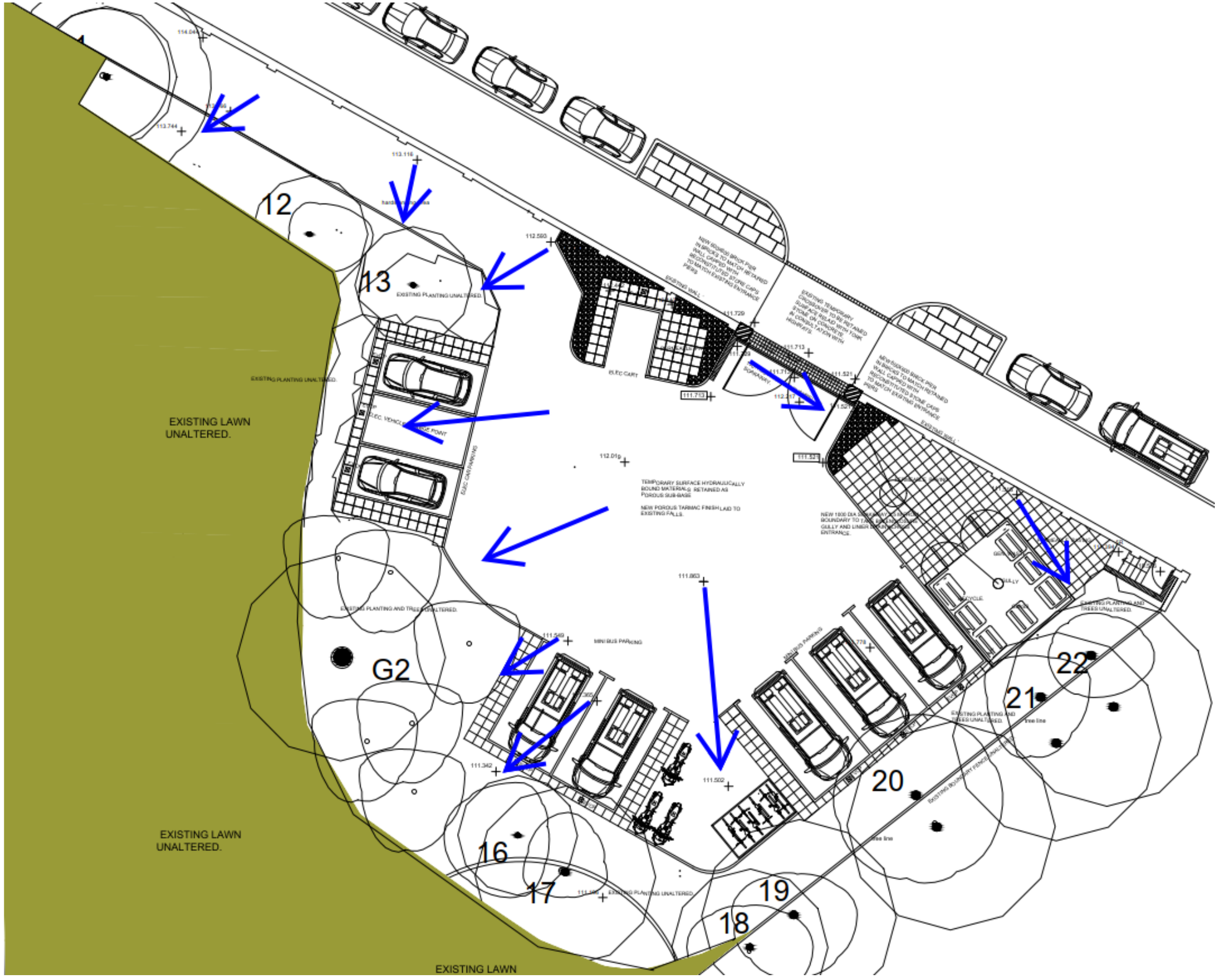
Storage is Online Cover Level (m) 5.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.41325	Width (m)	20.0
Membrane Percolation (mm/hr)	1000	Length (m)	28.0
Max Percolation (l/s)	155.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.10	Evaporation (mm/day)	3
Invert Level (m)	4.850	Membrane Depth (m)	0

Appendix E

Exceedance Plan



Job	Channing School Car Park			Date	16.02.2022
Title	Exceedance Plan			Eng.	CL
Job No.	1843	Sheet	SKC01	Rev.	P1

HEYNE TILLETT STEEL

Appendix F

Maintenance Schedule

1843 – Channing Junior School
Date: February 2022
Prepared by: Carmel Lennon

Drainage Inspection and Maintenance Strategy

This document has been prepared to support the inspection and maintenance of the proposed below ground drainage of the car park area off Highgate Hill at Channing Junior School. The drainage network comprises surface and foul water drainage systems:

- The surface water network consists of a permeable car park which serves its own footprint.

In accordance with CIRIA C625 it is recommended that a private SuDS maintenance agreement is undertaken as a simple contract between the property owner and the maintenance provider (the maintainer). It is mainly to facilitate continuing maintenance of the SuDS that are in private ownership. The maintenance requirements are in accordance with the CIRIA C753 SuDS Manual 2015 and product manufacturer's requirements.

The following Drainage / SuDS measures are proposed within the development:

- General Drainage:

Maintenance Period	Maintenance Task	Frequency
Regular maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action.	Monthly
	Inspect surface structures and covers removing obstructions and silt as necessary.	Monthly or as required
	Check there is no physical damage.	
	Remove overgrown vegetation 1m min. around structures and keep hard aprons free from silt and debris.	
Occasional Maintenance	Remove sediment from pre-treatment structures (e.g. gullies, channels silt traps) and non-return valves.	Six-monthly or as required after large storm events
	Remove cover and inspect inside, ensuring water is flowing freely and that the exit route for water is unobstructed.	Annually or as required after large storm events.
	Remove debris and silt.	
	Undertake inspection after leaf fall in autumn.	
Remedial Actions	Repair/rehabilitation of inlets, outlets, overflows and vents.	As required
Monitoring	Inspect all manholes, inspection chambers, inlets, outlets, overflows and vents to ensure they are in good condition and operating as designed.	Annually or after large storms.

- Overflows and Flood Routes:

Maintenance Period	Maintenance Task	Frequency
Regular maintenance	Remove any accumulated grass cuttings or other debris on top of grass weirs or stone filled baskets overflows.	Monthly
	Make visual inspection of flood routes. Check route is not blocked by new fences, walls, soil or other rubbish. Remove as necessary.	
	Jet pipes leading from overflow structures annually and check by running water through overflow. Check free flow at next SuDS feature – inlet to basin or chamber.	Annually
Remedial Actions	If overflow is not clear, then dismantle structure and reassemble to design detail.	As Required

- Permeable paving system:

Maintenance Period	Maintenance Task	Frequency
Regular maintenance	Inspect for sediment and debris in the inlet chambers and trim any roots that may be causing blockages.	Annually or as required based on inspections
	Cleaning of gutters and any filters on downpipes	
	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or as required,
Occasional maintenance	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required, based on inspections
Remedial Actions	Remedial work to any depressions, rutting, cracked or broken blocks considered detrimental to the permeable paving performance.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required
	Jet washing and suction cleaning will substantially reinstate pavement to 90% efficiency (CIRIA RP992).	As required
Monitoring	Initial inspection.	Monthly for three months after installation
	Inspect inspection chambers and note rate of sediment accumulation and establish appropriate brushing frequencies.	Monthly in the first year and then annually
	Inspect for evidence of poor operation and/or week growth – if required, take remedial action.	Annually
	Monitor effectiveness of permeable pavement and when water does not infiltrate immediately advise Client of possible need for reinstatement of top layers or specialist cleaning.	As required

Reference shall be made to CIRIA publication C753 (The SuDS Manual) and to the relevant maintenance guidance from the products manufacturers.