Eckersley O`Callaghan

Branch Hill House
London NW3 7LS
Drainage Condition Discharge

Issue P01

Project Number:	**21021**
Report Issue Date:	**21 Oct 2021**
Report Status:	**For Planning**
Prepared by:	**ES/JH**
Checked by:	**DW**

London Office 9th Floor, 236 Gray's Inn Rd, London WC1X 8HB +44 (0) 20 7354 5402 **eocengineers.com**
Directors Brian Eckersley BEng BA(Arch) CEng MIStructE, James O'Callaghan BEng CEng MIStructE MHKIE

Document History

Date	Issue	Reason for Issue	Prepared by	Checked by
21 Oct 2021	P01	For Planning	ES/JH	DW

Contents

1 Introduction

This report outlines the proposed below ground drainage scheme for Branch Hill House in the borough of Camden, London, NW3 7LS and our compliance with the planning condition requirements.

This report should be read in conjunction with following drawing which show full details of the sustainable drainage system including the below-ground cellular attenuation and flow restriction proposals.

BHH-EOC-DR-S-5000

BHH-EOC-DR-S-5100

BHH-EOC-DR-S-5101

The below ground drainage system accommodates all storms up to and including a 1:100-year storm with a 40% provision for climate change.

The whole-site run-off is limited to match greenfield rates:

1 in 1	2.3l/s
1 in 30	6.1l/s
1 in 100	8.6l/s

2 Drainage Maintenance Schedule

The below schedule indicates the recommended minimum maintenance requirement to provide a fully functioning drainage system. This schedule will be regularly reviewed by the operator and where necessary the actions and frequency will be updated to reflect the ongoing operation of the facility.

The property will be under single ownership so there will be no conflict. The site owner will be responsible for maintenance of the common drainage systems and specialist contractors will be used where necessary.

No man entry is permitted into manholes or enclosed spaces unless performed by fully qualified personnel. A yearly inspection is to be undertaken after leaf fall in Autumn.

Approved safety procedures must be followed.

Ref	Maintenance Item	Required Action	Frequency
01	Below Ground Drainage Pipework	All drainage to be fully jetted and inspected for integrity by CCTV survey. Where pipework is damaged or obstructed localised repairs will be needed immediately to ensure operation of drainage systems.	10 yearly As required
02	Manholes	Inspect manholes and for integrity and debris. Remove cover and ensure water is flowing freely and unobstructed. Clean out blockages, remove silt from any catchpits and repair damage	5 yearly As required
03	Roof Gutters	Visually inspect gutters for leaves and debris. Clearing/jetting of gutters to remove build-up of debris and leaves to prevent carry of material to below ground system. Waste material to be disposed to refuse.	Annually As required
04	External gullies	Inspect surface water gullies and silt traps To be cleaned with vacuum tanker when silt exceeds 50% of catch pit depth	Annually As required
05	Overland flow paths	Inspection of overland flow routes to ensure route not blocked by new structures, furniture, overgrown vegetation, walls or debris. Remove and maintain as necessary	6 Monthly
06	Flow Controls	Remove cover and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.	Annually

Record Keeping

To ensure the above maintenance regime is followed the operator will draw up a suitable maintenance schedule for completion by the site operatives and to be signed off by the relevant manager. The schedule will be based on the above table and will include:

- Date of maintenance inspection.
- 'Undertaken By' boxes to confirm inspection items carried out and by whom.

- A comments column to record condition of items inspected and what maintenance actions need to be taken or procedures to be instigated to correct any non-compliance with the operation strategy
- A column for confirming maintenance and/or rectification works have been carried out.
- An overall signature space for sign off by a competent member of the company's management team.

3 Overland Flood Exceedance Routing Plan

In accordance with the NPPF, this new build has been classified as 'more vulnerable' and is located within the Floor Zone 1. It is therefore considered suitable in accordance with Table 2 of the NPPF. Below is the flood exceedance routing plan included with the original approved plans. The overall exceedance discharge is towards the northwest of the site. There will be no damage to property due to surface water ingress during exceedance events.

4 Drainage Design Hierarchy

Consideration to the London Plan drainage hierarchy is required including justification for the selected drainage strategy features on the proposed development.

London Plan Drainage Hierarchy –

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

1. **Store rainwater for later use**.
   The development includes communal rainwater harvesting tanks. This is to be used by the residents and by the groundsman tending to the landscape areas. The location and size have yet to be decided upon and will be settled at the detailed design stage.

2. **Use infiltration techniques, such as porous surfaces in non-clay areas**.
   The ground condition has poor infiltration rates therefore it is not feasible to use soakaways. See Appendix A for extracts from the Ground investigation.

3. **Attenuate rainwater in ponds or open water features for gradual release**.
   The topography and the development restraints are not suitable for open water features of any significant volume.

4. **Attenuate rainwater by storing in tanks or sealed water features for gradual release**.
   A 191m^3 below ground attenuation will be provided so that the greenfield run off rate limits are met. This is based on all storms up to and including 1:100-year return period with a 40% allowance for climate change. This will allow a gradual release of the rainwater to the combined sewer See Appendix B.

5. **Discharge direct to a watercourse**.
   N/A – there are no nearby watercourses.

6. **Discharge rainwater to a surface water sewer/drain.**
   N/A – there are no nearby surface water sewers.

7. **Discharge rainwater to the combined sewer.**
   Separate surface water and foul water drainage systems will be provided, with a combining manhole upstream of the public sewer connection at manhole EXCMH9104.

5 Drainage strategy conclusions

1. The energy/sustainability consultee has addressed the water use target, which aims for a maximum of 105 litres per person per day.

2. Surface and foul water generated by the site is to discharge into public combined sewer network on Heysham Lane.

3. Due to the poor infiltration rates, soakaways are not considered as a viable option.

4. No watercourses or other appropriate surface water bodies are within the site proximity. The development will connect to the existing public sewer for the disposal of surface water from impermeable areas.

5. The discharge from the site post-development will be limited to greenfield run off rates during all events up to and including the 1:100 AEP event, including a 40% allowance for climate change.

6. To achieve the above limitations, 191.0m^3 of below ground attenuation will be provided.

7. The proposals will reduce the flood risk associated with the receiving public sewer network exceedance as a result of the significant reduction in peak runoff rates compared to the existing flows.

6 Appendix A- Site Investigation Extract

Ground Model	Stratum	Thickness	Notes
GM1	Made Ground	1.65m	Granular SPT = 5
	Bagshot Formation (Sand)	15m	Granular SPT = 15
	Claygate Member (Clay)	11-20m	Cu = 110kN/m^2

Table 8.7. Ground Model

6.3. Groundwater Conditions

Groundwater was discovered at the following locations:

BH No.	Depth of Strike (mbgl)	Rose to (mbgl)
BH01	15.00 & 24.50	14.00 & 23.00
BH02	12.90 & 26.10	12.00 & 23.45
BH03	10.00	9.50

Table 6.2: Groundwater Locations and Strikes

6.2.1. Standard Penetration Testing (SPT)

SPT were carried out throughout the boreholes and windowless boreholes and gave SPT 'N' values of between 5 and 30 in the Bagshot Formation & 9 and 29 in the Claygate Member.

The distribution of SPT N-values is shown in Table 6.1 and Graph 6.1. Engineering logs are showing the full test results are included in Appendix 2.

BH No.	Depth (mbgl)	Strata	SPT 'N' Value	Main Constituent
BH01	1.2	Bagshot Formation	12	CLAY
	2.0		10	
	3.0		9	
	5.0		14	
	8.0		22	
	11.0		30	SAND
	12.5		27	
	14.0		8	CLAY
	15.5	Claygate Member	11	SAND
	17.0		12	
	20.0		23	CLAY
	23.0		29	SAND
	26.0		15	CLAY
BH02	1.2	Bagshot Formation	13	SAND
	2.0		17	
	3.0		5	
	4.0		8	
	6.5		17	
	9.5		23	
	12.5		28	
	14.0		13	
	17.0	Claygate Member	14	
	18.5		9	
	21.5		24	CLAY
	24.5		20	
	27.5		21	SAND
	29		28	
BH03	1.2	Bagshot Formation	15	CLAY
	3.0		16	
	4.0	Claygate Member	19	SAND
	5.0		25	
	6.5		25	
	8.0		27	
	9.5		27	

Table 6.1: SPT 'N' Value Distribution

Project				EX. HOLE No
Branch Hill House				**BH01**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5008338	08-04-19 10-04-19			
Contractor				Sheet
Ridge and Partners LLP				1 of 2

SAMPLES & TESTS			Water	Reduced Level	Legend	Depth (Thick-ness)	STRATA DESCRIPTION	Geology	Instrument/ Backfill
Depth	Type No	Test Result							
						0.10	MACADAM.		
						0.60	MADE GROUND: Dark brown silty sandy angular to sub-rounded fine to coarse Gravel of flint, concrete and brick. Sand is fine to coarse.		
1.00	D						Loose to medium dense orangish brown and brownish orange mottled clayey silty fine and medium SAND inter-bedded with thinly bedded sandy CLAY. (BAGSHOT FORMATION).		
1.20		N12							
2.00	D								
2.00		N10							
3.00	D								
3.00		N9							
4.00	D								
4.00-4.45	U100	43 blows							
4.50	D								
5.00	D					(9.80)			
5.00		N14							
6.00	D								
6.50-6.95	U100	38 blows							
7.00	D								
8.00	D								
8.00		N22							
9.00	D								
9.50-9.95	U100	52 blows							
10.00	D					10.40			
11.00	D						Medium dense brownish orange fine SAND. (BAGSHOT FORMATION).		
11.00		N30							
12.00	D					(3.40)			
12.50		N27							
13.00	D								
			1			13.80			
14.00	D					14.50	Firm brown silty sandy CLAY. Sand is fine and medium. (BAGSHOT FORMATION).		
14.00		N8				15.10	Loose to medium dense dark grey very silty fine SAND. (CLAYGATE MEMBER).		
15.00	D						Medium dense greenish grey very clayey silty fine SAND. Locally dark grey very sandy Clay. (CLAYGATE MEMBER).		
15.50		N11							
16.00	D					(2.70)			
17.00	D								
17.00		N12				17.80			
18.00	D						Stiff grey silty CLAY. (CLAYGATE MEMBER).		
18.50-18.95	U100	61 blows							
19.00	D					(3.20)			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
									12	15	CAT scanned prior to excavation. Groundwater strikes at 15.00mbgl and 25.40mbgl. Borehole terminated at 26.00mbgl due to running sands and complications with casing.

All dimensions in metres Scale 1:125	Client Almax Group Ltd	Method/ Plant Used Dando CP Rig	Logged By PB

Project				EX. HOLE No
Branch Hill House				BH01
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5008338	08-04-19 10-04-19			
Contractor				Sheet
Ridge and Partners LLP				2 of 2

SAMPLES & TESTS			Water	Reduced Level	Legend	Depth (Thick-ness)	STRATA DESCRIPTION	Geology	Instrument/ Backfill
Depth	Type No	Test Result							
20.00	D						Stiff grey silty CLAY. (CLAYGATE MEMBER). *(continued)*		
20.00		N23				21.00			
21.00	D						Dark grey silty fine SAND. (CLAYGATE MEMBER).		
21.50-21.95	U100	75 blows							
22.00	D					(3.90)			
23.00	D								
23.00		N29							
24.00	D								
24.50-24.95	U100	60 blows				24.90			
25.00	D					(1.10)	Firm to stiff grey sandy CLAY. Sand is fine. (CLAYGATE MEMBER).		
26.00	D					26.00			
26.00		N15							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											CAT scanned prior to excavation. Groundwater strikes at 15.00mbgl and 25.40mbgl. Borehole terminated at 26.00mbgl due to running sands and complications with casing.

All dimensions in metres Scale 1:125	Client Almax Group Ltd	Method/ Plant Used Dando CP Rig	Logged By PB

Project				EX. HOLE No
Branch Hill House				BH02
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5008338	10-04-19 12-04-19			
Contractor				Sheet
Ridge and Partners LLP				1 of 2

SAMPLES & TESTS			Water	Reduced Level	Legend	Depth (Thick-ness)	STRATA DESCRIPTION	Geology	Instrument/ Backfill
Depth	Type No	Test Result							
						0.30	Turfed grass over TOPSOIL: Brown sandy Silt with abundant roots.		
1.00	D						Loose to medium dense orangish brown and brownish orange mottled clayey fine and medium SAND inter-bedded with thinly bedded sandy CLAY. (BAGSHOT FORMATION).		
1.20		N13							
2.00	D								
2.00		N17							
3.00	D								
3.00		N5							
4.00	D								
4.00		N8							
5.00	D								
5.00-5.45	U100	31 blows							
5.50	D					(11.70)			
6.00	D								
6.50		N17							
7.00	D								
8.00	D								
8.00-8.45	U100	43 blows							
8.50	D								
9.00	D								
9.50		N23							
10.00	D								
11.00	D								
11.00-11.45	U100	63 blows				12.00			
11.50	D						Medium dense brownish orange fine SAND. (BAGSHOT FORMATION).		
12.00	D								
12.50		N28				(2.40)			
13.00	D								
14.00	D					14.40			
14.00		N13				15.00	Medium dense brown clayey silty find and medium SAND. (BAGSHOT FORMATION).		
15.00	D						Firm brownish grey and greyish brown silty sandy CLAY. Sand is fine. (CLAYGATE MEMBER).		
15.50-15.95	U100	45 blows				(2.00)			
16.00	D								
17.00	D					17.00			
17.00		N14					Medium dense dark grey very silty fine SAND. Locally dark grey very sandy Clay. (CLAYGATE MEMBER).		
18.00	D					(2.00)			
18.50		N9							
19.00	D					19.00			
							Firm to stiff grey silty sandy CLAY. Sand is fine. (CLAYGATE MEMBER).		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											CAT scanned prior to excavation. Groundwater strikes at 12.90mbgl and 26.10mbgl.

All dimensions in metres Scale 1:125	Client Almax Group Ltd	Method/ Plant Used Dando CP Rig	Logged By PB

Project				EX. HOLE No
Branch Hill House				BH02
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5008338	10-04-19 12-04-19			
Contractor				Sheet
Ridge and Partners LLP				2 of 2

SAMPLES & TESTS			Water	Reduced Level	Legend	Depth (Thick-ness)	STRATA DESCRIPTION	Geology	Instrument/ Backfill
Depth	Type No	Test Result							
20.00	D						Firm to stiff grey silty sandy CLAY. Sand is fine. (CLAYGATE MEMBER). *(continued)*		
20.00- 20.45	U100								
20.50	D								
21.00	D								
21.50		N24				(6.00)			
22.00	D								
23.00	D								
23.00- 23.45	U100	83 blows							
23.50	D								
24.00	D					25.00			
24.50		N20					Medium dense greenish grey very clayey silty fine SAND. (CLAYGATE MEMBER).		
25.00	D								
26.00	D								
26.00- 26.45	U100	54 blows							
27.00	D								
27.50		N21				(5.00)			
28.00	D								
29.00	D								
29.00		N28							
						30.00			
30.00	D								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											CAT scanned prior to excavation. Groundwater strikes at 12.90mbgl and 26.10mbgl.

All dimensions in metres Scale 1:125	Client Almax Group Ltd	Method/ Plant Used Dando CP Rig	Logged By PB

Project				EX. HOLE No
Branch Hill House				BH03
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5008338	15-04-19 15-04-19			
Contractor				Sheet
Ridge and Partners LLP				1 of 1

SAMPLES & TESTS			Water	Reduced Level	Legend	Depth (Thick-ness)	STRATA DESCRIPTION	Geology	Instrument/ Backfill
Depth	Type No	Test Result							
						0.10	MACADAM.		
						(1.10)	MADE GROUND: Brown speckled red clayey fine to coarse Sand. Frequent gravel of flint, brick and concrete.		
1.00	D					1.20			
1.20		N15					Firm orangish brown silty sandy CLAY. Sand is fine and medium. (BAGSHOT FORMATION).		
2.00	D					(1.80)			
2.00-2.45	U100	80 blows							
2.50	D					3.00			
3.00	D						Medium dense brown clayey silty fine SAND. (BAGSHOT FORMATION).		
3.00		N16							
4.00	D								
4.00		N19							
5.00	D								
5.00		N25							
6.00	D								
6.50		N25				(7.00)			
7.00	D								
8.00	D								
8.00		N27							
9.00	D								
9.50		N27	1						
10.00	D					10.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											CAT scanned prior to excavation. Groundwater strike at 10.00mbgl.

All dimensions in metres Scale 1:125	Client Almax Group Ltd	Method/ Plant Used Dando CP Rig	Logged By PB

Project				EX. HOLE No
Branch Hill House				SA1
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5008338	17-04-19 17-04-19			
Contractor				Sheet
Ridge and Partners LLP				1 of 1

SAMPLES & TESTS			Water	Reduced Level	Legend	Depth (Thick-ness)	STRATA DESCRIPTION	Geology	Instrument/ Backfill
Depth	Type No	Test Result							
						0.20	TOPSOIL: Dark brown slightly clayey slightly sandy Silt with abundant roots and rootlets. Sand is fine.		
0.30	ES					0.60			
0.80	ES					(1.40)	MADE GROUND: Yellowish brown / brownish yellow locally mottled light grey locally very clayey fine and medium Sand. Occasional angular to sub-rounded fine to coarse gravel of brick.		
1.00	B					2.00	Brownish yellow mottled orangish brown and light grey clayey fine and medium SAND. Locally very clayey.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											CAT scanned prior to excavation. Groundwater not encountered.

All dimensions in metres Scale 1:125	Client Almax Group Ltd	Method/ Plant Used Kubota U27-4	Logged By RG

Project				EX. HOLE No
Branch Hill House				SA2
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5008338	17-04-19 17-04-19			
Contractor				Sheet
Ridge and Partners LLP				1 of 1

SAMPLES & TESTS			Water	Reduced Level	Legend	Depth (Thick-ness)	STRATA DESCRIPTION	Geology	Instrument/ Backfill
Depth	Type No	Test Result							
0.50	ES					0.20 (1.45) 1.65	TOPSOIL: Dark brown slightly clayey slightly sandy Silt with abundant roots and rootlets. Sand is fine. MADE GROUND: Brown occasionally orangish brown mottled dark blackish brown, speckled red, silty sandy gravelly Clay. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse brick, concrete, flint and clinker. Frequent cobbles of brick and concrete. Occasional wood pieces. Occasional pieces of concrete paving slabs and tarmacadam. Rare sub-rounded medium gravel of chalk. Asphalt/concrete slab at base.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											CAT scanned prior to excavation. Groundwater not encountered. Terminated at a depth of 1.65m due to presence of asphalt/concrete slab.

All dimensions in metres Scale 1:125	Client Almax Group Ltd	Method/ Plant Used Kubota U27-4	Logged By RG

7 Appendix B- Thames Water